Reply to Data Quality Act Request to the U.S. Department of Agriculture, Forest Service

The Forest Service received a Data Quality Act Correction of Information Request on November 19, 2021, from Ben Wudtke, the Executive Director of Black Hills Forest Resource Association (BHFRA) (c/o Kent Holsinger (Holsinger Law LLCC) related to **RMRS-GTR-422**. On page 22-23 of the request, ***VI. Information to be Corrected***, six items were identified for which correction was sought. This document outlines the detailed Forest Service response to these six topics, based on **RMRS-GTR-422**.

This response is organized using the following format:

1. Each of the six topics are labeled: Correction Requests 1 through 6.
2. If a correction request had multiple points that needed to be addressed, each unique response sub-element is labeled Correction Request 1.1 or 1.2, as an example. Each of these topics are followed by a reply – Reply to Correction Request 1.1.
3. There are seven reports referenced in this response. The reports and their citations are listed in Appendix A. When referenced in this reply, the name of the report is bolded.
4. Quotes from any cited report are in italics without quotation marks.

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Correction Request 1

"Arbitrary exclusions of available timber for harvest on the BHNF from spruce and timberlands outside the suitable base in the current RMPA"

This correction request included four points and this reply addresses each point separately:

1.1. The analysis in the GTR is contrary to the standards of the DQA.

1.2. Arbitrary exclusions of white spruce for harvest on the BHNF.

1.3. Faulty assumptions and arbitrary exclusion of available timbered acres.

1.4. Assume suitable base will never change over 80 years.

Correction Request 1.1. The analysis in the GTR is contrary to the standards of the DQA and would be firmly grounded as arbitrary and capricious in a NEPA document used for these discussions and decisions.

Reply to Correction Request 1.1.

RMRS-GTR-422 follows the standards of the Data Quality Act, and it is not a NEPA document; no decision is made in **RMRS-GTR-422**. Rather, as stated in its title, **RMRS-GTR-422** may be used to inform future agency decisions that are supported by requisite environmental analysis. Therefore, the request for correction has been declined. The following evidence is provided.

1. In the **Reconciliation of Comments** under Technical Peer Review, page 3 states: *The technical review includes a review of the statistics, research design, experimental methods, interpretation of results, and other technical aspects of the document to ensure maximum quality, objectivity, utility, and integrity of information*. Office of Management and Budget Guidelines, Section 515, Pub. L. No. 106-554, Data Quality Act (DQA).
2. **RMRS-GTR-422** follows and meets the standards of the DQA. There are three elements that USDA agencies and offices must follow in developing and reviewing information and disseminating it to the public: objectivity, utility, and integrity. This Request for Correction of Information focused on the objectivity aspect of the DQA. Under objectivity, the information USDA agencies disseminate will require a clear statement of research objectives and description of the approaches and methods, prove research information to the public that is reliable, accurate, and presented clearly, and provide an explanation detailing how it was obtained, what it is, the conditions to which it applies, and the limitations associated with the research information. The data needs to be transparent, reliable, accurate and unbiased. In addition, USDA agencies and offices will identify the source of the information so that the public can assess whether the information is objective. See https://www.usda.gov/ocio/guidelines-and-compliance-resources/information-quality-activities/scientific-research. To fulfill the standards of objectivity, **RMRS-GTR-422** provides details associated with data from past reports and Forest Inventory and Analysis (FIA) data presented in the tables (Tables 1, 2, 3, 4, and 5) either in the text and/or as footnotes.
    - The following are locations of associated FIA data within **RMRS-GTR-422**.

- Tables
  - Table 1. Text and footnotes associated with table.
  - Table 2. Sources of information cited in table.
  - Table 3. Number of plots measured for 2017 and 2019 evaluation and 2012 data was cited.
  - Table 4. Text beginning on page 18-23, box on page 23 defining terms, and footnotes associated with the reports (page 24).
  - Table 5. Provided footnotes on sampling error for the 2019 sawtimber means and 68% confidence interval.
- Scenarios used in analysis: Page 27 of **RMRS-GTR-422** describes scenario development and assumptions made. This discussion provides an objective and unbiased approach at evaluating different harvest rates, which allow the public to evaluate and understand the process and use of the data in **RMRS-GTR-422**.
- *Appendix A. Land Area* provides a synopsis of the acres used in the analysis of **RMRS-GTR-422**.

3. **NRS-FIA Response** provides detailed information associated with the FIA data used in **RMRS-GTR-422** analysis for evaluating the scenarios.

Correction Request 1.2. Arbitrary exclusions of white spruce for harvest on the BHNF.

Reply to Correction Request 1.2. White spruce was not included in **RMRS-GTR-422** scenarios for the following reasons:

1. The **Reconciliation of Comments** had five comments (technical reviewer #1, technical reviewer #2, comment #123, #272, and #150) of the 285 comments received that related to white spruce. In general, the reviewers requested a) to include white spruce when characterizing Forest Inventory reports and include white spruce data, or, b) to see a scenario that figures the additional CCF from white spruce harvest and commercial harvest outside of the suitable base. How much CCF would this add to the potential annual harvest?
   - Author's response in the reconciliation of comments: *RMRS-GTR-422 was intended to address the sustainability of only ponderosa pine sawtimber, not other types of timber. However, we recognize that white spruce could contribute to ASQ and the timber sale program. In table 4, we highlight which years included white spruce and ponderosa pine in the volume estimates versus those that only report ponderosa pine.* AND
   - *Our task was to address ponderosa pine sustainable harvest on the suitable timberlands. While white spruce does have commercial value and can contribute to the annual CCF for harvest, it was not within the scope of RMRS-GTR-422*.

2. An email from Jerome (Jerry) Krueger to Mike Battaglia and Russ Graham on 11/26/2019, provided the final questions for the FIA analysis from the Black Hills National Forest Timber Resource Working Group. The Working Group consisted of U.S. Forest Service Black Hills National Forest (Jerry Krueger, Kerry Burns, and Blaine Cook), forest products industry (Ben Wudtke, Dan Buehler, and Adam Gahagan), Wyoming Forestry (Josh Van Vlack), and

South Dakota Forestry (Marcus Warnke). In that email, the species of interest was ponderosa pine and to isolate data by this species, if possible.

3. Across the Black Hills region, ponderosa pine has been the dominant commercial tree species **(RMRS-GTR-422**, page 4). The ponderosa pine resource was the tree species that was significantly impacted by the mountain pine beetle epidemic (**RMRS-GTR-422**, p. 5). Furthermore, based on Forest Service records of timber volume sold, from 2012 to 2017, an average of 193,107 CCF/yr of sawtimber was sold. While sawtimber harvest volumes were increasing, most harvested stands were adjacent to stands killed by the mountain pine beetle (MPB). These infested stands were not harvested (Figure 7; **RMRS-GTR-422**); the combination of mountain pine beetle and harvesting of green trees contributed to the reduction of the standing live sawtimber volume on the BHNF (**RMRS-GTR-422**, page 7).
4. According to the **Underhill Report**, which addressed additional information outside the scope of **RMRS-GTR-422**, about 150,000 CCF (about 7,500 CCF/yr over the next 20 years) of white spruce may be possible for harvest. However, white spruce harvest is beyond the scope of **RMRS-GTR-422.** If the objective is to determine the actual white spruce harvest a transparent, accurate and more reliable method to evaluate white spruce and its contribution is to conduct a separate analysis with its species-specific growth and mortality rates and harvest levels in a different document.

As such, the request to correct this segment of the document has been declined.

Correction Request 1.3. Faulty assumptions and arbitrary exclusion of available timbered acres.

Reply to Correction Request 1.3. There are several reasons why this request for correction is declined, including:

1. There have been ongoing discussions about the acres of ponderosa pine that are specifically available for harvesting in the Black Hills National Forest. Each entity (group, individual, agency, or program) defines acres available for harvest differently. The challenge for **RMRS-GTR-422** was to determine which definition of the suitable acres from the many different sources that identify available timbered acres on the Black Hills National Forest should be used for purposes of determining sustainable ponderosa pine harvest. The DQA requires three elements that USDA agencies and offices follow while developing and reviewing information and disseminating it to the public: Objectivity, utility, and integrity. Under objectivity, with respect to influential scientific information, the agency (1) will use data collected by accepted methods or best available methods (if the reliability of the method and the nature of the decision justifies the use of the data). This was paramount because the agency is directed to *Disseminate influential scientific information with a high degree of transparency about data and methods to facilitate its reproducibility by qualified third parties. Reproducibility means that the information is capable of being substantially reproduced, subject to an acceptable degree of imprecision.* https://www.usda.gov/ocio/guidelines-and-compliance-resources/information-quality-activities/scientific-research

   Because of the different perspectives on what constitutes suitable and accessible timberland, **GTR-RMRS-422** used data that has a high degree of transparency and has strict data

collection protocols subject to quality assurance and quality control procedures. Forest Inventory and Analysis (FIA) provides details on field data collection online and has peer-reviewed statistical foundations of the FIA sample to ensure that reliable unbiased estimates are generated along with associated values of uncertainty. The associated value of uncertainty is critical when defining the live standing volume plus confidence intervals as indicated in the **NRS-FIA Response** to the **BHFRA Consultant's Report**. **GTR-RMRS-422** based the acreage estimates following a specific protocol used by FIA.

2. **Reconciliation of Comments** included 21 comments concerning the acres of suitable timberlands. The Northern Research Station Forest and Inventory Analysis (NRS-FIA) group provided an explanation of the suitable timberland acres several times to the stakeholders. In **RMRS-GTR-422** Appendix A explicitly documents, in the last two paragraphs, the acres utilized in the analysis of the scenarios:

   Direct comparison of acreage from the Black Hills National Forest and FIA is challenging due to differences in how area is calculated, sampling intensity, timing of inventory, and classification protocols (USDA FS 2020b).

   For this analysis, the USDA Forest Service, Forest Inventory and Analysis Program (USDA FS 2021) identified and analyzed 765,734 acres of suitable timberland... The difference here is predominately due to non-forested areas which were included within the Black Hills National Forest suitable timberlands but that do not meet the FIA definition of timberland (USDA FS 2020b).

3. Although outside the scope of **RMRS-GTR-422**, there are two reports that discuss acreage estimates of the Black Hills National Forest that provided additional information: (1) the **NRS-FIA Response,** which directly responded to concerns brought up by the **BHFRA Consultant Report**; and (2) the **Underhill Report,** which was an assessment of the National Forest Advisory Board (NFAB) recommendation.

   a) The **NRS-FIA Response** (2020) to the **BHFRA consultant's report** provides the following information about acreage estimation:

      i. *The net suitable and accessible timberland total area estimates for each inventory are comparable (See Table B1). The FSVeg spatial total (731,283 acres) falls within the 95% confidence interval for the FIA estimate (704,860 ± 30,808 acres).*

      ii. *Differences in FIA and forest land classification are apparent regarding classification of currently non-forest areas or regenerating areas with low stocking. FIA data indicates that 44,000 acres is non-forest, presumably through a type conversion from forest to grasslands. The majority of these acres are still designated as part of the suitable and accessible timber base by the BHNF as non-stocked or marginally stocked areas (84,244 acres).*

      iii. *Differences in classification of non-forest or regenerating areas with low stocking will not affect volume estimates.*

   b) The **Underhill Report** verifies the conclusions in the **NRS-FIA Response**:

The suitable timberland area estimation of 765,733 acres (2017-2019 FIA augmented inventory) is consistent with 865,890 acres designated as lands suitable for timber production by the 1997 Forest Plan. The variance can easily be explained by differences in classification methods for non-stocked areas. No adjustments to expansion factors are justified. Differences in FIA and Forest classification protocols do not apply to stocked areas and will not affect standing inventory estimates.

The standing inventory on unsuitable acres should not be included in the sustained yield calculations for timber production. By doing this, the standing inventory volume is inflated by 742,000 CCF which produces an inflated NAG [Net Annual Growth] and thus an inflated sustainable program level.

c) **RMRS-GTR-422** assumed the entire 765,733 acres would be available for harvest, but as stated in the section titled **Moving Forward** (page 38, second paragraph): *It is important to acknowledge that the scenarios presented in this document assume that all the standing live tree volume on the suitable timberlands is available for harvesting. However, national forests provide a variety of resources to the public including timber, water, wildlife habitat, recreation, and a sense of place. To balance the various needs for these resources, the Forest and Rangeland Renewable Resources Act of 1974 as amended by the National Forest Management Act of 1976 (16 U.S.C. 1604 (g)) requires that Forest Plans consider these resources.*

d) There are Forest Service laws, regulations, and directives that guide sustainable harvest as stated on page 18 of the **Underhill Report,** including the Multiple-Use Sustained Yield Act of 1960 and the National Forest Management Act (NFMA) of 1976. In addition, Section 5 on page 7 of the **Underhill Report** titled *Net Annual Growth Adjustments* quantified actual harvest levels within the context of the 1997 Forest Plan and Revision Phase II Amendment for the Black Hills National Forest: *The NAG (Net Annual Growth) scenarios presented in Graham et al. [RMRS-GTR-422] represent sustained yield calculations for ponderosa pine sawtimber in the suitable timber base that do not incorporate management direction and desired conditions. Additional steps are required to determine sustainable program levels that do factor in Forest Plan desired conditions and management direction.* In addition, Table 5a in the **Underhill Report** demonstrates that current structural stage distribution and the timber volume available when considering Forest Plan direction is 62,250 CCF/yr, which is even less than the harvest levels estimated in **RMRS-GTR-422**.

Correction Request 1.4. Authors assumed the suitable base will never change over the next 80 years.

Reply to Correction Request 1.4. The assumptions made in **RMRS-GTR-422** were based on the current suitable base, not a range of potential suitable base acreages that could change with Forest Plan revision. In **RMRS-GTR-422**, the 80-year estimates were based on starting live standing volume of 5,995,428 CCF +/- 646,307 on using current suitable base estimates. The 80-year graphs in **RMRS-GTR-422** (Figure 13) provide "what if" scenarios to characterize long-term sustainable timber harvest to inform how current standing live volume, harvest levels, mortality, and growth interact and subsequently influence the future availability of timber.

However, realized mortality rates and growth rates over time will ultimately influence the harvest levels on the Black Hills National Forest. Time will tell whether **RMRS-GTR-422** captures future growth and mortality, and the shift in the standing live volume will change over time. For this reason, the first paragraph in the section titled *Moving Forward* on p. 38 of **RMRS-GTR-422** emphasizes that *continuous monitoring and flexibility to adjust harvest levels based on realized mortality rates is crucial for long-term timber sustainability*. For these reasons, the request for correction has been declined.

Correction Request 2

"Incorrect sawtimber growth estimates"

This correction request included two sub-points and this reply addresses each point separately:

2.1. Incorrect sawtimber growth estimates.

2.2. The GTR authors ignored the BHFRA comments and the **BHFRA Consultant Report**.

Correction Request 2.1. Incorrect sawtimber growth estimates have two distinct elements to address:

1. Authors used growth rates from trees greater than 5-inches d.b.h. These smaller trees are often suppressed and do not reflect true sawtimber growth rates.
2. GTR authors claimed lack of reliable historical (pre-2000) data sawtimber growth, but they ignored the 19 years of available sawtimber growth rates provided in comments submitted by BHFRA and affirmed by FIA.

Reply to Correction Request 2.1. RMRS-GTR-422 utilized a range of growth rates that included both pre-2000 and post-2000 data as well as rates that included trees greater than 5-inches d.b.h. While inclusion of growth rates for trees ranging from 5-inches d.b.h. to 8.9-inches d.b.h. can reduce growth rates, the three growth rates used in the scenarios still represented what was observed in the pre-2000 and post-2000 data. Furthermore, **RMRS-GTR-422** did not ignore the 19 years of available sawtimber growth rates provided in comments submitted by BHFRA. The rates provided in the comments submitted by BHFRA and the **BHFRA Consultant Report** were not used for valid reasons as described below. Based on the evidence presented below, the request for correction for this item has been declined.

1. Page 28 of **RMRS-GTR-422** acknowledges and documents why growth rates were not limited to trees greater than 9-inches d.b.h.

The growth rates were the average annual gross growth as a percentage of the standing live volume for merchantable ponderosa pine trees > 5 inches d.b.h. (table 4). Growth rates for the > 9 inches d.b.h. were not used due to the lack of historical data [see pages 19-22*]. There is an element of uncertainty associated with how fire, MPB, and weather (wind and drought) will influence growth rates. Furthermore, forest growth across the Black Hills is variable, especially when comparing the southern Hills to the northern Hills and Bear Lodge Mountains of Wyoming (fig. 1). Therefore, we included a range of growth rates to account for this uncertainty. An average growth rate of 2.54% was derived from the 1962, 1984, 1999, 2011, and 2019 values (table 4). The 2017 value was excluded since it was included in the 2019 calculation. The average gross growth rate was bracketed with the minimum gross growth rate of 2.33% that was reported in 2019 and the maximum gross growth rate of 2.73% reported in 1962 (table 4). By using observed low and high growth rates from the 1960s through 2019 and a mean value in the scenarios, the variation in forest growth over the entire Black Hills region and the uncertainty of a future climate was represented (table 6).*

2. Page 5 of the **Underhill Report** provides additional support for and explanation of the use of growth rates in **RMRS-GTR-422:**

GGRs (defined as gross growth rate) are generally higher for sawtimber size trees than trees in the pole and sapling size classes. In order to evaluate GGRs for sawtimber from available, comprehensive inventories (not periodic cycles) 1960-2019, rates must be derived from comparable areas, size classes, and species.

Comparisons of recent inventory and historical inventory results for lands classified as suitable for timber production are not possible since stratification of inventory data by suitable lands applies to the 2017-2019 augmented FIA inventory only.

Correction Request 2.2. The GTR authors ignored the BHFRA comments and the BHFRA Consultant Report regarding sawtimber growth estimates.

Reply to Correction Request 2.2. RMRS-GTR-422 does not ignore the BHFRA comments or the **BHFRA Consultant Report** regarding sawtimber growth estimates. These were considered in the following ways:

1. In the **Reconciliation of Comments** there were numerous comments, including those of the BHFRA, on growth and mortality rates with requests to revise the original scenarios in the draft report. Based on the interest to see additional growth and mortality rates, **RMRS-GTR-422** was revised and the growth rates, mortality rates, and harvest rates were expanded to create 60 different management scenarios, rather than the 6 initial scenarios in the draft report.
2. The **NRS-FIA Response** released September 2020 responded to the **BHFRA Consultant Report.** The **NRS-FIA Response** to the **BHFRA Consultant Report** identified several concerns with the use of the on-line public database (FIADB) versus the augmented FIA data used in **RMRS-GTR-422** and the assumptions with the **BHFRA Consultant Report**. These concerns were addressed in the **NRS-FIA Response** and are highlighted below.

   The use of the on-line public database (FIADB) is inappropriate for this analysis because:

   - *FIADB based on older observations, it ignores the more recent observations included in the "augmented" data set.*
   - *The "augmented" and FIADB on-line public 2019 estimates do represent the same reporting year but are based on different samples which observe different periods of change and employ different stratifications.*
   - *FIADB uses a different stratification and only included South Dakota compared to the "augmented" data set includes lands from Wyoming and South Dakota and defined suitable and not-suitable areas within the BHNF boundary.*
   - *The "augmented" data and associated calculations (specific sample/stratification pairing) yields an unbiased estimate.*
3. The **Underhill Report** assesses the recommendations from the National Forest Advisory Board (**NFAB Recommendation**) for the Black Hills National Forest, which was released in January 2021. The **Underhill Report** suggests that the gross growth rate of 3.06% used in the **NFAB Recommendation** is not representative of long-term conditions in the Black Hills National Forest and should not be used in long-term sustainable program calculations.

Instead, based on a review of available inventories, the **Underhill Report** suggests that growth rates are within a range of 2.51% to 2.88% and that this range is consistent with growth rates identified in **RMRS-GTR-422** (2.54% and 2.73% gross growth rate). The **Underhill Report** further discusses that a growth rate higher than 2.51% may be reasonable due to the predominance of open, low-density forest conditions that will persist for decades. Additionally, page 5 of the **Underhill Report** suggests that the lower growth rate of 2.33% used in **RMRS-GTR-422** and the higher growth rate of 3.19% observed in the periodic inventory from 1979-1983 should be considered *outliers that are not representative of disturbance cycles throughout a rotation*.

For these reasons, this request for correction has been declined.

Correction Request 3

"Incorrect application of high mortality rates and labeling of "rational" mortality rates"

This correction request included five sub-points and this reply addresses each point separately:

3.1. Incorrect application of high mortality rates and labeling of "rational" mortality rates.

3.2. Authors of the GTR settle on "reasonable" estimate of a mortality rate, representing current rates and into the future, that mirrors the rate in 2011 report of FIA data (Walters et al 2013).

3.3. Report [Walters et al. 2013] represents impacts of Jasper, Ricco, Roger Shack, Battle Mountain, and other fires in combination with the MPB [mountain pine beetle] epidemic. Basing immediate and long-term mortality trends on a report with the largest wildfire in recorded history in the Black Hills, three other large fires, and 11 years of pine beetle mortality is illogical when looking at long-term trends outlined in table 1.

1. Hasn't been large fire on Black Hills in nearly a decade.
2. It's been more than 15 years since a large fire burned any significant portion of the suitable base.
3. Pine beetle epidemic was declared 'over' 4 years ago.

3.4. Contrary to the GTR, there are currently exceptionally low mortality rates on the BHNF. A continuous period of more than 40 years mortality rate on the BHNF was reported as ranging between 0.16 and 0.26%. These rates of 0.16 and 0.26 percent accurately reflect current conditions.

3.5. Incorrect application of high mortality rates.

Correction Request 3.1. Incorrect application of high mortality rates and labeling of "rational" mortality rates.

Reply to Correction Request 3.1. The following evidence indicates that the mortality rates were carefully considered:

1. The **Reconciliation of Comments** included numerous comments concerning table 4 in the draft GTR that used different FIA reports from different periods. We addressed these comments in the final **RMRS-GTR-422** as follows:
   a) **RMRS-GTR-422** uses valid methodology to gather rational mortality rates for the scenarios. A common form of scientific investigation is to conduct reviews and literature synthesis of scientific literature. Scientific synthesis is a method whereby inferences are drawn from analysis of multiple data sets or scientific literature to explain observed patterns across a range of time and space. **RMRS-GTR-422** follows an established scientific process and scientific methods for conducting an assessment and synthesis using the FIA inventories. The scientific process was also validated through technical and blind peer reviews of draft **RMRS-GTR-422**, and the final **RMRS-GTR-422** was blind peer reviewed by scientists. A statistical review was also conducted prior to publication to ensure a sound scientific process and accurate reporting.

b) The mortality rates used in the scenarios were informed by Forest Survey (precursor to FIA) and FIA data from the 1960s through 2019 for timberlands in the Black Hills National Forest (**RMRS-GTR-422,** Tables 1, 4, 5). In addition, fire history and cyclic mountain pine beetle epidemics in the Black Hills National Forest and other ponderosa pine forests throughout the western United States were used to provide context and to justify potential future mortality estimates. **RMRS-GTR-422** was developed using this process because there is an element of uncertainty associated with future mortality rates, particularly as climate continues to influence disturbance. Therefore, an informed range of mortality rates was evaluated, some of which could be considered best-case scenarios and some of which could be considered worst-case scenarios.

c) **RMRS-GTR-422** clearly explains how the historical FIA inventory reports of the Black Hills region were reviewed to provide context on mortality rates over the years. **RMRS-GTR-422** cautions on pages 18-19 that *users of this older data* [i.e., data from pre-2000 periodic inventory versus the post-2000 annualized inventory] *need to be careful in its interpretation and not use it to quantify trends*. A trend can be defined as linking reports over time as either increasing or decreasing volume, which is an inappropriate interpretation; however, the data at a particular time used in a particular report is valid. That is why Figure 11 on page 25 of **RMRS-GTR-422**, shows vertical lines between each measurement year. This figure was followed by text emphasizing the appropriate way to interpret FIA inventory reports over time and space:

> *Direct comparisons of absolute values of standing live volume of 1962 and 1984 to later values are complicated by the measurement methodology and geographic region measured. However, an assessment of how harvest levels impacted net change to standing live inventory is still valid within each measurement period.*

Page 18 of **RMRS-GTR-422** more explicitly explains why using a trend is inappropriate:

> *It is important to note that the periodic and annual inventory data are not directly comparable, but both provide good descriptions of forest resources (Goeking 2015). This doesn't negate the data from periodic inventories, since it is the best available information from that time...*

<u>Correction Request 3.2</u>. Authors of the GTR settle on a "reasonable" estimate of a mortality rate, representing current rates and into the future, that mirrors the rate in 2011 report of FIA data (Walters et al 2013).

<u>Reply to Correction Request 3.2</u>. On pages 28-29 of **RMRS-GTR-422** in the *Mortality Rates* section, the rationale for and interpretation of different mortality rates clearly shows that **RMRS-GTR-422** does not settle on a specific mortality rate, but rather includes a range of options for consideration:

> *An annual mortality rate of 0.26% was chosen to reflect both minimal MPB- and wildfire-induced mortality that occurred over multiple decades as shown in the 1984 and 1999 surveys by FIA (table 1). For a moderate amount of MPB- and*

wildfire-caused tree mortality, a rate of 1.04% was chosen, which was the mortality rate reported in 2011 (table 4). To reflect a mortality rate between the low (0.26%) and moderate (1.04%) values, the mean of reported values between 0.16% and 1.04% (table 4) was calculated (0.60%) (table 6). While a mortality rate of 3.07% was observed in the 2019 FIA measurement period, this rate occurred during high MPB and wildfire activity and is highly unlikely to occur for an extended length of time. Instead, we set 2.0% as the maximum mortality rate based on the average of the reported rate of 1.04% and the maximum reported rate of 3.07% (table 4). The medium to high mortality rate of 1.52% was calculated by averaging the medium and high mortality rates. These chosen mortality rates reflect those that have been reported in ponderosa pine forests across the western United States over the past several decades (table 2; DeRose et al. 2018; Goeking and Menlove 2017; Thompson et al. 2017; Shaw et al. 2018; Werstak et al. 2016; Witt et al. 2018; Witt et al. 2019; van Mantgem et al. 2009). Furthermore, mortality caused by wildfire and MPB has been historically cyclic; but as we progress through time, there is uncertainty associated with climate-disturbance interactions. Therefore, by evaluating a range of mortality rates, we can better represent these different disturbance cycles. In total, five mortality rates (0.26, 0.60, 1.04, 1.52, and 2.00%) were used in the scenarios (table 6).

<u>Correction Request 3.3</u>. Report [Walters et al. 2011] represents impacts of Jasper, Ricco, Roger Shack, Battle Mountain, and other fires in combination with the PB epidemic. Basing immediate and long-term mortality trends on a report with largest wildfire in recorded history in the Black Hills, three other large fires, and 11 years of pine beetle mortality is illogical when looking at long-term trends outlined in table 1.

1. Hasn't been large fire on Black Hills in nearly a decade.
2. It's been more than 15 years since a large fire burned any significant portion of the suited base.
3. Pine beetle epidemic was declared 'over' 4 years ago.

<u>Reply to Correction Request 3.3</u>. RMRS-GTR-422 utilizes the mortality rate of 1.04% from the 2011 Walter's et al. report as 1 of 5 mortality rates. However, **RMRS-GTR-422** does not assume that insect or wildfire-induced mortality will be absent in the future, and the rationale for a range of mortality rates was placed within context for several reasons. The following quotes from **RMRS-GTR-422** recognize the potential for future disturbances to occur in the Black Hills National Forest is noted below:

1. The Black Hills National Forest has a long history of wildfire as was stated on page 13 of **RMRS-GTR-422**:

   Prior to European settlement (circa 1875), wildfires burned in the forests of the Black Hills on average every 10 to 31 years depending on elevation (Brown and Sieg 1996; Brown and Sieg 1999; Brown et al. 2008; Hunter et al. 2007).

Wildfire ignitions are common within the Black Hills and have the potential to burn thousands of acres. For example, from 2000 to 2019, approximately 100 fires burned each year on public lands within the Black Hills, but most remained small and were suppressed (NIFC 2020). However, under conducive weather conditions, large wildfires can occur (fig. 6). From 1960 to 2019, across the Black Hills region, 547,449 acres burned, with over 75% of the burned area occurring in the last 20 years. Before 2000, wildfires burned 141,481 acres, averaging 3,628 acres per year. However, most of these fires were not extensive nor did they burn in areas where the FIA plots were located (Choate and Spencer 1969; Collins and Green 1988; DeBlander 2002; Green and Conner 1989). As a result, the contribution wildfire made to the total annual mortality from the 1960s through 1990s ranged from 0.00 to 0.03% (table 1). From 2000 through 2017, a total of 406,331 acres burned, averaging 22,574 acres burning per year with wildfire contributing 0.13% to 0.20% of the total annual tree mortality in the Black Hills (table 1).

2. Since the GTR was published in 2021, 91 wildfires have ignited in the Black Hills National Forest and burned 247 acres (personal communication, Chris Stover 12/9/2021). Fortunately for the surrounding infrastructure, forest, and human life, fire suppression activities were successful. However, as noted during the past 20 years, several wildfires have burned large acreages in the Black Hills region, and this is expected to reoccur.

3. Mortality of ponderosa pine is occurring throughout the interior western United States, and the Black Hills National Forest has not avoided those disturbances and mortality, as stated on page 14 of **RMRS-GTR-422**:

   Mortality Trends Across the Interior West: Recent mortality in ponderosa pine forests is not limited to the Black Hills region. FIA resource bulletins have reported increases in ponderosa pine mortality across the Interior West of the United States over the past few decades (Goeking 2015). Mortality rates ranged between 0.12 (Utah) to 1.30% (Montana) with an average mortality of 0.79% (table 2). Wildfires, followed by insects and disease, were the main contributor of mortality on a land area basis across the Interior West (DeRose et al. 2018; Goeking and Menlove 2017; Shaw et al. 2018; Thompson et al. 2017; Werstak et al. 2016; Witt et al. 2018, 2019). Several studies have reported that the number of wildfire events, along with the amount of acres burned, have increased across the western United States and Canada (Coop et al. 2020; Hanes et al. 2018; Parks and Abatzoglou 2020; Westerling 2016).

4. **RMRS-GTR-422** also considers the impacts of projected climate change on wildfire, mountain pine beetle, and ponderosa pine mortality, including regeneration success after disturbances such as wildfire, as stated on page 15 of **RMRS-GTR-422**:

   How might these climate change projections impact wildfire, MPB, and ponderosa pine mortality in the Black Hills region? Warmer temperatures throughout the year may result in earlier snowmelt and longer growing seasons. Moreover, higher temperatures in winter may shift snow to rain. These changes in growing season and precipitation type

could result in fire seasons starting earlier and ending later, a situation that is being observed across the western United States (Coop et al. 2020; Rocca et al. 2014; Westerling 2016; Westerling et al. 2006). These changes may increase fire frequency (Rocca et al. 2014), increase wildfire extents (Parks and Abatzoglou 2020), and prolong fire seasons (Brown et al. 2004). These events may diminish regeneration and growing stock potential. For example, 20 years after the 2000 Jasper Fire, large areas of high burn severity still have limited or no ponderosa pine regeneration establishment (fig. 8; Keyser et al. 2008; Lentile et al. 2005; Lentile et al. 2006; Ziegler et al. 2017); similar occurrences are being observed across the western United States (Coop et al. 2020). Furthermore, in these high-severity burned areas, surface fuels are increasing from the dead and down trees (fig. 9a; Keyser et al. 2008) and a reburn in this area could result in adverse post-fire outcomes (fig. 9b; Coop et al. 2020; Stevens-Rumann et al. 2012). Mountain pine beetle impacted areas that have not burned also can produce a fire hazard due to their heavy fuels (fig. 10; Sieg et al. 2016). Warmer temperatures directly impact MPB population dynamics (Bentz et al. 2010). Mountain pine beetles are often in the larvae stage during the cold, winter months. While the larvae can cold harden to survive the cold winter temperatures, extreme cold temperatures can reduce MPB populations (Bentz and Mullins 1999). However, with warmer winter temperatures, MPB will not succumb to this mechanism of population control. These factors could lead to more frequent outbreaks. If these estimates come to fruition, then mortality rates could exceed the historically lower rates observed in the 20th century.

<u>Correction Request 3.4</u>. Contrary to the GTR, there are currently exceptionally low mortality rates on the BHNF. A continuous period of more than 40 years mortality rate on the BHNF was reported as ranging between 0.16 and 0.26 percent. These rates of 0.16 and 0.26 percent accurately reflect current conditions.

<u>Reply to Correction Request 3.4</u>. RMRS-GTR-422 presents a range of growth and mortality scenarios, not just one ideal scenario. One of the five mortality rates evaluated was a 0.26% mortality rate to reflect a low mortality. As shown in **RMRS-GTR-422**, Table 1, without any insect mortality, a mortality rate of 0.44% was calculated for the first decade of the 2000s. Without any wildfire or insect mortality, the mortality rate would have been around 0.31% due to weather and unknown or other factors. Based on the 2017-2019 FIA augmented data and removing insect and wildfire mortality, a mortality rate of 0.27% was calculated. Both mortality rates (0.27% and 0.31%) still fall within the range of the lower mortality rates used in **RMRS-GTR-422** scenarios (0.26% and 0.60%) and exceed 0.16%. The Correction Request also suggests that mortality in the Black Hills National Forest could be as low as 0.16%, which appears to conflict with several sources:

1. In 2019, the mortality rate without the influence of insects was 0.47%, a value that exceeds the 0.16% estimate of mortality desired by the request for correction (**RMRS-GTR-422,** Table 1). The request for correction is based on the mortality rates reported in 1962, 1984, and 1999. The correct interpretation of data is important. These values were not generated during a continuous period of measurement showing 40 years of low mortality. The periodic

inventory that FIA performed before 2000 estimated mortality at one point in time, not during a continuous period. Furthermore, insects and wildfires were each contributing less than 0.03% mortality during those snapshots in time. Wildfire frequency and drought are expected to continue to increase in the Black Hill National Forest. In **RMRS-GTR-422**, Table 2 shows an average mortality rate of 0.79% in ponderosa pine forests across the interior western United States.

2. Based on using the Forest Vegetation Simulator (FVS) and a subset of FIA data, the **BHFRA Consultant Report** claims that mortality rates were only 0.23% for the suitable base timberlands. However, the BHFRA consultant's report fails to recognize that the mortality estimated by the FVS is based only on density-dependent mortality; the report does not include external factors such as natural disturbances (e.g. weather, insects, wildfires). Therefore, it is reasonable to assume that a minimum mortality rate of 0.23% without any disturbance is the background mortality.
3. In the **NFAB Recommendation**, some stakeholders stated that 0.26% was a reasonable mortality rate, but to reach consensus among all members, they agreed upon a 0.40% mortality rate. This 0.40% mortality rate falls within the 0.26% and 0.60% mortality rates used in **RMRS-GTR-422**.
4. The **Underhill Report** suggests that a mortality rate of 0.40% does not account for the increasing trend in weather and wildfire-related mortality and that this rate should be considered only as a starting point for modeling future mortality. In fact, pages 22-25 of the **Underhill Report** suggest a realistic mortality rate is within a range of 0.5% - 1.0% based on an evaluation of existing inventories.

Correction Request 3.5. Incorrect application of high mortality rates.

Reply to Correction Request 3.5: RMRS-GTR-422 includes scenarios with high mortality rates (1.52 and 2.0%) to provide a full range of outcomes, but **RMRS-GTR-422** also uses rates of 0.26%, 0.60%, and 1.04% to provide a full range of mortality rates. For example, if large wildfires were to occur in the Black Hills National Forest, there is potential for such high mortality rates, especially if the burned areas do not recover quickly. To determine the realized mortality rate, in the section "Moving Forward" in **RMRS-GTR-422** states: *Continuous monitoring and flexibility to adjust harvest levels based on realized mortality rates is crucial if long-term timber sustainability is to continue.*

All requests for correction in this section (3) have been declined for the above stated reasons.

Correction Request 4

"Incorrect exclusion of plausible scenarios with observed lower mortality and/or higher growth rates as "unsustainable"

Request for Correction 4. Incorrect exclusion of plausible scenarios with observed lower mortality and/or higher growth rates as "unsustainable"

Reply to Correction Request 4: Several of the components of these proposed scenarios (i.e., growth rates, mortality rates, and acres used to estimate volume) were addressed in the Correction Requests above; therefore, rather than repeating each point, the responses to the previous correction requests (i.e., correction requests 1.3, 2.1, 2.2. and 3.4) are referenced and incorporated below.

During the comment period for the draft **RMRS-GTR-422**, BHFRA suggested five different scenarios (Scenario A-E). An additional scenario was proposed by the **NFAB Recommendation** in October 2020. Five of the six scenarios used a mortality rate of 0.16%. Analysis of the suggested mortality rate of 0.16% was provided in ***Correction Request 3.4*** and is incorporated here by reference. The following addresses each of BHFRA proposed scenarios (A through E) from the **Reconciliation of Comments** and the **NFAB Recommendation**.

- Scenario A: Growth rate at 2.2923% and mortality rate at 0.16%; starting volume is all timberlands in Black Hills National Forest (8,850,306 CCF). Growth rates were stated by BHFRA that they were actual reported numbers from FIA for sawtimber (>9 inches d.b.h.).

  This proposed scenario used a growth rate of 2.2923%. BHFRA stated that this growth rate value came from FIA data for sawtimber, but the calculation used or data source for this growth rate was not provided. The proposed growth rate of 2.2923% is lower than the 2.33% growth rate used in **RMRS-GTR-422** by 0.04%; the minute difference does not justify adding this growth rate to the scenarios that were tested, particularly since the growth rate used in **RMRS-GTR-422** was higher.

  For this proposed scenario volume was inappropriately based on all timberlands on the Black Hills National Forest, instead of on the suitable base timberlands. As stated in ***Reply to Correction Request for Correction 1.3***, there have been ongoing discussions about the acres of ponderosa pine that are specifically available for harvesting in the Black Hills National Forest.
- Scenario B: Growth rate at 2.83164% and mortality rate at 0.16%; starting volume is based on suitable timberlands in the Black Hills National Forest (5,995,428 CCF), but one-third of the harvest comes from timberlands outside the suitable base. Growth rate based on 2019 growing stock >5 inches d.b.h.

  For this proposed scenario, there are other areas in this document that have addressed these values. For example, ***Correction Request 2.1*** states: "Authors used growth rates from trees >5-inches d.b.h. These smaller trees are often suppressed and do not reflect true sawtimber growth rates." However, the growth rate of 2.83% suggested in this correction request from

BHFRA comes from trees >5 inches d.b.h. This scenario also suggests a starting volume of 5,995,428 CCF and expanding the harvesting outside the suitable timberlands. **RMRS-GTR-422** applies the same starting volume of 5,995,428 CCF; however, **RMRS-GTR-422** uses fewer acres (only suitable timberland acres) than what was suggested in the above scenario.

- Scenario C: Growth rate at 4.16% and mortality rate at 0.16%; starting volume is based on suitable timberlands in the Black Hills National Forest (5,995,428 CCF). The growth rates were derived from FIA data from permanent plots measured only in 2019 (75% of total permanent plots) for sawtimber (>9 inches d.b.h.).

  See ***Reply to Correction Request 2.2,*** which discusses the difference between the public FIADB database and the augmented data set. The augmented data set consists of the intensification of the inventory in time and space and includes the South Dakota and Wyoming data in a single estimate. In contrast, the FIADB database does not include the intensification plots and is reported separately for South Dakota and Wyoming.

  > Concerning growth rates of 3.0% or higher the **NRS-FIA Response** to Concern 13 of the **BHFRA Consultant Report** states: *If the gross growth rate is computed from the "augmented" data set, without excluding WY, the rate is 2.51%. There is no reason to suspect these lower growth rates are biased or otherwise underrepresenting the components of this attribute.* And, under Concern 14*: The BHFRA Consultants Report builds on the previous concern, gross annual growth rate. The report states that the 3% rate is "more defensible" because it aligns more closely with the recent SD estimates from the on-line data and because it "mitigates the effects of incorrect acreage estimation…*
  >
  > **The NRS-FIA Response to Concern 14** of the **BHFRA Consultant Report states,** *the 3% rate computed from the on-line data is based on older observations. It ignores the more recent observations included in the "augmented" data set.*

  This proposed scenario also suggests a starting volume of 5,995,428 CCF which was used as the starting volume in **RMRS-GTR-422**.

- Scenario D: Growth rate at 2.815% and mortality rate at 0.16%; starting volume (6,424,712 CCF) based on suitable base of 824,000 acres (not the 765,734); harvesting of 29,000 CCF each year from timberlands outside the suitable timber base.

  The response to Scenario B concerning growth rates also applies to Scenario D. Scenario D also suggests a starting volume of 6,424,712 CCF, which comes from the erroneous acreage estimates (***Reply to Correction Request 1.3***) and additional harvest of 29,000 CCF each year from timberlands outside the suitable timber base. In addition, the suggested starting volume in the proposed scenario includes volume from outside the suitable base. **RMRS-GTR-422** utilizes volume only from the suitable base.

- Scenario E: Growth rate at 2.3284% and mortality rate at 0.16%; starting volume is 9,288,562 CCF which includes ponderosa pine and white spruce on timberlands in the Black Hills National Forest.

RMRS-GTR-422 did use a growth rate of 2.33% as one of the scenario components, which is the suggested growth rate by BHFRA. The starting volume in this Scenario incorporates the white spruce volume on the Black Hills National Forest. See ***Reply to Correction Request 1.2*** concerning the inclusion of white spruce. See the response to ***Correction Request 1.3*** regarding acreage and volume discrepancies.

- **NFAB Recommendation** of growth rate of 3.06% and 0.40% mortality with a starting inventory of 6,737,990 CCF.

  The elements of this scenario were addressed in several responses to other requests for correction. A growth rate of 3.0% was addressed in the ***Reply to Correction Request 2.2.*** The 0.40% mortality rate was within the range of mortality scenarios that were evaluated in **RMRS-GTR-422** (see ***Reply to Correction Request 3.4***). The volume value of 6,737,990 CCF was broadly addressed in ***Reply to Correction Request 1.3.***

For the above stated reasons, the request for correction for this item (4) has been declined.

Correction Request 5

"Incorrect/inconsistent suitable base flag"

Correction Request 5. Incorrect/inconsistent suitable base flag.

Reply to Correction Request 5: In the FIA sampling methodology, an FIA sample point consists of four separate subplots, organized with subplot 1 as the center, and subplots 2, 3, and 4 located 120 feet away at 360º, 120º, and 240º, respectively. The **BHFRA Consultant Report** suggests that the FIA database flag that indicates whether an FIA plot is contained within the suitable base acres was being incorrectly applied to the entire cluster of four subplots, rather than to each individual subplot. The **BHFRA Consultant Report** states: *Classifying all subplots as a group to either the suitable or non-suitable category could cause significant inaccuracies in acreage and volume estimation.*

The issue of acres used to estimate the standing live volume and amount of volume available to contribute to a sustainable ponderosa pine timber program has been addressed by the Forest Service Northern Research Station's Forest Inventory and Analysis (NRS-FIA) Program. In the **NRS-FIA Response** to the **BHFRA Consultant Report**, NRS-FIA addresses each of the concerns raised in the consultant's report.

NRS-FIA reported: *that the majority of the report's* [**BHFRA Consultant Report**] *claims reflect misunderstandings about how FIA prepared, completed, processed, and reported the BHNF inventory.* Furthermore, the **NRS-FIA Response** reported *None of the concerns expressed in the report* [**BHFRA Consultant Report**] *have discernable impacts on the published estimates. To the contrary, this review fundamentally validates the substance and quality of the published inventory data and summaries.* In addition, **RMRS-GTR-422** addresses the issue of suitable base versus timberland to determine volume in the Timberlands outside the suitable base section of the **Correction Request 1.3**.

The following passage from the **NRS-FIA Response** to the **BHFRA Consultant Report** addresses the concern regarding suitability base flagging:

The report [**BHFRA Consultant Report**] *correctly observes that the BHNF suitability flag is assigned at the plot level and proceeds to assert that it would be more appropriate to have this flag assigned at the subplot level on the grounds that it is really functioning as a condition-level variable.*

First, FIA completed what was requested: plot-level tagging.

Second, the report [**BHFRA Consultant Repor**t] *states that suitability should be assigned at the subplot level. The authors* [of the **BHFRA Consultant Report**] *presumably mean condition level based on their reference to other condition-level variables for justification.*

Third, this approach is reasonable if suitability does indeed vary more at a finer spatial resolution than at the plot level. This suggestion also appears to accept that the definition of

suitable base through any GIS exercise will necessarily have "inclusions" that are contrary to each polygon's classification: GIS-suitable may be field-unsuitable and vice versa.

If this variable is indeed a condition-level attribute, then there are two methods to provide this, neither of which can be completed at this point in the analysis. The first would be to request the crews to collect this information on-plot. The second is to model it in the office based on field-collected measurements. Direct field measurements would need to be developed and deployed on some test plots to assure some reliability to the field measurement. The second method requires training a model where field measurements can be associated with the "correct" answer. FIA has no such model. Given the sensitivity of this variable for the analysis, such an addition should be developed and tested before including it in the final analysis.

To summarize, FIA was requested to do plot level tagging and the methodology for sub-plot flagging has not been developed and tested. For the above stated reasons, this request for correction has been declined.

Correction Request 6

"Thorough explanation of methods, including the use of a fraction of trees with available growth information, among others"

This correction request included three sub-points and this reply addresses each point separately:

Correction Request 6.1. Thorough explanation of methods, including the use of a fraction of trees with available growth information, among others.

Correction Request 6.2. Authors do not adequately disclose or discuss uncertainties with or implications from their chosen methods or data relied upon for their results.

Correction Request 6.3. Scientific documents typically include a methods section, methods for data collection, data analysis, errors associated with means, and other information. This is noticeably absent from the GTR.

Correction Request 6.1. Thorough explanation of methods, including the use of a fraction of trees with available growth information, among others.

Reply to Correction Request 6.1.

The request for correction suggests that **RMRS-GTR-422** does not adequately disclose or discuss uncertainties with or implications from chosen methods or data relied upon for its conclusions. Several concerns raised in this request were addressed in ***Reply to Correction Request 1.5***. The remaining concerns (A - D) are addressed below.

Concern A: Only 253 trees were used when calculating growth for the BHNF in 2019; the report fails to disclose any methods or rationale for excluding other trees which had repeated measurements for establishing growth or why and how those 253 trees were chosen from an FIA database with 2400 FIA tree records of live growing stock trees and associated growth measurements.

> Response: Further inquiry with NRS-FIA after this correction was requested determined that the sample size was misquoted in the question-and-answer chat section of the April 2020 webinar. Examination of the FIA data indicates that 1,253 sawtimber sized ponderosa pine trees from suitable lands on National Forest System lands were used. While there are many more trees in the entire database, only the trees on plots that were remeasured were used for growth analysis. Pages 20-21 of **RMRS-GTR-422** discuss the FIA data used, the measurement periods (**RMRS-GTR-422,** Table 3), and the number of plots used to assess growth rates in addition to other values concerning the 2019 FIA data. The uncertainty in growth rates was reported in a footnote to Table 5 of **RMRS-GTR-422.** Furthermore, the range in growth rates used for the scenarios (2.33%, 2.54%, and 2.73%) captures the range of the reported growth rates in Table 4 of **RMRS-GTR-422.**

Concern B: BHFRA stated that there is a large degree of uncertainty in the estimated volume inventory and growth estimates. For example, although the total net growth estimate of sawlog volume from sawtimber trees is a negative value (-28,000 CCF), the 95% confidence limit

indicates the actual growth could be anywhere from negative 107,000 CCF to positive 51,000 CCF. When making decisions based on such an estimate, it is imperative to recognize the large degree of uncertainty associated with the estimate. The **NRS-FIA Response**, in their written review of the **BHFRA Consultant Report**, agreed with the importance of disclosing these levels of uncertainty.

> Response: A footnote to Table 5 of **RMRS-GTR-422** discloses the amount of uncertainty for growth, mortality, and inventory volume. Furthermore, for each of the scenarios, a 95% confidence interval was reported (5,995,428 $\pm$ 646,307 CCF), which was used to determine if standing live volume estimates remained sustainable or decreased over time, as reflected on pages 32-36 and in Table 7 of **RMRS-GTR-422.** The caption for Table 7 states: *The change in ponderosa pine average standing live sawtimber volume (CCF) after 5 years under various volume growth and mortality rates and harvest levels. Starting volume was 5,995,428 ± 646,307 CCF (95% confidence interval). Values in bold represent scenarios that decrease standing live volume. Values with an "*" represent values that are not significantly different from zero (95% confidence interval). Values presented are based on a range of volume gross growth and mortality rates for ponderosa pine on the Black Hills National Forest.*

Concern C: By accelerating permanent plot remeasurements from 2017-2019, the growth period has been halved, resulting in the need to accurately measure diameter growth of 0.25 inch or less. In these circumstances, the relative impact of measurement error increases greatly, and the slightest inaccuracies in field measurement (e.g., the diameter tape placed too high or low, at an angle, or over a loose piece of bark) can substantially affect growth estimates. This context is missing from the discussion in the GTR.

> Response: This concern was raised in the **BHFRA Consultant Report** and addressed in the **NRS-FIA Response** to that report. NRS-FIA determined that the FIA field crews could make accurate diameter measurements at remeasurement periods of 3 years or more. FIA utilizes a quality assurance crew to conduct blind checks on a random sample of at least 4% of all plots to ensure that individual field crews are meeting the measurement quality objectives and to assess the crew's compliance with measurement standards. Based on the NRS-FIA analysis, measurement quality objective tolerance was achieved, and the measurements taken were in compliance with applicable standards. Based on this information, there was no need to discuss this concern in **RMRS-GTR-422**.

Concern D: Analyzing the sawlog percent volume defect by tree DBH class in the 2017-2019 BHNF augmented FIA database showed that the 29+" DBH class for ponderosa pine, and every DBH class for white spruce had the identical defect percentage value of 11.78%. We can find no USFS documentation explaining why this fixed defect value is being applied, or how it was derived. This context is missing from discussion in the GTR.

> Response: This concern was raised in the **BHFRA Consultant Report** and addressed in the **NRS-FIA Response** to that report. The **NRS-FIA Response** reports that early quality assurance/quality control results for defect had low repeatability across the former North Central Research Station's FIA unit. Therefore, an average value is applied by TREECLCD to limit the effect of this noise at the population level. The value of 11.8%

was consistent with the defect observed in recent Black Hills National Forest ponderosa pine timber sales as communicated by J. Krueger (Deputy Forest Supervisor, Black Hills National Forest) to NRS-FIA. Since **RMRS-GTR-422** did not utilize white spruce volume estimates for the scenarios, it is irrelevant that white spruce defect percentages were 11.78% regardless of size class. Based on J. Krueger's communication to NRS-FIA and the **NRS-FIA Response**, the issue was deemed addressed and was not necessary to discuss in **RMRS-GTR-422**.

Correction Request 6.2. Authors do not adequately disclose or discuss uncertainties with or implications from their chosen methods or data relied upon for their results.

Reply to Correction Request 6.2: As shown below and consistent with applicable legal requirements and OMB and Departmental guidelines, **RMRS-GTR-422** is substantively accurate, reliable, and unbiased and presented in an accurate, clear, complete, and unbiased manner. In addition, **RMRS-GTR-422** identifies the source of the information it contains so that the public can assess whether the information is objective. **RMRS-GTR-422** discloses uncertainties (confidence intervals), uses unbiased data (**NRS-FIA Response**), and other information so that the public knows the analysis and information in the report is objective.

RMRS-GTR-422 page 8 states: *in June 2017 the BHNF Leadership convened a working group to develop questions of interest on how these changes may impact the ability of the BHNF to provide forest products to the timber industry. These questions centered on developing a comprehensive understanding of the forests growing on BHNF suitable timberlands* (Appendix A in **RMRS-GTR-422**). *This working group consisted of BHNF staff, industry representatives, and representatives from* the *South Dakota and Wyoming State Foresters' offices. The working group and the leadership of the BHNF recognized an information need that required a rigorous inventory of the forest resources of the Black Hills and agreed to have the Forest Service's Northern Research Station Forest Inventory and Analysis (NRS-FIA)*

The Black Hills National Forest Timber Resource Working Group selected NRS-FIA data for the analysis prior to the development of the draft **RMRS-GTR-422**. The Black Hills National Forest then approached the Rocky Mountain Research Station to address specific questions, resulting in **RMRS-GTR-422,** as documented on page 9 of the report: *the leadership of the BHNF asked the USDA Rocky Mountain Research Station (RMRS) to form a team to address the following questions:*

> *1. What impact does the current 2019 forest condition (i.e., standing volume, mortality, and growth) have on the out-year timber program of harvesting at current levels compared to other harvest level scenarios using probable growth and mortality estimates?*
>
> *2. What is a sustainable timber harvest estimate for the BHNF using the 2019 NRS-FIA data assuming rational tree mortality and growth rates informed by those of the past?*

3. What would be the standing inventory volume necessary using reasonable growth and mortality estimates to sustain a sawtimber allowable sale quantity (ASQ) of 181,000 CCF?"

RMRS-GTR-422 had to use NRS-FIA data to address the questions and conduct the analysis because that was the data agreed upon by the Black Hill National Forest Working Group.

RMRS-GTR-422 does not include data collection and analysis methods associated with the NRS-FIA data because those methods are extensively documented by the FIA Program, as stated below by Pollard and Dunn, September 2021. *FIA is a National Program assigned to assess America's forests. All phases of the FIA program produce extensive documentation of methods. A substantial amount of effort is expended in controlling the data acquisition process. The Data Acquisition Band has the primary responsibility for documenting methodologies and implementation of quality control during data collection activities. These documents are updated regularly and continually reviewed by the various bands. For example, all core field data collection methods are standardized in a National Field Methods Manual. This document is updated with refinements and improvements to the field data collection process.* https://www.fia.fs.fed.us/library/fact-sheets/data-collections/QA.pdf

The **NRS-FIA Response** specifically addresses the **BHFRA Consultants Report** stating *The majority of the report's [**BHFRA Consultants Report**] claims reflect misunderstandings about how FIA prepared, completed, processed, and reported the BHNF inventory. Only two of the concerns and/or observations expressed in the summary's 18 concerns stand-up to further scrutiny: 1) growth rates in the augmented data do rely upon shorter remeasurement periods relative to the rest of the observations, and 2) NRS FIA does apply a consistent defect value across ponderosa pine as a species.*

*This review offered an opportunity to scrutinize the underlying data, processing, and analyses again. None of the concerns expressed in the report [**BHFRA Consultants Report]** have discernable impacts on the published estimates. To the contrary, this review fundamentally validates the substance and quality of the published inventory data and summaries.*"

Correction Request 6.3. Scientific documents typically include a methods section, methods for data collection, data analysis, errors associated with means, and other information. This is noticeably absent from the GTR.

Reply to Correction Request 6.3. A general technical report (GTR) is published to target an audience consisting of scientists, resource managers, and the public. These reports provide technical or scientific information, often for a technical audience such as land managers, natural resource professionals, and extension specialists. GTRs may contain scientific data, descriptions, or syntheses; descriptions of tools and products (e.g., computer programs, simulators, and models); annotated bibliographies; and proceedings of a scientific meeting. GTRs may either be an original report or elaborate on information published in scientific journals. Because they are intended for a broader audience, GTRs may not use terms such as introduction, methods,

analysis, results, and discussion as subtitles that are often used in scientific journals. GTRs typically are longer and more detailed than an article in a science journal.

While **RMRS-GTR-422** did not use journal relevant subtitles, it does not mean that these sections were excluded from the GTR. For clarity, the following text crosswalks the subsections included in a scientific journal to the subtitles in the GTR.

RMRS-GTR-422 has an abstract and an executive summary, which provides a more detailed summary of the report.

The Introduction section, which is much longer than in a scientific journal, provides background (The Setting), the research objectives (Recognizing an information need) and introduces the three questions to be addressed in the report.

The Approach section is the Methods section used in the report and covers several methodological areas. The objective of a methods section is to document in detail the procedures used in a study so that others can replicate the work. **RMRS-GTR-422** provides a detailed, step-by-step description of the process used in the report and includes four subsections:

1. Understanding Disturbance and Tree Mortality-This section includes subsections that address the role of disturbance and mortality in the Black Hills and across the western United States.
2. Changing Climate—This section was added to inform the reader that the future has some unknowns, but also acknowledges that disturbance will continue.
3. Assessing Past FIA Reports—This section describes the history of FIA and how the data has been collected since 1930 and describes how specific measurement years and protocols varied among states. **RMRS-GTR-422** provides background and nuances associated with using FIA reports over time. This section is followed by a detailed description of each report, and the collection of the 2017 and 2019 data.
4. Growth, mortality, harvests, and standing live tree inventory over time—This section is a synthesis of the primary data used in the report's analysis and includes information in Table 4 and Table 5, and Figure 11 with associated text. Box 1—contains auxiliary information explaining how FIA calculates gross growth, net growth, and net change. Box 2 of page 30 of the report —addresses sustainable forest management, sustained yield, long term sustained yield, and sustained yield limit:
    a) *Our first assumption was that a sustainable harvest level must (1) initially allow for positive net growth by accounting for mortality caused by disturbance and (2) harvest levels cannot exceed net growth but can be equal to net growth. Our second assumption was that if we wanted to return to harvest levels more in line with past harvest levels, a period of recovery to the standing live volume may be necessary; and to accomplish this, net growth must exceed harvest, at least in the short term. Our third assumption was that although mortality levels are likely to decline due to the end of the MPB epidemic, other disturbances such as wildfire, weather related disturbances, and harvesting will continue to impact net growth and net change in standing live volume. This provides unique challenges, because a recovery period is needed for net growth and net change to become positive for standing live inventory*

to increase to levels that allow for sustainable harvests while also considering other resources

b) The Scenario Development section outlines the rationale and different scenarios evaluated.

The Scenario Outcomes section is the Results section and addresses the assumptions associated with the results.

The Moving Forward section is the Discussion section of the **RMRS-GTR-422**. Page 38 of the Moving Forward section states:

1. *Continuous monitoring and flexibility to adjust harvest levels based on realized mortality rates is crucial if long-term timber sustainability is to continue. In addition, growth rates also need to be adjusted going into the future because there is uncertainty on how climate will specifically influence subsequent disturbance and growth rates. (p. 38)*

2. *It is important to acknowledge that the scenarios presented in this document assume that all the standing live tree volume on the suitable timberlands is available for harvesting. However, national forests provide a variety of resources to the public including timber, water, wildlife habitat, recreation, and a sense of place. To balance the various needs for these resources, the Forest and Rangeland Renewable Resources Act of 1974 as amended by the National Forest Management Act of 1976 (16 U.S.C. 1604 (g)) requires that Forest Plans consider these resources. (p. 38).*

3. Page 39 of the Management Opportunities section states: *As the ponderosa pine forests of the Black Hills recovers from the recent MPB epidemic, management opportunities to enhance tree growth and reduce future mortality rates while sustainably managing for forest products and multiple benefits can be pursued.*

The Conclusion section states: *Over the past two decades, multiple disturbances have changed the landscape of the Black Hills. There is strong interest in developing management options to maintain a sustainable timber industry while honoring the USFS mission of "sustaining the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.*

For these reasons, the request for correction for item 6 has been declined.

Appendix A - Cited Reports

Seven documents are referenced in the Forest Service response to the Black Hills Forest Resource Association (BHFRA) request for correction of information concerning **RMRS-GTR-422**: *A Scenario-Based Assessment to Inform Sustainable Ponderosa Pine Timber Harvest on the Black Hills National Forest* (RMRS-GTR-422), each of which is cited in bold below.

1. **Correction Request.** The Request for Correction of Information that was submitted by the Black Hills Forest Resource Association by Holsinger Law, LLC, November 19, 2021. 30 p. (148 p. of exhibits).
2. **GTR-RMRS-422.** Graham, Russell T.; Battaglia, Mike A.; Jain, Theresa B. 2021. A scenario-based assessment to inform sustainable ponderosa pine timber harvest on the Black Hills National Forest. Gen. Tech. Rep. RMRS-GTR-422. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 61 p. February 2021.
3. **Reconciliation of Comments.** The Reconciliation of Comments for the draft document that led to RMRS-GTR-422. Battaglia, M., Jain. T. Reconciliation of Comments for RMRS-GTR-422. 184 p. June 24, 2021.
4. **BHFRA Consultant Report.** The Black Hills Forest Resource Association Consultant's Report. Scharosch, S., Huebschmann, M., Montzka, T. Review of Black Hills National Forest 2017-2019 Augmented FIA Inventory Results. 91 p. July 2020.
5. **NRS-FIA Response.** Northern Research Station Forest Inventory and Analysis Response. FIA Responses to "Review of Black Hills National Forest 2017-2019 Augmented FIA Inventory Results" Report. 47 p. September 2, 2020.
6. **NFAB Recommendation.** National Forest Advisory Board Recommendation. 16 p. October 2020.
7. **Underhill Report.** Jeffrey Underhill, Black Hills National Forest, Forest Silviculturist. Assessment of the National Forest Advisory Board Timber Program Recommendation. Black Hills National Forest. 34 p. January 2021.