



Habitat Conservation Plan for State Trust Lands 2005 Implementation Monitoring Report

February 2007



WASHINGTON STATE DEPARTMENT OF
Natural Resources
Doug Sutherland - Commissioner of Public Lands

Acknowledgements

Principle Authors

Angela Cahill
Bruce Livingston

Data Collection Team

Corina Logan
Austen Thomas
Angela Cahill
Chris Montero
Andrew Hayes
Bruce Livingston
Phil Kirner

Special Contributors

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Contributions are by DNR staff unless otherwise indicated.
Copies of this report may be obtained from the Land Management Division, Habitat Conservation Plan Science Section, 1111 Washington Street, PO Box 47016 Olympia, WA 98504-7016; <http://www.dnr.wa.gov/hcp/>

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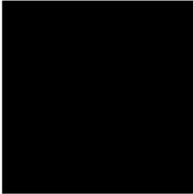
HCP Science Section
Land Management Division



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Introduction

The Washington State Department of Natural Resources (DNR) developed a multi-species Habitat Conservation Plan (HCP) for management of forested state trust lands. Authorized under the Endangered Species Act, the HCP is a partnership between DNR and the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (now known as NOAA Fisheries Service) (collectively, the Services). The HCP covers all DNR management activities on approximately 1.6 million acres of forested state trust lands within the range of the northern spotted owl (*Strix occidentalis caurina*). It includes several primary conservation strategies for the habitats of threatened and endangered species including the northern spotted owl, marbled murrelet, the western Washington runs of several salmonid species, and other species listed by federal and state government as being at risk of extinction. In addition, the HCP provides an incidental take permit that covers seven upland species listed by the federal government as endangered or threatened. The HCP has been fully implemented since January 1999.

In general, the HCP guides DNR's management of forested state trust lands in Western Washington and those on the eastern slopes of the Cascade Mountains, from the Canadian border to the Columbia River. To manage habitats within this landscape more efficiently and effectively, DNR has formed nine planning units based primarily on large watersheds. DNR has a contractual agreement with the Services to implement and monitor this HCP according to the following objectives for all planning units:

- To determine whether the HCP conservation strategies are implemented as written (Implementation Monitoring);
- To determine whether implementation of the conservation strategies results in anticipated habitat conditions (Effectiveness Monitoring): and
- To evaluate cause-and-effect relationships between habitat conditions resulting from implementation of the conservation strategies and the animal populations these strategies are intended to benefit (Validation Monitoring).

HCP implementation monitoring for 2005 was conducted in the five Westside HCP planning units (North Puget, South Puget, Straits, South Coast and Columbia) plus the Klickitat Planning Unit (see Figure 1), which are encompassed in five DNR Regions (Northwest, Olympic, Pacific Cascade [formerly Central and Southwest], Southeast, and South Puget Sound).

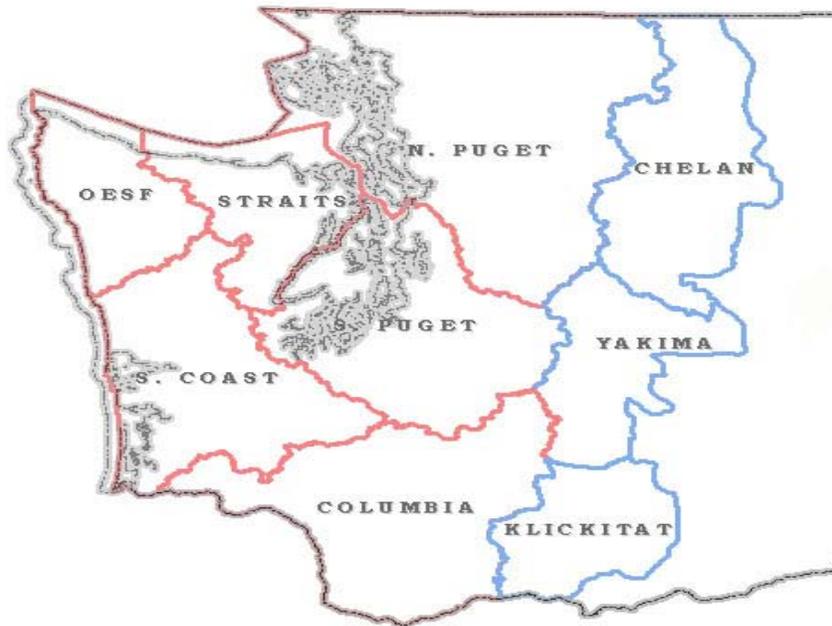
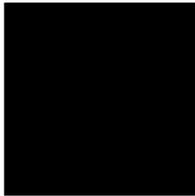


Figure 1. HCP Planning Units

Two major conservation strategies or components were selected for review in 2005: the hydrologic maturity in the rain-on-snow zone (hereafter referred to as rain-on-snow) component of the riparian strategy and the northern spotted owl conservation strategy (both the original strategy applicable to all HCP planning units except Klickitat (DNR, 1997a) and HCP Amendment No. 1: Administrative Amendment to the Northern Spotted Owl Conservation Strategy for the Klickitat HCP Planning Unit (DNR, 2004). Since the methodologies for sampling and analyzing the data from each of the selected HCP strategies were significantly different, and to facilitate clarity, each strategy will be discussed in a separate section of this report.



1. Rain-on-Snow

Objectives and Steps for Determining Compliance

- Determine the objective criteria for monitoring the hydrologic maturity in the rain-on-snow zone component of the HCP riparian strategy (DNR, 1997a), and use them to develop a monitoring protocol.
- On a timber sale activity basis, determine whether an activity took place in the significant rain-on-snow zone (which includes the rain-on-snow and snow-dominated precipitation zones as defined by DNR (1997b)).
- For activities in the significant rain-on-snow zone, determine whether or not the activity needed to be managed for rain-on-snow.
- For activities required to apply the strategy, determine if the activity was compliant.

Methods

BACKGROUND AND MONITORING CRITERIA

Two-thirds of DNR-managed forestlands in drainage basins in the significant rain-on-snow zone are to be maintained in hydrologically mature forests (well-stocked conifer stands at least 25 years old). When any part of a timber sale is in the significant rain-on-snow zone, an assessment must be made to determine whether or not the area should be managed for rain-on-snow. Some drainage basins are not managed for rain-on-snow based on ownership patterns and likely impact levels to salmonids during rain-on-snow events. Timber sales do not have to conform to the hydrologic maturity prescription when:

- Less than 1/3 of the basin is in the significant rain-on-snow zone; or
- At least 2/3 of the basin's area in the significant rain-on-snow zone is covered by hydrologically mature forests, with reasonable assurance it will remain that way (i.e. in national parks, Natural Resource Conservation Areas, etc.); or
- Less than 1/2 of the basin's area in the significant rain-on-snow zone is under DNR management, and there is no reasonable assurance that other landowners will contribute hydrologically mature forests (i.e. other land is in farms, houses, etc.).

If DNR believes there is a more effective way to protect salmonid habitat in a drainage basin, it may develop a prescription based on the Hydrologic Change Module of Watershed Analysis (DNR, 1997b). These analyses use a quantitative model to estimate changes in snow accumulation and melt under different harvest scenarios and the resulting effects on peak flow magnitudes. Specific management prescriptions are written for parts of the Watershed Administrative Unit (WAU) likely to be impacted by hydrologic change. Once the prescription and analysis are complete, the hydrologic maturity prescription is waived.

To help determine compliance with the rain-on-snow strategy, an office review form (Appendix 1A) was created, covering all objective HCP criteria. The goal was to determine if timber sales in the significant rain-on-snow zone needed to apply the strategy and, for those that did, whether the strategy was correctly applied.

SAMPLE SELECTION

The reviewed timber management activities were selected from a population of all timber sale activities in Westside planning units managed under the HCP. The team selected activities from those initiated after January 1999 with close dates in DNR's Revenue Management System between July 1, 2003 and June 30, 2004 (fiscal year 2004). There were 172 timber management activities that met the criteria for inclusion in the sample population in 2005. A further screening was used to determine which of those activities occurred in the rain-on-snow zone.

SAMPLE SCREENING

For each of the selected timber sales, the team recorded the answers supplied by field staff on HCP checklists. Knowing that HCP checklists sometimes contain false positives (checking yes when a strategy was not applied) and false negatives (checking no when a strategy should have been applied), the team looked for additional documentation to help determine which sales to monitor. In addition to information contained in the official files in Olympia (timber sale jackets), data available in DNR's Planning and Tracking (P&T) database and GIS system were used to further stratify the sample.

A GIS map was created for each timber sale that closed in fiscal year 2004. These maps included DNR's rain-on-snow layer as well as Forest Management Units (FMUs) and roads. For each sale, the team determined whether any part of the timber sale units or associated new road construction fell within the significant rain-on-snow zone (either snow dominated or rain-on-snow). If this was the case, the rain-on-snow strategy should have been considered—though not necessarily implemented—when the sale was set up, so the activity was flagged by the team for monitoring. For sales marked yes on the HCP checklist (indicating that the strategy was applied), but not shown in the significant rain-on-snow zone in GIS, documentation in the sale jacket and P&T was analyzed to determine if the strategy was actually applied. (In this case, 'applied' meant that some part of the sale was in the significant rain-on-snow zone, so region staff filled out a checklist to determine whether or not the activity could continue as planned.) All 40 activities applying this strategy were selected for review.

OFFICE REVIEWS

For the rain-on-snow strategy, office reviews of available documentation were performed using the form in Appendix 1A. DNR's GIS system has layers showing Watershed Administrative Units, land ownership, rain-on-snow zones, and other data used by field staff when setting up sales. The data underlying these layers changes over time as forest stands mature and management activities occur. The data used when setting up the timber sales cannot be re-created years later when the activities are monitored, so the team had to rely on documentation in the timber sale jackets and DNR's P&T database to determine compliance. Such information included HCP checklists, Management Activity Summaries, SEPA checklists, and memos and reports from field staff. The team filled out an office review form for each activity and decided whether compliance could be determined based on available documentation. The preliminary data and determinations were then shared with region staff, who were given the opportunity to provide copies of critical pre-existing information not in the Olympia sales jacket. If region staff supplied additional documentation, it was reviewed to see if it could be used in determining strategy compliance.

Data Analysis

Compliance with this strategy was determined based on documentation that existed at the time the sale was set up. The data for determining compliance with this strategy were gathered on office review forms (Appendix 1A). Answers to the questions regarding compliance (as defined by the HCP) led the team to one of two conclusions: the activity was compliant or compliance could not be determined. Although the team's original goal was to categorize all activities as compliant or not compliant, this was not always possible. Since the team could not re-calculate the basin hydrologic maturity level that existed pre-harvest, determine which sub-basin a harvest occurred in, nor reconcile all conflicting information, it was not possible to determine if some activities were in fact non-compliant. In those cases, the activities were categorized under 'compliance can't be determined'.

Results and Discussion

Forty timber sale activities were monitored statewide. Overall, 88 percent of the monitored sales were determined to be compliant with the rain-on-snow strategy, and compliance could not be determined in 13 percent of the sales (See Table 1.1; note that numbers don't add due to rounding).

Table 1.1. Compliance data for the rain-on-snow strategy

| Planning Unit | Number of Sales Monitored | Number (%) Compliant | Number (%) Compliance Can't be Determined |
|---------------|---------------------------|----------------------|---|
| Columbia | 10 | 8 (80%) | 2 (20%) |
| N Puget | 14 | 14 (100%) | 0 (0%) |
| S Coast | 7 | 6 (86%) | 1 (14%) |
| S Puget | 7 | 6 (86%) | 1 (14%) |
| Straits | 2 | 1 (50%) | 1 (50%) |
| All | 40 | 35 (88%) | 5 (13%) |

Observations and Recommendations

The rain-on-snow strategy is difficult to monitor because hydrologic maturity conditions existing at the time a sale was set up cannot be easily re-created years later when the sale is monitored. At present, there is no system to store some of the data useful in determining compliance, such as the acres and ownership of hydrologically mature forests in a sub-basin at a given point in time. As a result, the team relied on documentation provided in timber sale jackets and the Planning & Tracking database and assumed that the information was correct when the sale was set up. To rectify this situation, the team is talking with DNR GIS staff about setting up a system to both track relevant information and allow assessments to be made regarding past conditions. The team supports establishing a baseline dataset that can be used to determine pre-harvest conditions in a sale and compare them to post-harvest conditions. Key data, such as the amount of each basin in the significant rain-on-snow zone, can be recorded on a regular basis and stored for future monitoring use.

Despite these difficulties, DNR provided sufficient documentation to determine compliance with the strategy 88 percent of the time. This suggests that field staff are generally doing a good job of providing complete, useful information.

Appendix 1A - Office Review Form for Determining Compliance with the Rain-on-snow (ROS) Strategy

TS Name: _____ Unit(s) in ROS zone: _____
Region: _____ HCP Planning Unit: _____
Reviewed By: _____ Review Date: _____
Activity Type: _____

1. Has a Forest Practices watershed analysis been completed on the WAU?
_____ Yes – verify applicable procedures were followed—do not proceed with this form
_____ No – go to question 2.

2. Which WAU(s) is/are the unit(s) in?

3. Which sub-basin(s) is/are the unit(s) in?

For each sub-basin: if **YES is answered to question 4 *or* 5 *or* 6, the area is not managed for ROS. If **NO** is answered to questions 4 *and* 5 *and* 6, the area is managed for ROS—fill out the table below. **

4. Is less than 1/3 of the sub-basin's area in the significant ROS zone (ROS or snow dominated?)

_____ No – go to 5
_____ Yes – area not managed for ROS

5a. Is at least 2/3 of the sub-basin's area in the significant ROS zone in hydrologically mature forest?

_____ No – go to 6
_____ Yes – go to 5b

5b. Is there reasonable assurance it will remain in that condition? (USFS Late Successional Reserves, National Park, NAP/NRCA, gene pool reserve, etc.)?

_____ No – go to 6
_____ Yes – area not managed for ROS

6. Is less than 1/2 of the sub-basin's area in sig. ROS under DNR management with no reasonable assurance that other landowners will contribute hydrologically mature forest?

_____ No – go to 7
_____ Yes – area not managed for ROS

7. Is the area managed for ROS?

_____ No – go to 8
_____ Yes – fill out table below, then go to 8

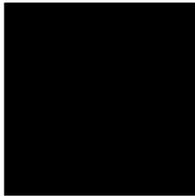
| A. Sub-Basin Name | B. Total ROS Acres (DNR) | C. Hydro Mature Target Acres (2/3 of Column B.) | D. Current DNR Acres in Hydro Mature Forest | E. Surplus (+) or Deficit (-) Acres | F. Acres of Hydro Mature Forest to be Removed | G. Surplus (+) or Deficit (-) Acres After Activity |
|-------------------|--------------------------|---|---|-------------------------------------|---|--|
| | | | | | | |
| | | | | | | |
| | | | | | | |

8. Based on available documentation is the activity compliant with the HCP?

_____ Yes

_____ No (explain why not)

_____ Unknown (explain what is missing)



2. Northern Spotted Owl—Outside of the Klickitat Planning Unit

Objectives and Steps for Determining Compliance

- Modify existing review forms for the northern spotted owl HCP conservation strategy for the Westside and Eastside planning units (DNR, 1997a) to develop an improved monitoring protocol.
- On a timber sale basis, determine whether an activity took place in a designated spotted owl management area.
 - If it did, analyze information including the location, habitat type, and other data necessary to determine strategy compliance.
- On a timber sale basis, determine whether an activity took place in a northern spotted owl circle subject to short-term additional protections.¹
 - If it did, analyze information on the location, status, timing restrictions, and other data necessary to determine strategy compliance.

Methods

BACKGROUND AND MONITORING CRITERIA

Compliance with the northern spotted owl strategy was determined by evaluating activities that were conducted in designated Nesting, Roosting, and Foraging (NRF) or dispersal management areas, as well as those activities where disturbance to an active nest site subject to additional protection could have occurred. Whether a management activity is compliant varies depending on the habitat type, amount of suitable habitat relative to the 50 percent (by WAU) habitat threshold, proximity to a nest site or nest patch buffer, and other factors. These factors are discussed in more detail in the HCP (DNR, 1997a). The factors critical to determining strategy compliance were incorporated into an office review form (Appendix 2A). By working through the questions, the team was able to determine compliance with the strategy on a timber sale basis.

¹ When the HCP was being developed, the U.S. Fish and Wildlife Service requested some sites receive short-term, site-specific protection in addition to the areas already protected under the HCP. To meet this request, certain owl circles were provided additional protection. These circles are identified in HCP Implementation Memo #1 (DNR, 1998) and associated procedures and Standard Practice Memoranda.

SAMPLE SELECTION

The timber management activities selected for review were from a population of all activities initiated after January 1999 with close dates in DNR's Revenue Management System between July 1, 2003 and June 30, 2004 (fiscal year 2004). Although the northern spotted owl strategy applies to all planning units, no sales implementing this strategy in the Yakima, Chelan, South Coast or OESF (Olympic Experimental State Forest) planning units were part of the fiscal year 2004 sample. Activities on lands outside of HCP planning units were excluded from the sample. There were 176 timber management activities that met the criteria for inclusion in the sample population.

SAMPLE SCREENING

For each timber sale in the sample, the team recorded the answers supplied by field staff on HCP checklists. Knowing that HCP checklists sometimes contain false positives (checking yes when a strategy was not applied) and false negatives (checking no when a strategy should have been applied), the team looked for additional documentation to help determine which sales to monitor. In addition to information contained in the official files in Olympia (timber sale jackets), data available in DNR's Planning and Tracking (P&T) database and GIS system were used to further stratify the samples.

The team created GIS maps for each unit of each timber sale that closed in the Revenue Management System in fiscal year 2004. The maps included layers showing FMUs; NRF and dispersal management areas; and spotted owl site centers, nest patch cores, and nest patch buffers. If any part of a timber sale was within a designated NRF or dispersal management area or a status 1, 2, or 3 owl circle the sale was selected for further monitoring. If the HCP checklist was marked 'yes' for the owl strategy and the GIS map didn't show that activity being in an area of concern, the team read through the documentation in the sale jacket and P&T to determine if the strategy was actually applied (an owl site center could have been moved since the sale was set up, etc.). If the team found evidence that the strategy was (or should have been) applied, the sale was selected for monitoring. A total of 23 sales were monitored.

OFFICE REVIEWS

For each activity implementing the strategy, the team looked to documentation available in the official Olympia file (timber sale jacket), P&T, and GIS data layers to answer the questions on the office review form in Appendix 2A. This included answers on HCP checklists, Management Activity Summaries, and biologists' reports. Once a review form was filled out for a timber sale activity, the team decided whether or not compliance could be determined based on the available documentation. Documentation was assessed and compliance determined on a timber sale basis. The preliminary data and determinations were then shared with region staff, who were asked to provide copies of any pre-existing critical information not otherwise available to the team. This information needed to have been prepared when the sale was set up, not after the fact. Any additional documentation (such as habitat assessment forms or memos from region biologists) was then reviewed to see if it helped in determining compliance. If no additional information was provided, compliance was determined based solely on documentation found by the monitoring team.

Data Analysis

The data for determining compliance with this strategy were gathered on office review forms (Appendix 2A). Answers to the questions regarding compliance (as defined by the HCP) led the team to decide whether the activity was compliant or if compliance could not be determined. The latter category was used when documentation necessary to determine compliance was not available, so the team could not definitively show compliance or non-compliance.

Results and Discussion

Statewide, 23 activities (timber sales) were monitored. Seventy eight percent of the monitored activities were compliant, while compliance could not be determined in 22 percent of the activities (Table 2.1). Where compliance could not be determined, it was due to lack of documentation or the presence of contradictory information (e.g. the timber sale jacket said the activity was in one spotted owl circle, while GIS showed it being in a different owl circle).

Table 2.1. Compliance data for the northern spotted owl strategy in all HCP planning units except Klickitat

| Planning Unit ¹ | Number of Timber Sales Monitored | Number (%) Compliant | Number (%) Compliance Cannot Be Determined |
|----------------------------|----------------------------------|----------------------|--|
| Columbia | 8 | 8 (100%) | 0 (0%) |
| North Puget | 3 | 2 (67%) | 1 (33%) |
| South Puget | 4 | 4 (100%) | 0 (0%) |
| Straits | 8 | 4 (50%) | 4 (50%) |
| ALL | 23 | 18 (78%) | 5 (22%) |

¹No activities implementing this strategy in the Yakima, South Coast, Chelan, or OESF planning units were part of the sample

Observations and Recommendations

Compliance with the northern spotted owl strategy appears to be relatively high. However, incomplete or contradictory documentation made it impossible to determine compliance in more than one-fifth of the monitored sales. Proper and careful documentation by field staff during timber sale design and harvest could help to alleviate similar problems in the future.

The team recommends creating a consistent statewide reporting process, including guidance on what data should be documented where. This should include providing thorough, accurate information in the silvicultural prescription section of P&T. Such information should include stand conditions, details on the type of management activity, location and amount of any existing habitat structural characteristics, and the amount of habitat in the Watershed Administrative Unit (WAU) or quarter township. In addition,

any maps showing the location of nearby owl circles, nest patches, and/or nest patch buffers should be included in the official timber sale jacket. Reports from biologists, including any habitat assessments they performed, should also be placed in the official timber sale jacket. All applicable documentation should be checked for accuracy and consistency before the timber sale is carried out.

Appendix 2A – Office Review Form for Determining Compliance with the Northern Spotted Owl Strategy Outside of the Klickitat Planning Unit

Timber Sale Name: _____ Unit(s): _____
Township(s): _____ Range(s): _____ Section(s): _____
DNR Region: _____
HCP Planning Unit: _____
Packet review by: _____ Date: _____
Field review by: _____ Date: _____
WAU(s) [Westside Sales] _____
Quarter Township(s) [Eastside Sales] _____

A. Management activity in a designated NRF area

If you answer yes to questions 1, 2, 3, or 4 continue and answer their sub-parts marked as a, b, or c.

Describe the management activity conducted _____

1. Did the management activity take place in existing NRF habitat (sub-mature or higher quality) that counts toward the target amount for the WAU? _____ Yes _____ No _____ N/A _____ Unknown

a) For Westside stands, was the management activity within a 500-acre Nest Patch? _____ Yes _____ No _____ N/A _____ Unknown

Was the WAU above the target threshold? _____ Yes _____ No _____ N/A _____ Unknown

Did the management activity occur in the 200-acre Nest Patch buffer? _____ Yes _____ No _____ N/A _____ Unknown

b) Were structural characteristics of sub-mature or higher quality habitat retained? _____ Yes _____ No _____ N/A _____ Unknown

c) If the harvest is in suitable habitat, has more than 5% of the sub-mature or higher quality habitat within a WAU been modified within a two-year period? _____ Yes _____ No _____ N/A _____ Unknown

If no, how much has been modified within the two-year period in that WAU?

2. Did the management activity occur in a forest stand that is not yet habitat but is managed with the intent of developing habitat? (for a WAU that is below the 50% threshold) _____ Yes _____ No _____ N/A _____ Unknown

What percent of the WAU is habitat, and how was that determined?

Was the area that was designated to grow NRF habitat delineated? (50% of the total NRF designated area within that WAU) _____ Yes _____ No _____ N/A
_____ Unknown

If yes, where was the delineation documented? _____

a) Was the intent of the activity to **decrease** the time required for the target amount of NRF habitat to be attained if the stand was left unmanaged? _____ Yes _____ No _____ N/A _____ Unknown

3. Did the management activity occur in a WAU that has exceeded the target amount for NRF habitat (sub-mature or higher quality habitat)? _____ Yes _____ No _____ N/A
_____ Unknown

Was the area that was designated to grow NRF habitat delineated and documented?
_____ Yes _____ No _____ N/A _____ Unknown

What was the percent of NRF habitat before the sale? _____

What was the percent of NRF habitat after the sale? _____

How were these percentages determined? _____

a) Did the management activity bring the total amount of NRF habitat below the target amount? _____ Yes _____ No _____ N/A _____ Unknown

4. Did the management activity take place within a WAU that was at or below threshold and was not part of the 50% designated NRF habitat? _____ Yes _____ No _____ N/A
_____ Unknown

B. Management activity in a designated Dispersal area

Describe the management activity conducted

1. Did the management activity take place in a quarter township (Eastside) or WAU (Westside) designated as dispersal habitat? _____ Yes _____ No _____ N/A _____ Unknown

a) Was the quarter township or WAU _____ above the 50% target amount; _____ below the 50% target amount; or _____ unknown

What was the percent of dispersal habitat before the sale?

What was the percent of dispersal habitat after the sale?

How were these percentages determined?

If below threshold, did the management activity occur in the non-habitat section of the WAU? _____ Yes _____ No _____ N/A _____ Unknown

C. Management Activities within **Any Owl Circle**—inside or outside NRF or dispersal management areas

Describe the management activity conducted

Which circle(s) did the activity take place in (name, number, status)?

1. Did the management activity take place within one of the spotted owl management circles listed in the Implementation Memo that required additional protection measures during the first ten years of the HCP? _____ Yes _____ No _____ N/A _____ Unknown

a) If yes, did the management activity occur in the non-habitat portion of the owl circle? _____ Yes _____ No _____ N/A _____ Unknown

Where/how is this documented?

2. Within NRF or Dispersal, did the management activity take place within 0.7 miles of a known nest site during the breeding season? _____ Yes _____ No _____ N/A _____ Unknown

3. Outside of NRF or Dispersal, did the harvest activity take place within the best 70 acres of a site center outside designated NRF and Dispersal? _____ Yes _____ No _____ N/A _____ Unknown

4. If Yes to either 2) or 3), were appropriate timing restrictions observed during the breeding season? _____ Yes _____ No _____ N/A _____ Unknown

D. For **ALL** Management Activities Applying the Spotted Owl Strategy

1. Based on the documented information, is the strategy compliant with the HCP?

_____ Yes

_____ No—explain why not

_____ Unknown—explain what information is missing



3. Northern Spotted Owl—Within the Klickitat Planning Unit

Objectives and Steps for Determining Compliance

- Determine the objective criteria for monitoring the amended northern spotted owl conservation strategy for the Klickitat HCP Planning Unit (DNR, 2004), and use them to develop a monitoring protocol.
- On a timber sale unit basis, determine if an activity took place in a designated northern spotted owl management area or a spotted owl circle subject to additional protection.
- On a timber sale unit basis, determine what the relevant monitoring criteria (e.g. legacy tree retention, stand composition) are and determine if the activity was compliant with those criteria.

Methods

BACKGROUND AND MONITORING CRITERIA

In the Klickitat Planning Unit, forest health issues associated with stands overstocked with species more susceptible to drought, disease, and insect infestations are degrading forests. In addition, some lands originally designated as Nesting, Roosting, Foraging (NRF) management areas are not capable of sustaining suitable northern spotted owl habitat. This makes the original habitat goals difficult, if not impossible, to achieve. In 2004, DNR established an amended spotted owl conservation strategy (HCP Amendment No. 1) to address the issues in the Klickitat Planning Unit.

The Klickitat amendment does not change the overall conservation objectives for the original northern spotted owl strategy laid out in the HCP (DNR, 1997a). However, field assessments, inventory data, and spotted owl demography data were used to create new habitat targets for the area. Four sub-landscapes within the planning unit were created, with habitat targets based on those sub-landscapes (rather than Watershed Administrative Units or quarter-townships). In addition, dispersal management areas in the Klickitat Planning Unit have been renamed Desired Future Condition (DFC) management areas. The habitat commitments are the same as those for dispersal (at least 50 percent canopy closure; at least 40 trees per acre that are at least 11 inches in diameter; a top height of at least 60 feet), but with the addition of a goal to create more complex habitat through retaining stand structure. Each sub-landscape has specific requirements in terms of acres of habitat in NRF and DFC management areas, as well as Ponderosa Pine Desired Future

Condition (PPDFC) and near-NRF (habitat that is structurally close to becoming NRF). DFC lands are managed by vegetative series (e.g. grand fir frigid-cold), with the goal of maintaining 50 percent of each vegetative series, by sub-landscape, in mature (at least 60 years old) DFC. These changes provide additional diversity to support other plant and animal species. They also allow for the development and maintenance of habitat that can be sustained in the long-term.

All of the timber sales monitored in 2005 were in the Glenwood sub-landscape, where the requirements call for maintaining at least 50 percent of designated NRF management areas in suitable sub-mature habitat and 50 percent of Desired Future Condition management areas in mature DFC by vegetative series. There is also a goal to maintain 50 percent of the ponderosa pine vegetative series in PPDFC. In 2005, the Glenwood sub-landscape was below the 50 percent habitat threshold for NRF. For DFC, the sub-landscape was below the 50 percent habitat threshold in the ponderosa pine frost and grand fir frigid cold vegetative series, but above the threshold for sub-alpine fir cryic warm. In management areas below the threshold, regeneration (clearcut) timber harvests can occur in stands that are not currently habitat, as long as the harvest does not increase the amount of time required for the sub-landscape to reach the habitat threshold. In those cases, there is a requirement to leave legacy trees.

Legacy tree requirements, which dictate leaving a minimum number of trees per acre from the largest diameter classes, are formalized in the amendment. For NRF “an average target of at least 10 to 12 trees per acre from the largest diameter classes will be retained during harvest to speed the stand’s growth into NRF habitat” (DNR, 2004 p. 10). For DFC, the legacy tree requirement states that “an average target of at least six trees per acre from the largest diameter classes will be retained during harvest to speed the stand’s growth into DFC and PPDFC” (*ibid.*, p. 12). However, what constitutes a legacy tree is not clearly defined in the amendment. The amendment language contains no explicit requirement for dead trees or snags, but also does not specify that only live trees should be counted toward legacy retention. After talking to field staff and the amendment’s authors, the team believes the intent was for only live trees to be counted as legacy.

SAMPLE SELECTION

Since a newly amended strategy (DNR, 2004) was being monitored, and timber sales applying it had not yet closed in DNR’s Revenue Management System, the sample population from the Klickitat Planning Unit was selected from a list of all sold sales (both harvested and scheduled for harvest) that had applied the new spotted owl strategy. The team decided to monitor all such sales that had been harvested, for a total of four sales containing 26 timber sale units. These sales were actually set up before the amended strategy was finalized, but received variances to apply the new strategy.

OFFICE REVIEWS

The team worked with staff from DNR, the Services, and Washington Department of Fish and Wildlife to prepare a list of objective, measurable criteria in the amended strategy. This included both parameters that needed to be monitored only once (e.g. changes in the planning unit boundaries) and variables that will be looked at in future effectiveness and compliance monitoring (e.g. determining if the proper number of legacy trees were left post-harvest). Once the criteria were established, the team created

an office review form (Appendix 3A) and determined what information critical to determining strategy compliance was missing. DNR region employees were asked to supply missing information, including GIS data layers. Based on the answers to the office review forms, the team then determined which units needed to be field reviewed and created field forms for collecting data critical to determining compliance.

FIELD REVIEWS

Documentation used in performing the office reviews (forest resource inventory data, timber sale jackets, and region-provided GIS layers) confirmed that all sales from the Klickitat Planning Unit being monitored in 2005 took place outside of suitable spotted owl habitat. No part of any of the sales was in a nest patch core or buffer or Status 1, 2, or 3 owl circle subject to additional protections. Therefore, the primary requirement that could be monitored in the field was whether or not adequate numbers of legacy trees remained post-harvest. The amendment language contains no explicit requirement for dead trees or snags, but also does not specify that only live trees should be counted toward legacy retention. The monitored activities were all in stands with forest health issues, leading to high mortality. This, combined with inconsistent marking of leave trees, made it difficult to determine whether trees in the stand when it was monitored were alive or dead when the sale was set up or harvested. For these reasons, the team ultimately counted all trees, but analyzed live and dead trees separately. For compliance purposes, live trees with a diameter at breast height (dbh) of at least eight inches were counted towards the legacy tree target threshold. Field data gathered included tree species, dbh, and life status.

Four timber sale units were excluded from the field review sample, as they were thinned units leaving far more than the required legacy trees. This left 22 units that could be monitored. The team randomly assigned an order to monitor these units, and completed as many as time permitted.

In order to determine compliance with the legacy tree requirement, the team performed strip sampling following a protocol similar to the one DNR has used to cruise for timber volume. Strip sampling can be used to assess a variety of parameters, including trees per acre, tree species and tree diameter, which are the primary metrics of the legacy tree requirement. The team selected strip sampling instead of variable probability plot sampling or 100 percent count sampling based on the typically even distribution of leave trees in the department's timber sales in Eastern Washington. Strip sampling assumes that the area sampled is representative of the entire unit; the percent sampled is based on the size of the unit.

When strip sampling, strips running the length of the sale are laid out at prescribed distances and every tree with the central axis of its trunk within thirty-three feet of either side of the strip line is counted and measured. The distance to the center of the trunk is measured from the point on the line perpendicular to the tree. For borderline trees (those whose centers were exactly 33 feet from the line) the team alternated between counting one and not counting the next. Trees with double leaders were treated as two trees if they split to two leaders below dbh height (4.5 feet above ground) or one tree if the split to two leaders was above dbh height. An expansion factor is then applied to project the number of trees in the entire sale. For example, in a 75-acre unit, 20 percent of the unit is sampled and the expansion factor is five, meaning each tree measured is assumed to

represent five trees in the sale as a whole. Sale units that are 20 acres or smaller are 100 percent counted and no strips are set up or expansion factors applied. Table 3.1 shows the percentages, distances, and expansion factors used.

Table 3.1. Strip sampling guidelines

| Unit size (acres) | Percent of sale to sample | Distance between strips (feet) | Expansion factor¹ |
|--------------------------|----------------------------------|---------------------------------------|-------------------------------------|
| <20 | 100 | N/A | N/A |
| 21-40 | 40 | 165 | 2.5 |
| 41-60 | 30 | 220 | 3.33 |
| 61-300 | 20 | 330 | 5 |
| >300 | 15 | 440 | 6.67 |

¹The expansion factor is the number of trees that each counted tree represents.

Significant differences in elevation can lead to significant differences in vegetation, so strips were typically run up and down slopes to avoid skewing the data. The starting point was typically chosen to maximize efficiency and to minimize edge effects and the need to run mini or partial strips (by, e.g., starting the first strip 330' in from the easternmost point of a 100-acre unit with strips running north-south). The distance between strips was dictated by unit size and sampling intensity.

If a strip was near the border of a timber sale (i.e. timber sale unit boundary, special management zone, or other non-harvested area), and more than half but less than one full strip width away from the last strip's center line, a 'mini' or half strip was run (See Figure 3.1, Strip 7.5). Mini strips help to ensure that the number of trees is not underestimated by excluding a section of the sale from the sample. The mini strip's center was only half the normal distance away from the last strip (in a 100-acre unit for example, it would be 165 feet, rather than 330 feet, away). Trees on the side of the strip interior to the border ("B" in Figure 3.1) were not counted, as they were already accounted for by the adjacent full strip (Strip 7 in Figure 3.1). For the side of the strip adjacent to the border ("A" in Figure 3.1), the distance between the center of the mini strip and the edge of the harvest area was measured, and then divided by the expansion factor to determine how far from the strip trees should be counted. For instance, if the team was working in the 100-acre unit in Figure 3.1 (expansion factor of five) and the strip was 120 feet from the timber sale boundary, only those trees with centers within 24 feet ($120/5$) of the strip center would be counted, rather than those within 33 feet. This system of adjusting the strip width ensures that the number of trees is not overestimated. This method is also applied to the side closest to the border on full strips where the center line is less than half of a full strip width away from the timber sale border (e.g. area "C" in Figure 3.1).

Sometimes, the border of a sale would open up to the full between-strip distance somewhere along a mini-strip. When this occurred, the mini-strip was ended, and a new strip started the full distance from the last full strip (See Figure 3.1, Strip 8). From the point where the full strip started, the team resumed counting trees on both sides of the strip.

Occasionally, a strip near a timber sale border would exit and then re-enter the sale. In such cases, the strip was run through the area outside of the sale, with no trees outside of the

harvest boundary counted. When the strip re-entered the sale, the team resumed counting the trees inside the harvest unit.

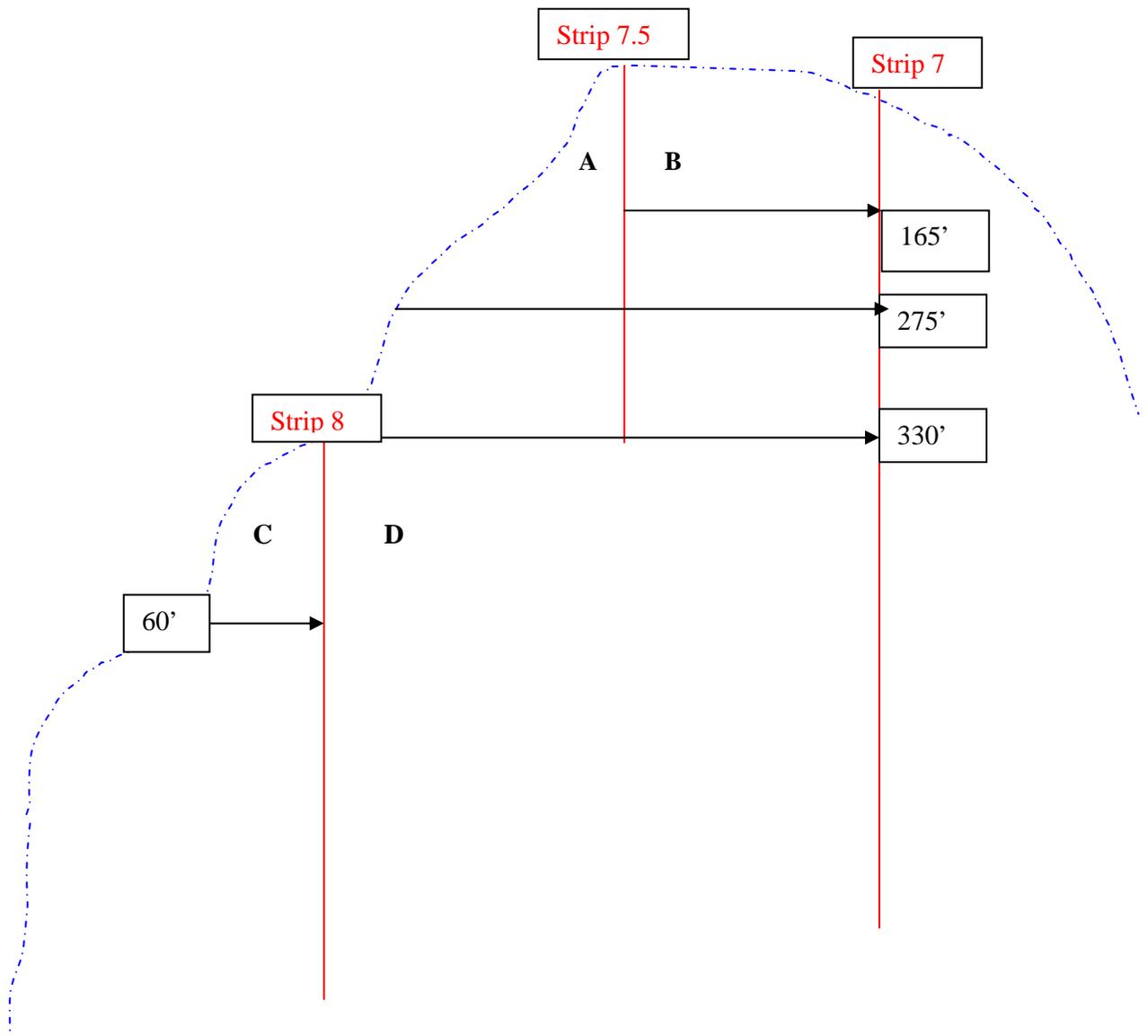


Figure 3.1. Example of a sale unit (100 acres in size) in which a mini-strip would be used. The blue (dashed) line is the timber sale boundary. The red (solid) lines are the sampling strips. The arrows and accompanying text boxes denote the distance between strips and mini-strips or the distance between strips and the timber sale boundary. The letters indicate sampling areas. Drawing is not to scale.

If a sale unit was comprised solely of NRF or of one DFC vegetative series, the strips were simply set up and counted. If the unit contained both NRF and DFC, or more than one DFC vegetative series, the different habitat types and/or vegetative series were delineated on the ground and their trees tracked separately. The team used a region-provided GIS coverage of NRF and DFC (by vegetative series), along with a Garmin

iQue M5 GPS (Garmin International, Olathe, KS) to delineate between habitat types and vegetative series on the ground. When possible, start and end points for each strip were marked with the GPS unit and uploaded into DNR's GIS system. The strips were also marked on the ground with flagging tape.

The team's objective was to count all the trees left as legacy (i.e. live trees with a dbh of at least eight inches), but determining which trees were legacy trees proved to be impossible. Forest health issues have led to relatively high mortality in some of the sale units, and it was not possible to retroactively determine which trees were alive or dead when the sale was set up. Differing prescriptions in the sale units also meant that not all legacy trees were marked (painted) in a consistent manner. The team could not determine when a tree died or what the forester intended to be a legacy tree. Instead, the team developed a method to provide an accurate picture of what the unit looked like when it was monitored.

In this method, the team counted and distinguished between *live* trees (defined by having predominantly green needles), *dead* trees (defined by having predominantly brown needles), and *snags* (defined by having no needles). (See Figure 3.2.) All trees with a dbh of at least eight inches were counted. Down trees were counted if they were live or dead or a painted snag (no snags were painted at set up, so only painted trees were assumed to be alive when the sale was set up). Snags were counted only if they were at least 20 feet tall (height was measured to where the bole was still complete for broken-topped snags). If a tree was inside the sampling area, its species and dbh were recorded. Snag heights were measured with an Impulse model laser rangefinder (Laser Technology Inc., Englewood, CO). Table 3.2 shows how data were collected, using an arbitrarily selected species code of two (which represented grand fir). Data were collected for nine timber sale units.

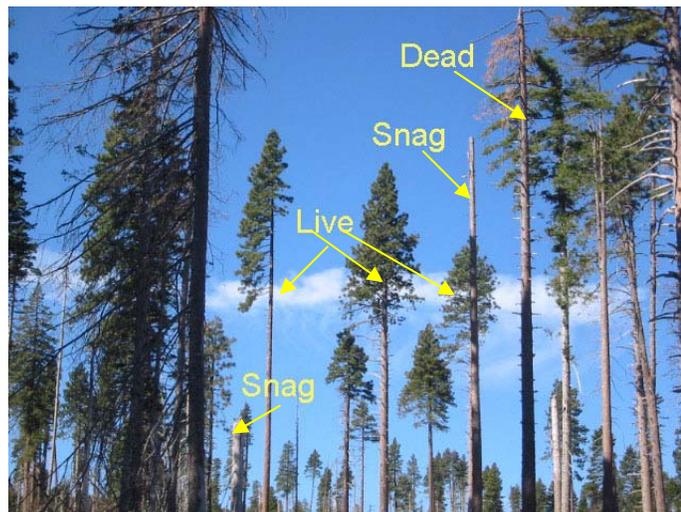


Figure 3.2. A timber stand containing dead, live, and snag trees as defined by the team

Table 3.2. Data collection protocol codes

| Class | Species code¹ | If painted² | If painted with color other than standard leave tree color¹ |
|--------------------------------|---------------------------------|-------------------------------|---|
| Live (green needles) | 2 | - | - |
| Dead (brown needles) | 2D | - | - |
| Snag (no needles) ³ | 2S | 2SP | 2SPO |
| Down Live ⁴ | 20 | 20P | 20PO |
| Down Dead | 20D | 20DP | 20DPO |
| Down Snag | Don't count if unpainted | 20SP | 20SPO |

¹ D = Dead, S = Snag, P = Painted; O = Other or non-standard paint color or marking.

² Paint (or lack thereof) was not noted on standing live or dead trees because all of these trees were assumed to be intended as leave trees.

³ A snag that could not be identified to species was marked with a species code of 9.

⁴ Down trees were noted by adding a zero after the species code.

Data Analysis

The Klickitat amendment language does not specify what constitutes a legacy tree nor whether a legacy tree must be alive. It also does not define the term ‘largest diameter classes’. In collecting the data, it became apparent that trees intended to be left as legacy trees could not be easily differentiated, and there was no way to determine whether a tree was alive or dead when the sale was set up or harvested. Instead, the team could only determine a tree’s status at the time of sampling and base any analyses on that. Given these limitations, the team chose to compare trees available pre- and post-harvest (by diameter class) to give an idea of which trees were harvested and which were left as legacy. Analyses were performed on stand composition and legacy trees.

In order to gain a more complete picture of which trees were left, the team needed information about the trees available pre-harvest. The team explored several options for this. Combining data on post-harvest trees with cruise data (surveys of stands pre-harvest, providing data only on trees to be harvested) to re-create the pre-harvest stands was considered. This was not a viable option because an old cruise method was used on some of the monitored sale units. This method did not provide adequate data to create a stand table showing pre-harvest tree species and diameters. The most comprehensive data available on pre-harvest stand conditions came from DNR’s Forest Resource Inventory System (FRIS). The team could have modeled projected changes in the stands based on the inventory data to attempt to account for mortality, growth, and other factors. However, this would have required additional time and resources, and the data may not have been any more accurate than the un-modeled data. Instead, the team chose to use the raw inventory data. Since inventory data were used to categorize pre-harvest stands, two assumptions were made: (1) none of the trees died between the time they were inventoried and the time they were harvested and (2) none of the trees grew between inventory and harvest (since there is no standard growth rate that can be applied).

To obtain pre-harvest stand information, the team used data from RIUs (Resource Inventory Units, the inventory analysis unit) rather than FMUs (Forest Management Units or timber sale units, the monitoring analysis unit). This required the assumption that the Resource Inventory Unit was uniform in terms of tree diversity, size, and health and that inventory unit plots were representative of the subsequent timber sale unit (realizing that areas of high diversity, healthy trees, and good habitat might have been excluded from the timber sale units, but not the inventory units).

In addition to differences in sampling area, differences in sampling intensity and methodologies make it difficult to make direct comparisons between pre- and post-harvest data. The inventory sampling methodology calls for utilizing variable probability plots, as opposed to strip sampling. Inventory data is collected using one plot per every five acres in a Resource Inventory Unit. The number of inventory plots falling within a given monitoring sample area (e.g. the NRF component of a timber sale unit containing both NRF and DFC) varied from zero to 21, depending on where those plots fell, the size of the monitoring sample area, and how the Resource Inventory Unit overlapped the Forest Management Unit. The monitoring methodology, meanwhile, uses a more intense sampling protocol, sampling anywhere from 15 to 100 percent of an FMU. Depending on where the sampling strips lie in relation to the Resource Inventory Unit, a large or small portion of that inventory unit might be strip sampled. These differences, assumptions, and caveats mean that the team was only able to record the conditions existing at the time of monitoring, not make definitive statements regarding the compliance of the timber sale units with strategy objectives or requirements. However, the team was able to create a series of graphs (discussed and shown below and in appendix 3B), which give an idea of how the strategy is being applied and which trees are being left.

STAND COMPOSITION

HCP Amendment No. 1 identifies the desired stand composition for each DFC vegetative series, as well as for mature NRF (See Table 3.3). It is important to remember that Desired Future Conditions represent a “properly managed vegetation series at a stand age of 60” (DNR, 2004 p. G-1), rather than a year or two post-harvest. Similarly, mature NRF is required to be 40 percent Douglas-fir or grand fir, but there are no such requirements for sub-mature NRF. The amendment also requires leaving 50 percent—by vegetative series—of each sub-landscape in mature DFC. The desired compositions are mostly qualitative, not quantitative (e.g. “favor” a species), and therefore cannot be used to determine precise requirements for stand composition.

To get an idea of how closely the stand compositions resembled these guidelines when monitored, the team analyzed what percentage of the live trees each species comprised pre- and post-harvest. This analysis only includes trees with a dbh of at least eight inches, so it does not account for naturally regenerated or planted seedlings, which will help bring the stands closer to desired future conditions as they mature. It does, however, show how the stands are progressing towards ideal compositions. The pre-harvest data are from DNR’s Forest Resource Inventory System and subject to the caveats discussed above. In many of the timber sale units monitored in 2005, one objective was to remove unsuitable species and replant and manage to create stands with species that are better suited to site conditions. If a stand composition does not match the ideal after harvest, it may simply mean that the desired species were not available in the stand pre-harvest.

Table 3.3. Desired compositions for mature NRF and DFC vegetative series

| Series | Ponderosa Pine (PP) | Douglas-fir (DF) | Grand Fir (GF) | Lodgepole Pine (LP) | Western Larch (WL) | Other |
|-------------------------|---------------------|------------------|----------------|---|---|--|
| SAF (cryic warm) | Component | Component | | Favor (with WL comprise at least ½ future stocking) | Favor (with LP comprise at least ½ future stocking) | Retain healthy advanced regeneration Engelmann spruce and sub- |
| GF (frigid cold) | 20% | 20% | 20% | Component acceptable | 40% | Component of western white pine (WWP) acceptable |
| PP Frost | Best adapted | | | Limited | Limited | |
| NRF | | 40% this or GF | 40% this or DF | | | |

LEGACY TREES

For stands classified as NRF or DFC management areas, but which do not meet suitable habitat definitions, the Klickitat Amendment requires retention of legacy trees post-harvest. The amendment does not specify whether these trees should be alive or dead, only that they must be from the “largest diameter classes”. However, the team believes that the intent is for the legacy trees to be alive (i.e. snags can be left as habitat, but do not count as legacy trees).

For a variety of reasons (forest health issues and associated mortality; required assumptions; lack of specificity in defining “largest diameter” trees; etc.), the team was not able to say whether the largest diameter trees were left. Instead, pre-and post-harvest data (from FRIS and team-collected data, respectively) were analyzed and graphed to show distribution in terms of trees per acre, both actual and cumulative. These analyses were performed for all trees, then separately for live trees and for dead trees (those counted as snags or dead). For each DFC vegetative series or NRF management area within a stand, a series of graphs were created:

- 1) Actual live trees per acre (TPA) (to show how many live trees there were in any given dbh class);
- 2) Cumulative live TPA (showing everything that is at least as large as a given dbh class, i.e. the column for 38 inch dbh shows the total number of TPA with a dbh of 38 inches, 39 inches, 40 inches, and/or greater than 40 inches). These graphs also have a line showing at which dbh class there are at least six TPA (DFC) or 10 or 12 TPA (NRF);
- 3) Actual dead TPA;
- 4) Cumulative dead TPA;
- 5) Actual total TPA (including both live and dead trees, with the percentage that were live also shown for comparison’s sake); and
- 6) Cumulative total TPA.

Graphs one through four for each timber sale unit are included in Appendix 3B. Graphs five and six for each unit are included in the results portion of this section. Scale issues make portions of the graphs difficult to read, so the raw data used in creating the graphs is included in Appendix 3C.

Results and Discussion

STAND COMPOSITION

In general, the stands appear to be developing towards desired species compositions. For instance, B&B West Unit 3B, which is in designated NRF, was more than 90 percent Douglas-fir/grand fir pre-harvest, but less than 50 percent post-harvest, much closer to the ideal of 40 percent for these two species in mature NRF (See Appendix 3D). The portion of Waterline 2 Unit 7 in the grand fir frigid-cold vegetative series, meanwhile, is developing into a more balanced (and desired) mix of Douglas-fir, grand fir, ponderosa pine, and western larch.

When looking at this data, it is important to keep in mind that trees that appear to have been in the stand pre-harvest might not actually have been there. These trees could have been sampled in a part of the inventory unit that was outside of the harvest unit or they could have died before the sale was set up. It is also possible that they were present in the stand post-harvest, but fell outside the team's sample area and thus are not reflected in the monitoring data. The cases where stands appear to be moving away from ideal compositions (e.g. King Mountain Unit 4 subalpine fir cryic-warm series, where there were no lodgepole pine or subalpine fir found post-harvest) could have been due to such factors.

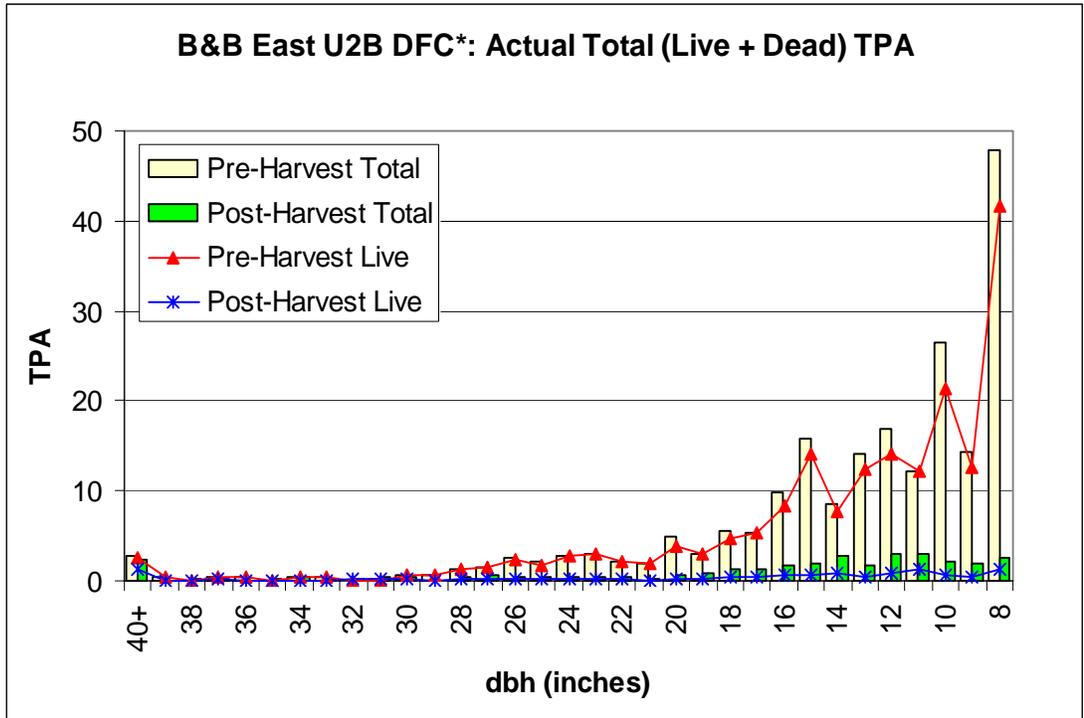
LEGACY TREES

Pre-and Post-Harvest Diameter Distribution

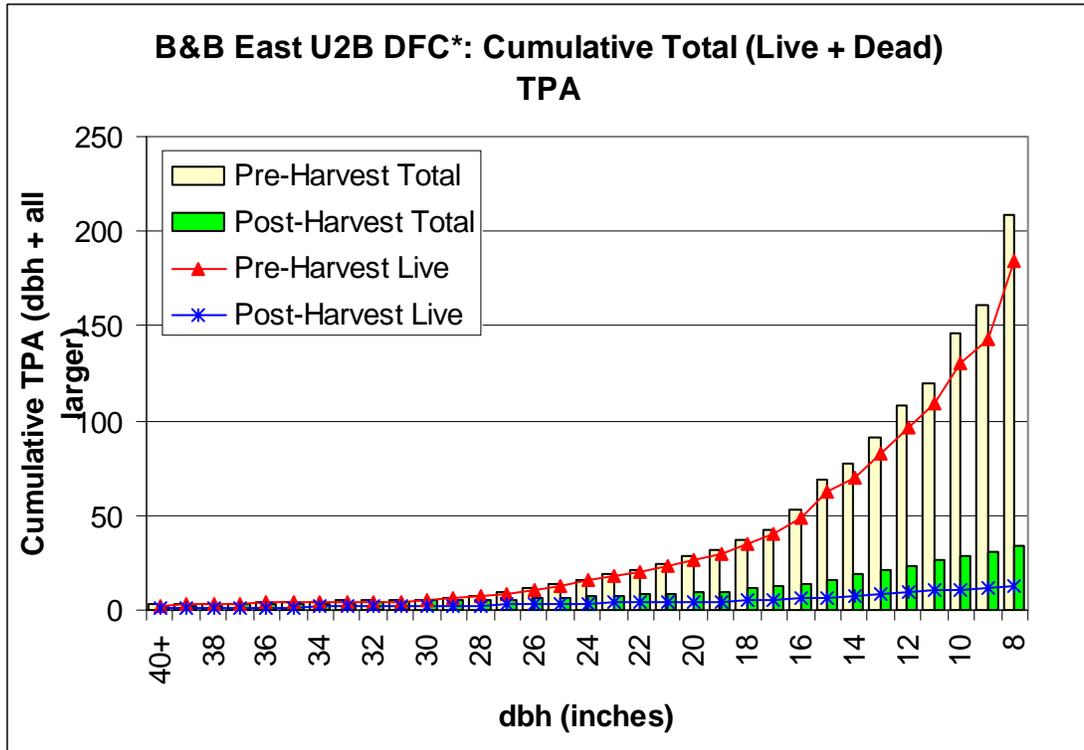
Overall, the data suggests that the legacy tree component of the strategy is being applied well. In every case but one (King Mountain Unit 5 NRF), the minimum number of trees per acre were left post-harvest. In addition, comparing the number of live trees per acre in the larger diameter classes pre-and post-harvest shows there is generally not a large difference. This suggests that the trees from the largest diameter classes are typically being left when possible.

Although an adequate number of trees were left, these trees may not have been from the largest diameter classes. Large differences in the size classes comprising six or 10 to 12 trees per acre (e.g. achieving six trees per acre at 28 inches dbh pre-harvest but having to include all trees 15 inches or larger to achieve six trees per acre post-harvest) suggest that some of the trees from the largest diameter classes were harvested. However, those trees may have died after inventory and before the sale was set up or the inventoried trees may have been outside the FMU and not actually available for harvest. In addition, field staff may have deliberately left some of the largest and healthiest trees from each desirable species. If some of those species have a relatively small maximum dbh, it would lower the stand's overall average dbh, but increase species diversity and move the stand towards the desired species composition.

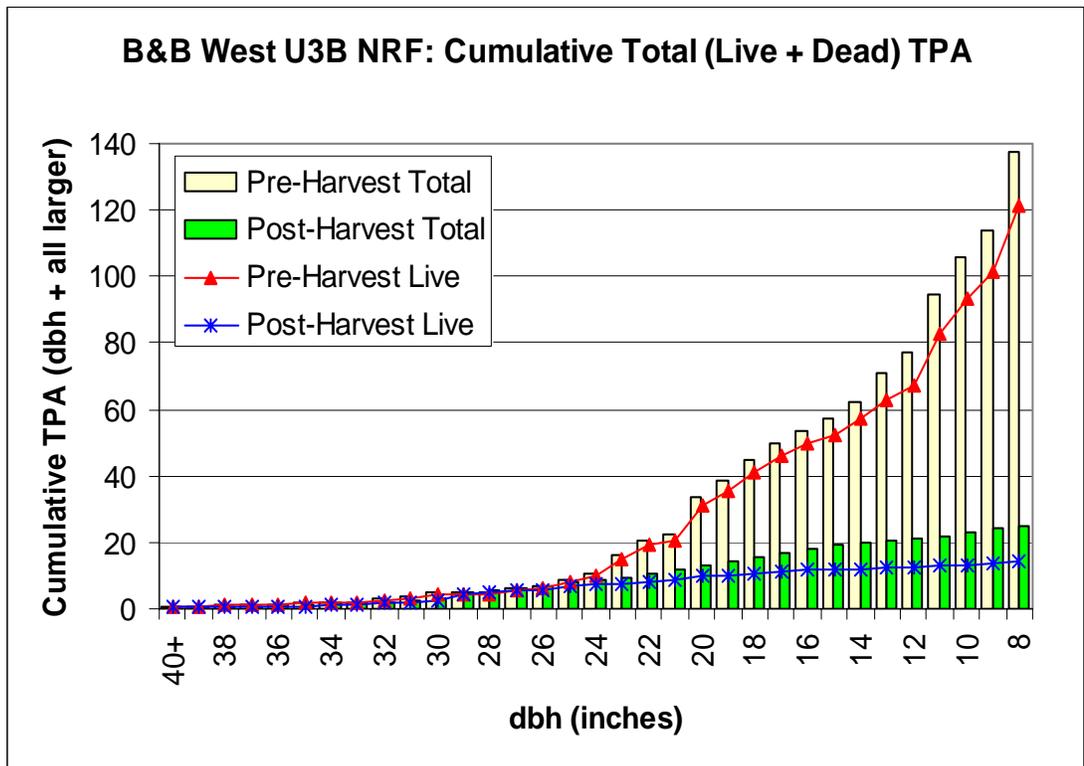
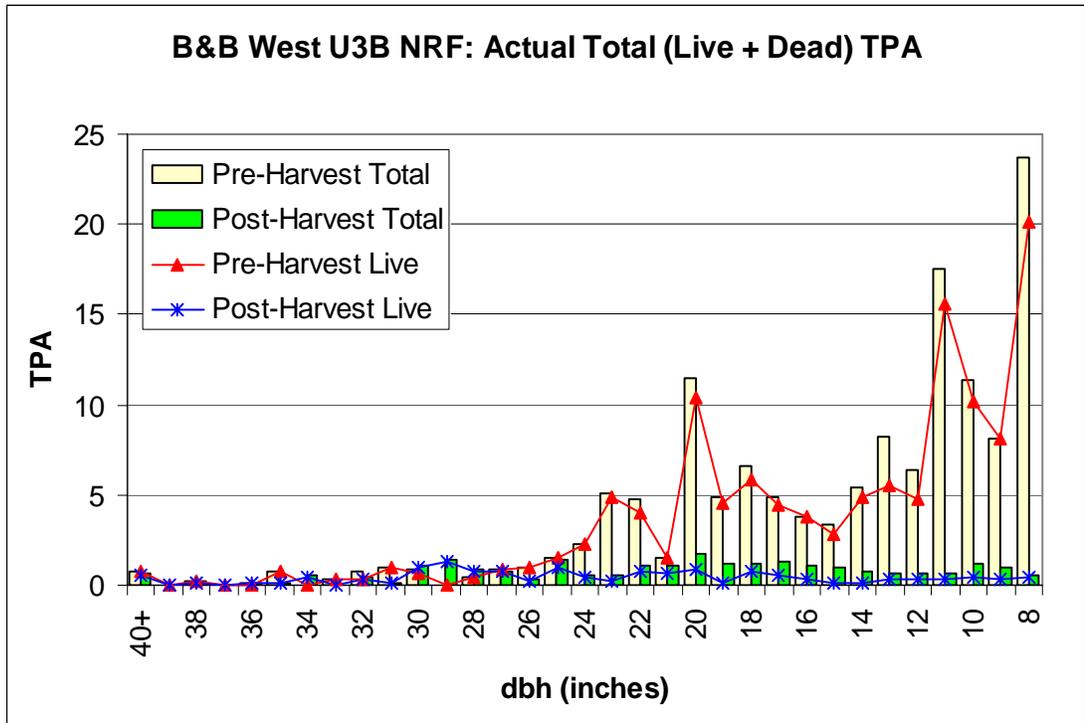
Looking at the number of live trees in relation to the number of dead trees or the total number of trees also gives an indication of stand health and may factor into why certain species or size classes were left post-harvest. For instance in B&B West Unit 3B, there were 12 trees per acre including everything at least 23 inches dbh pre-harvest, but trees as small as 13 inches dbh had to be included to achieve 12 live trees per acre post-harvest. However, there were a large number of dead trees in the 13 to 23 inch (and other) dbh classes post-harvest, suggesting that mortality may have been high in this stand and there may not have been many large, healthy trees to leave. Some of the larger dead trees may also have been deliberately left to provide snags, down woody debris, or other habitat features for spotted owls and other species.

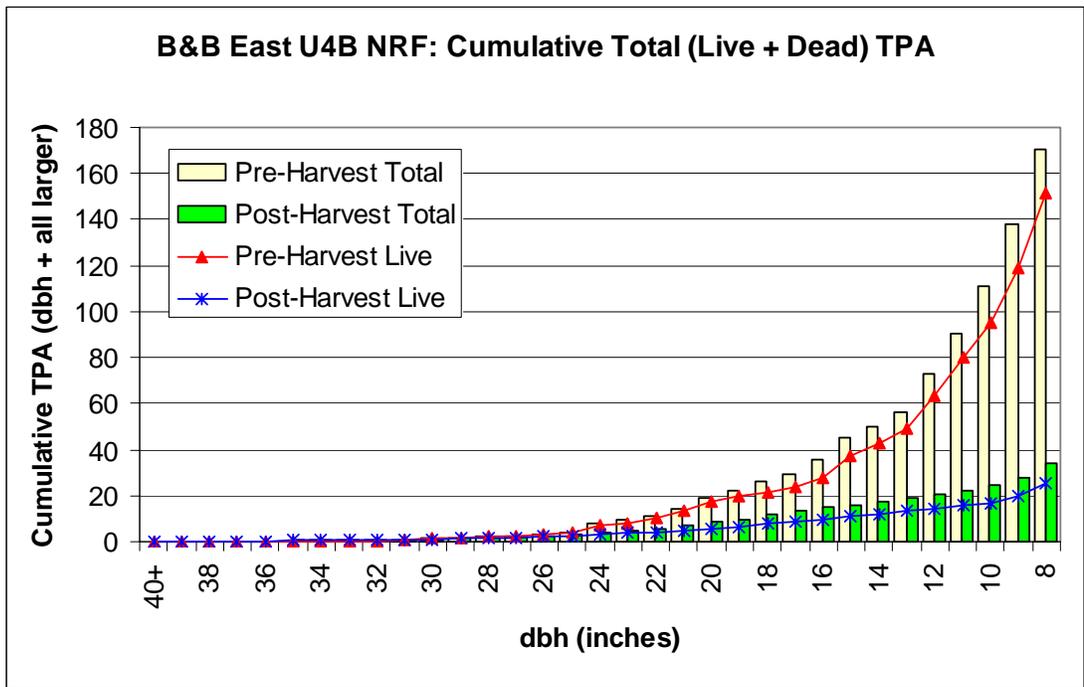
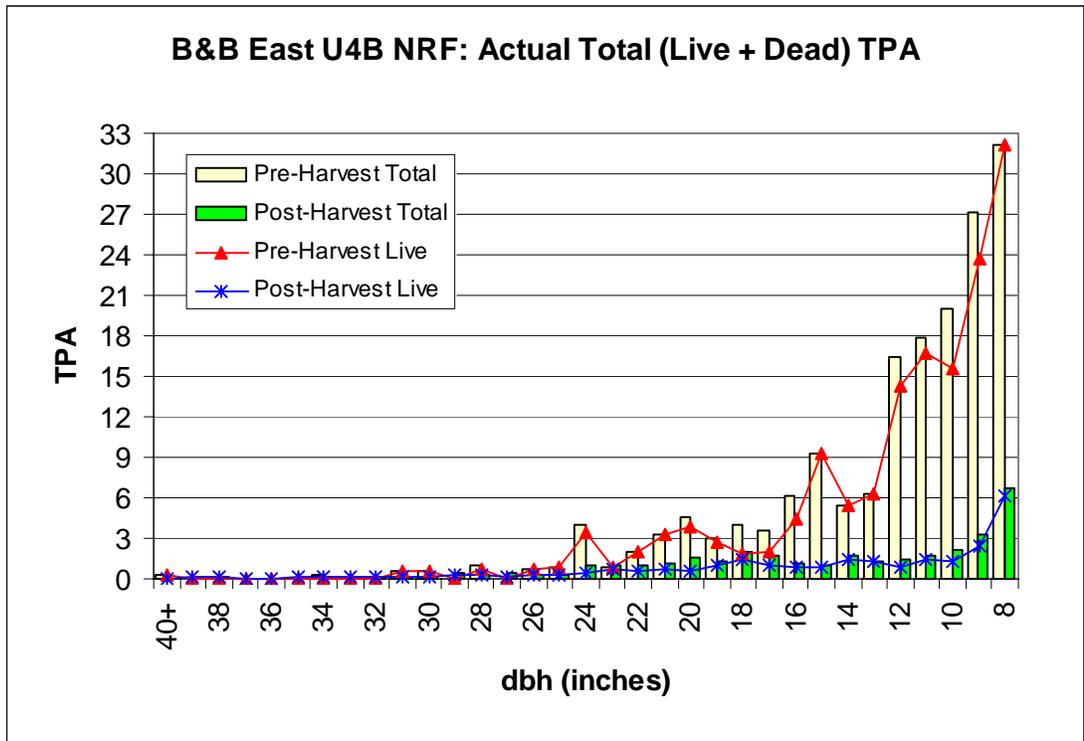


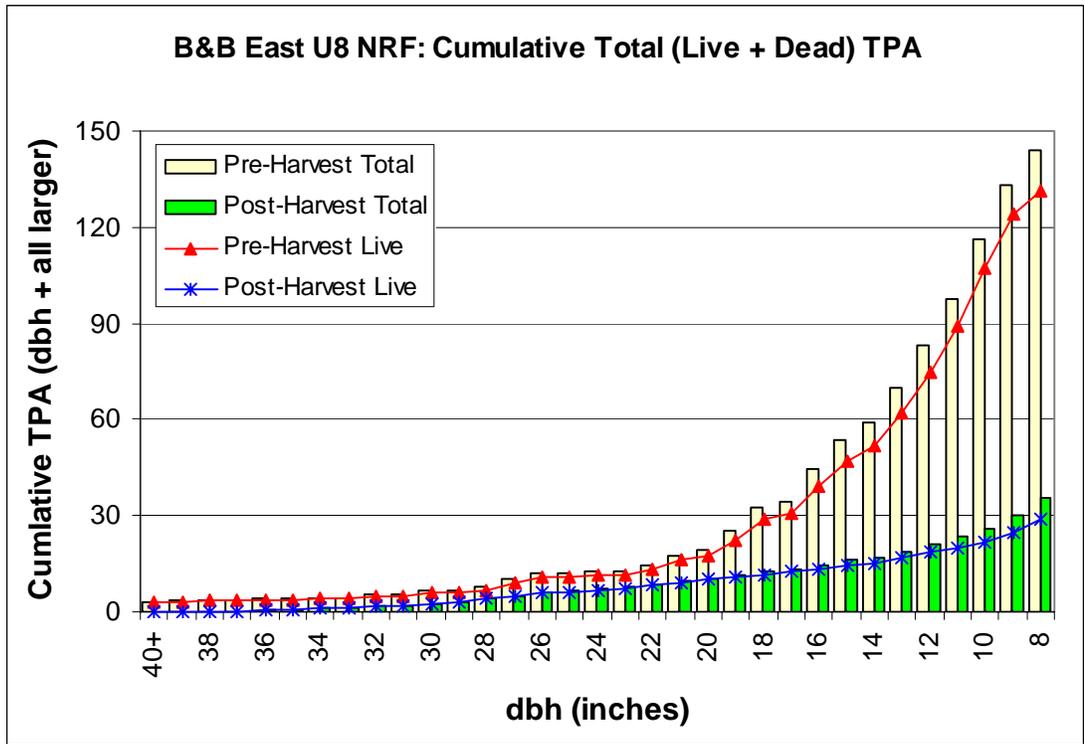
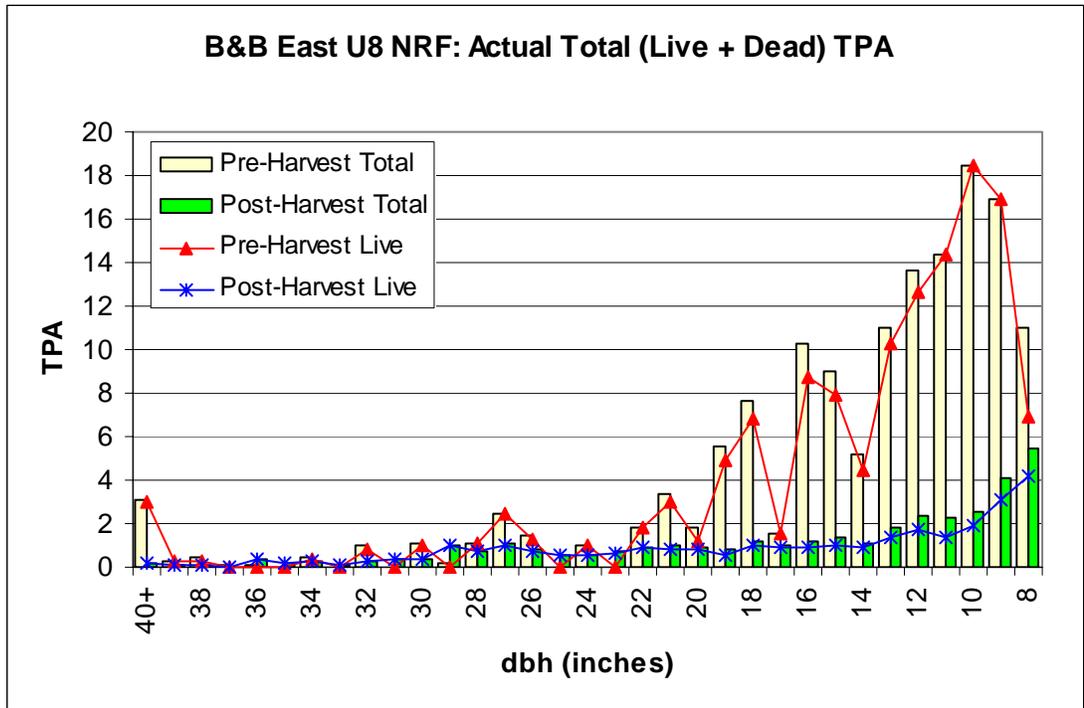
*Due to a data collection error, no distinction was made between the two DFC vegetation series when gathering post-harvest data for this unit.

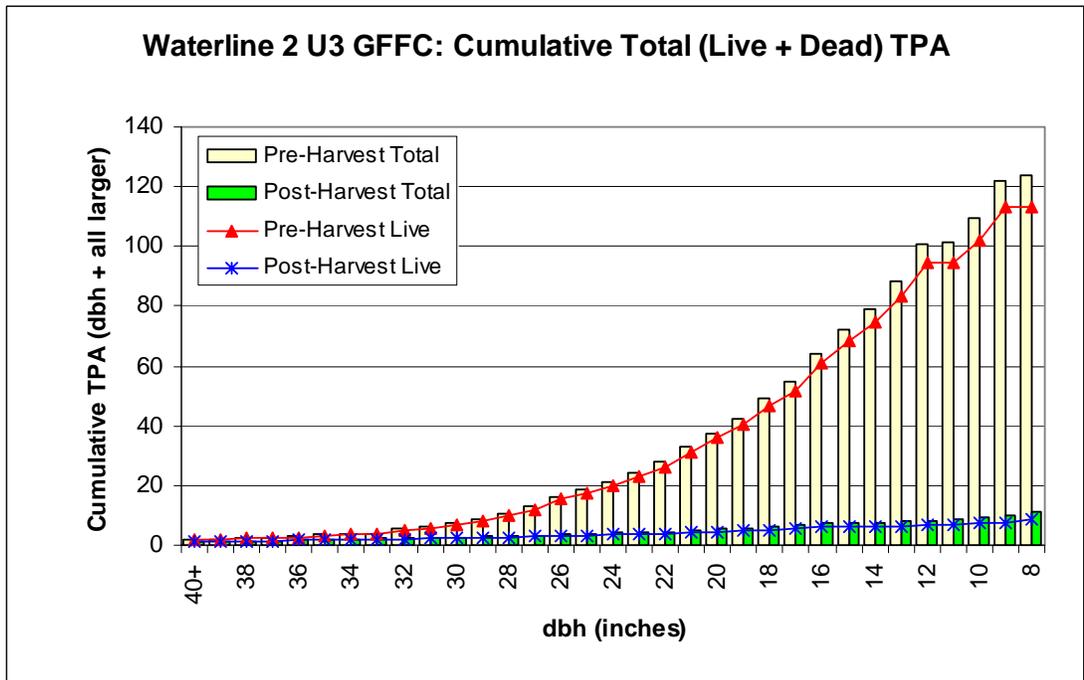
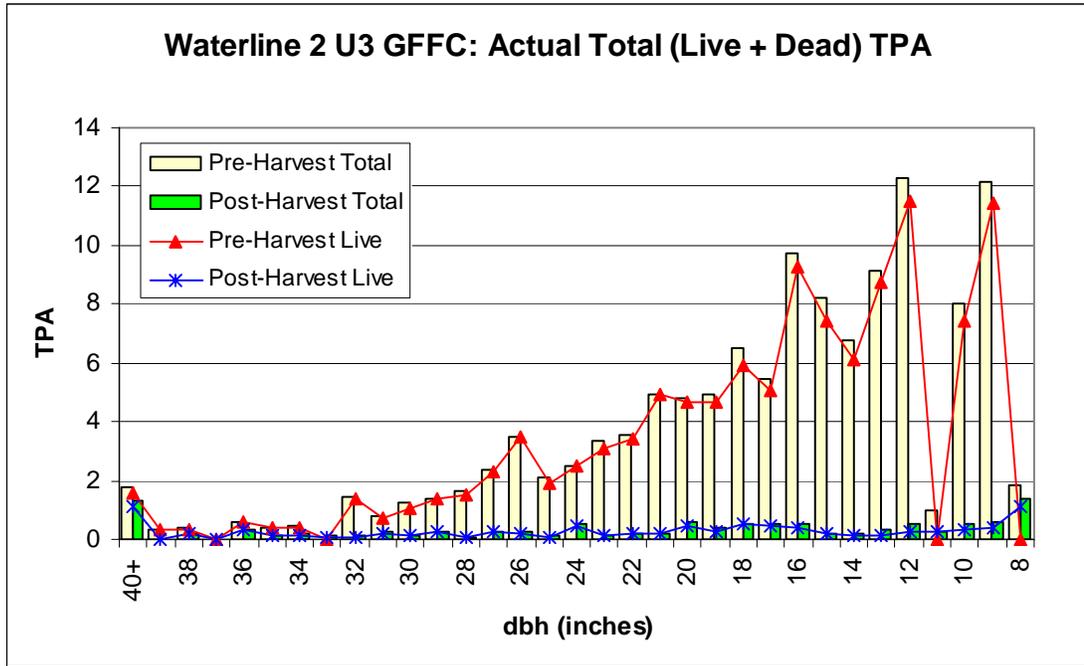


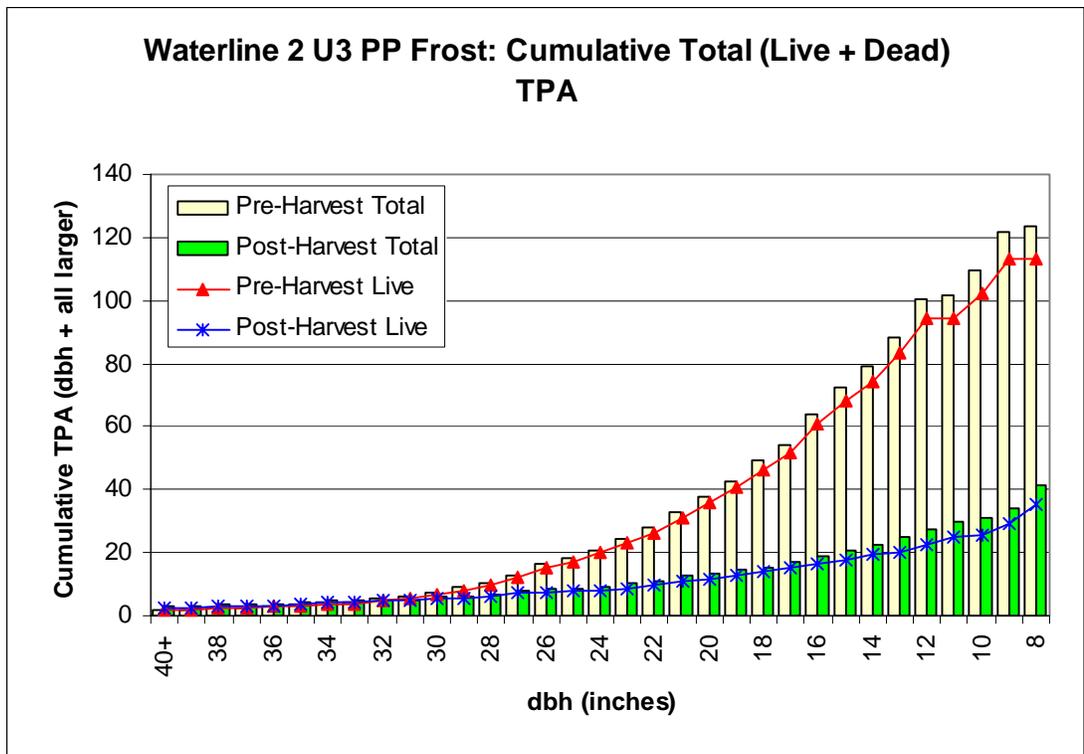
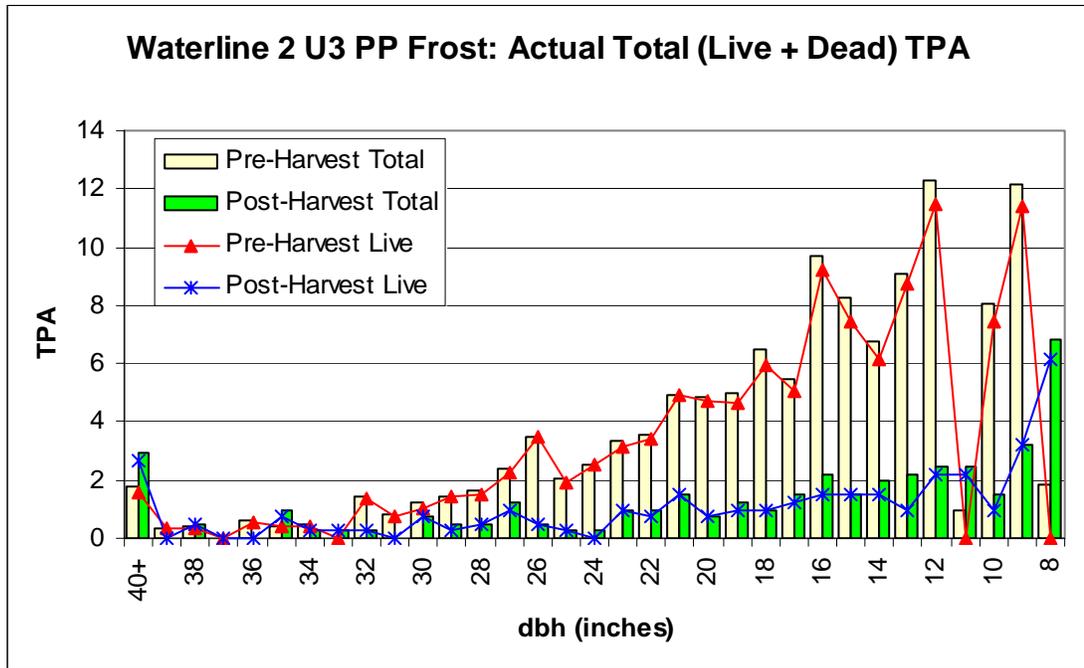
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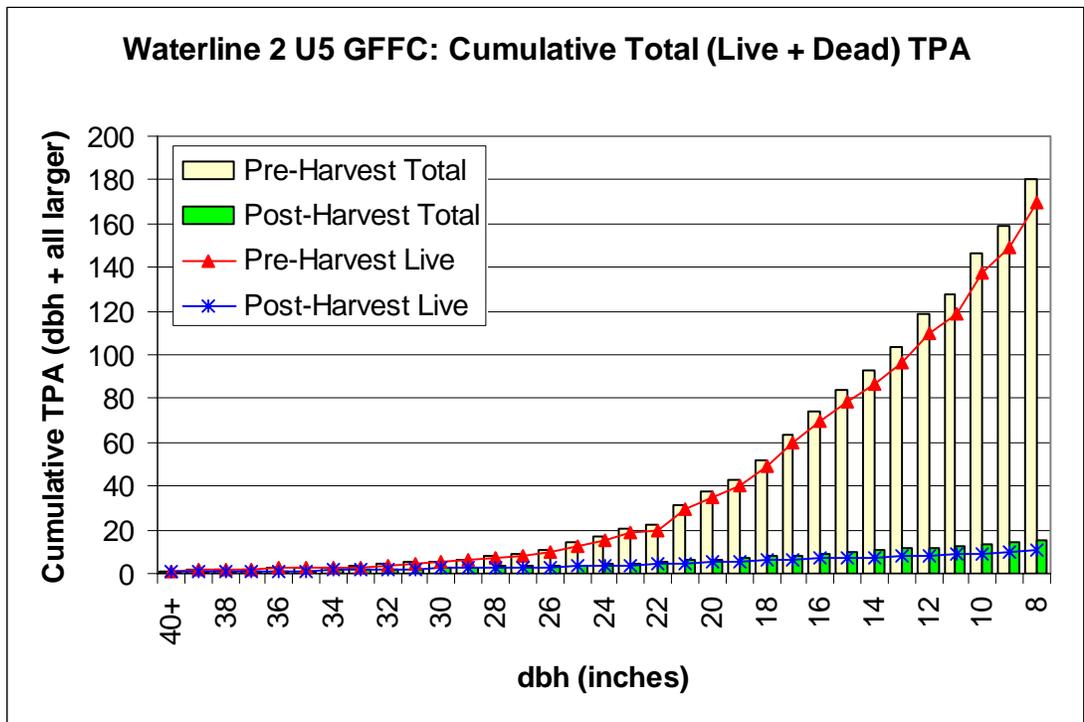
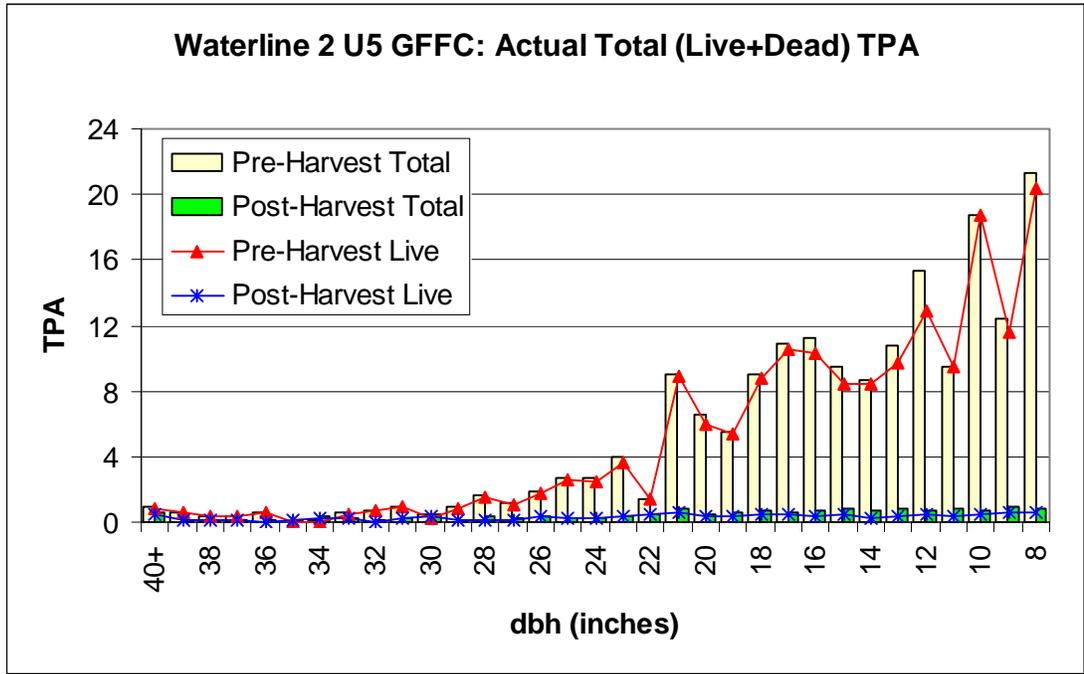


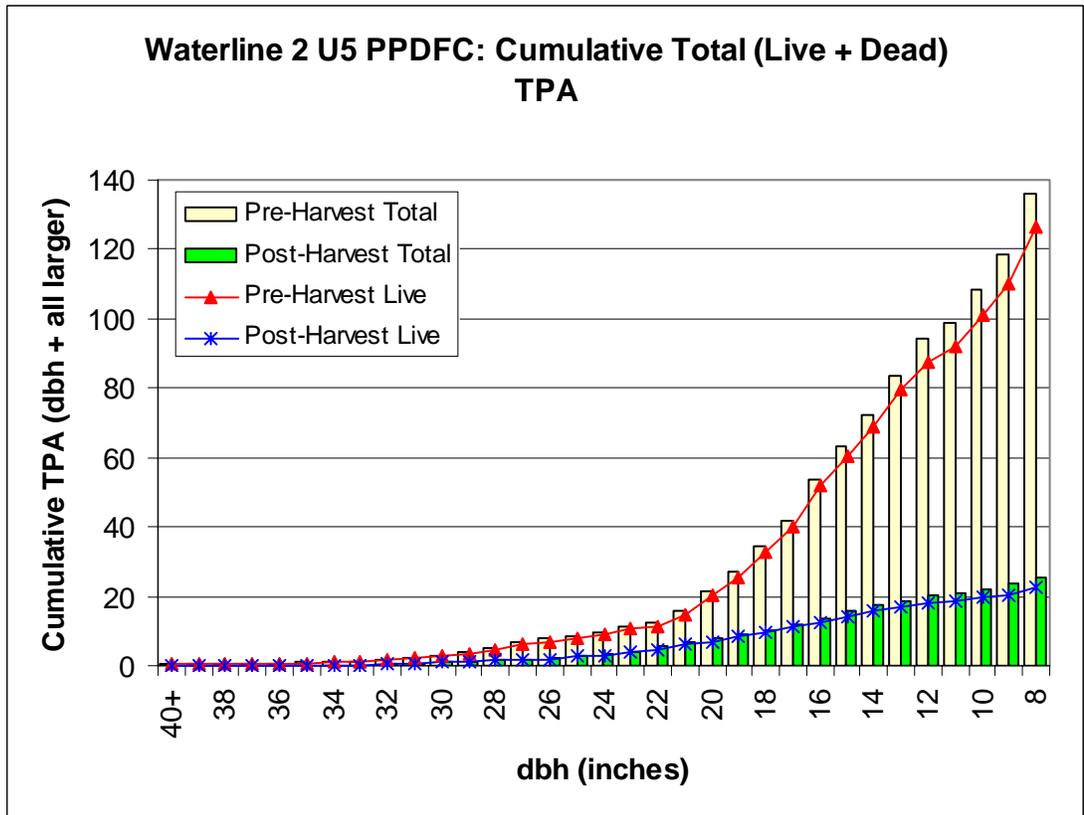
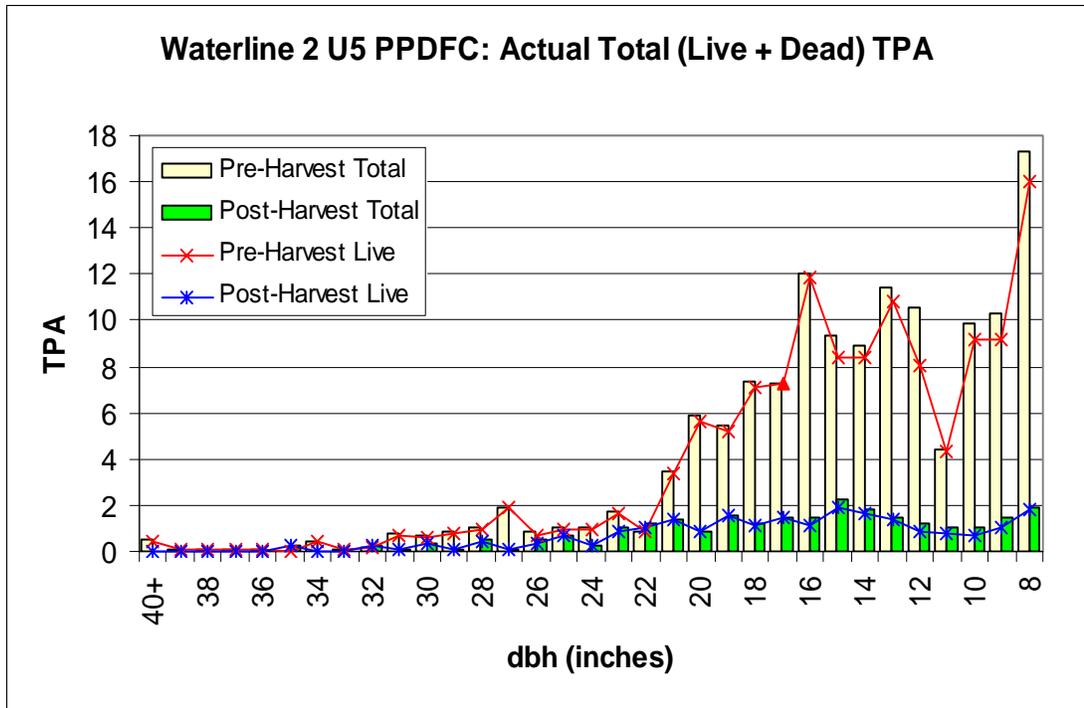




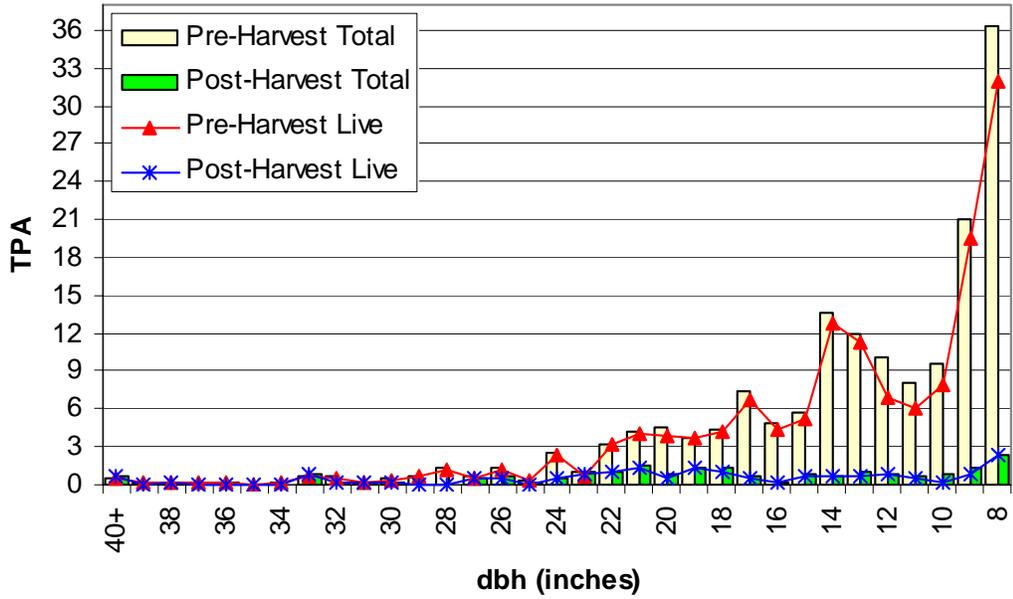




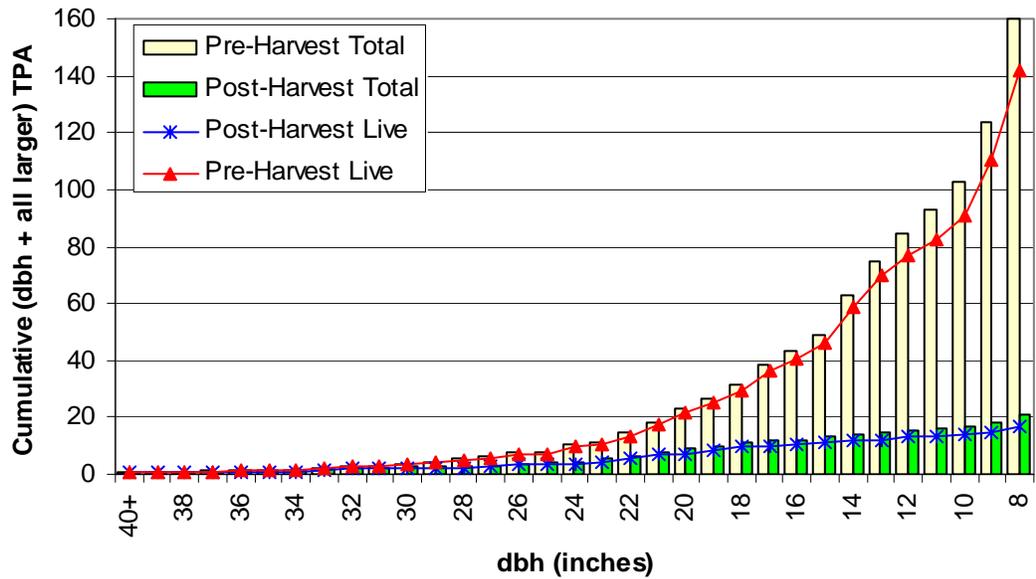


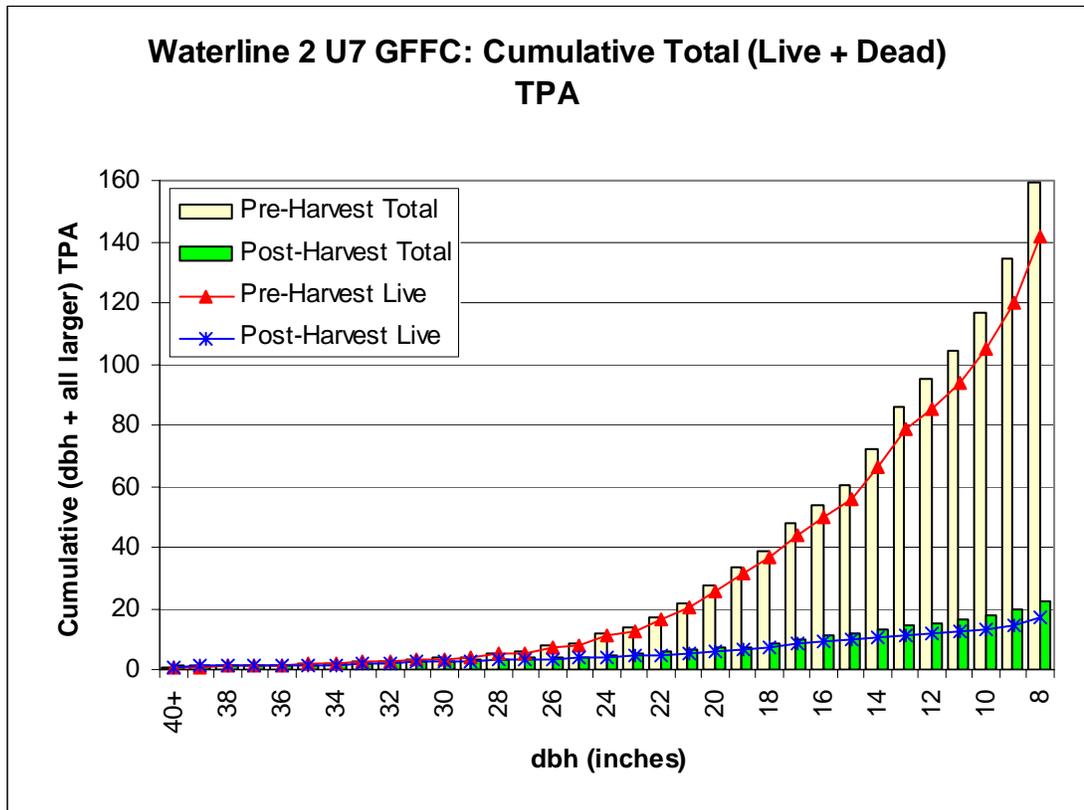
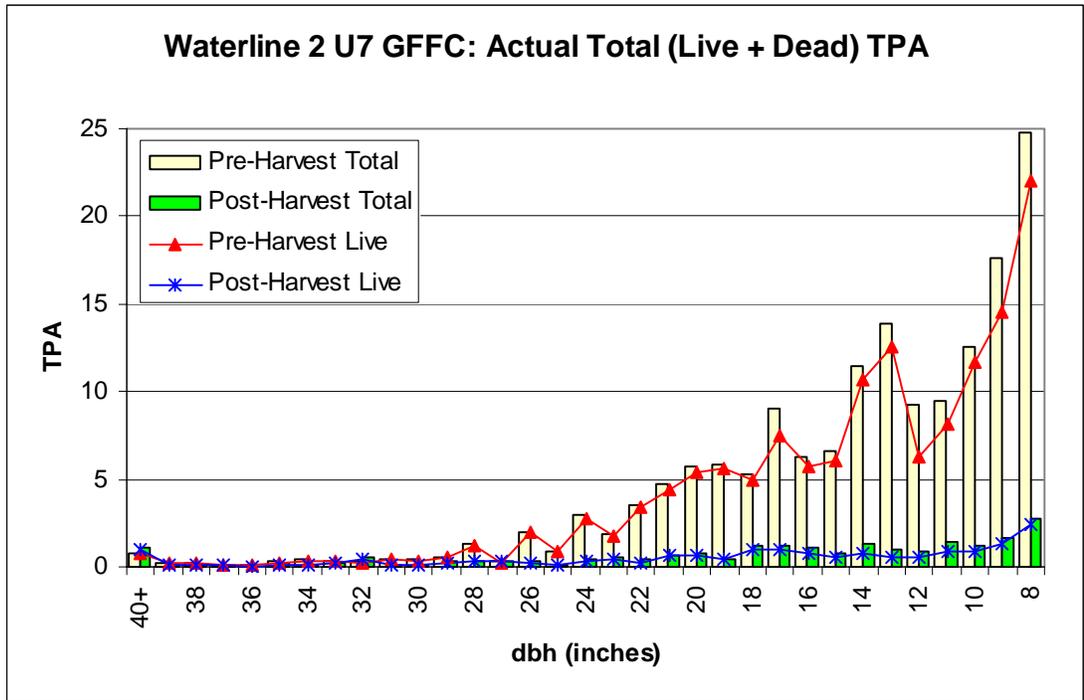


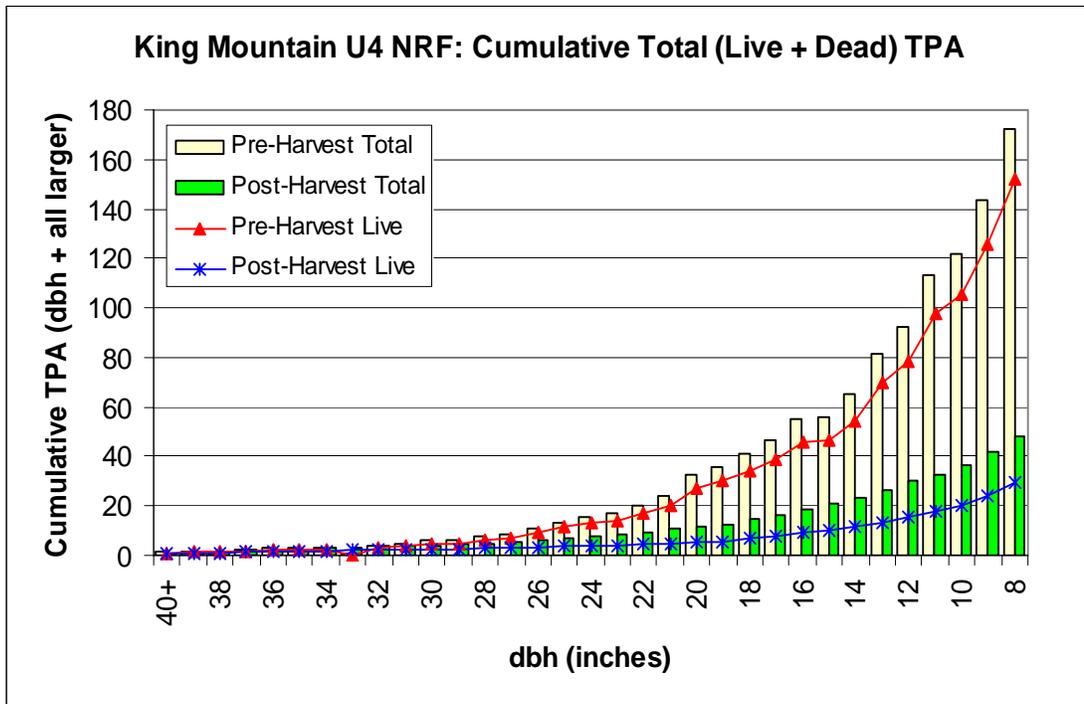
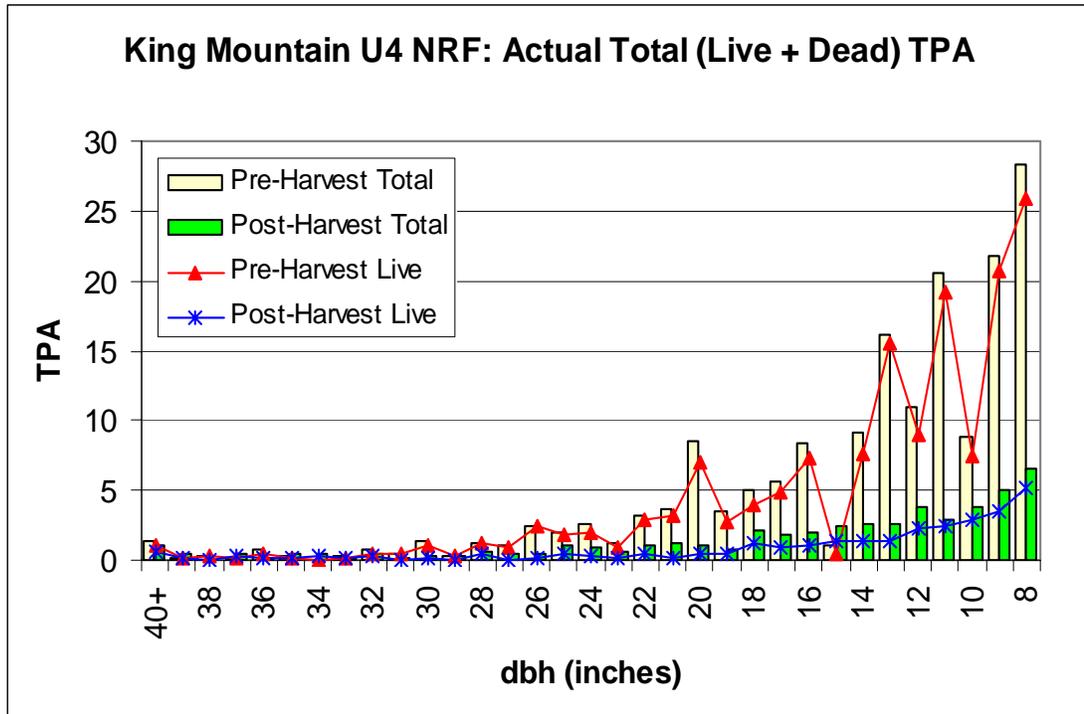
Waterline 2 U7 NRF: Actual Total (Live + Dead) TPA



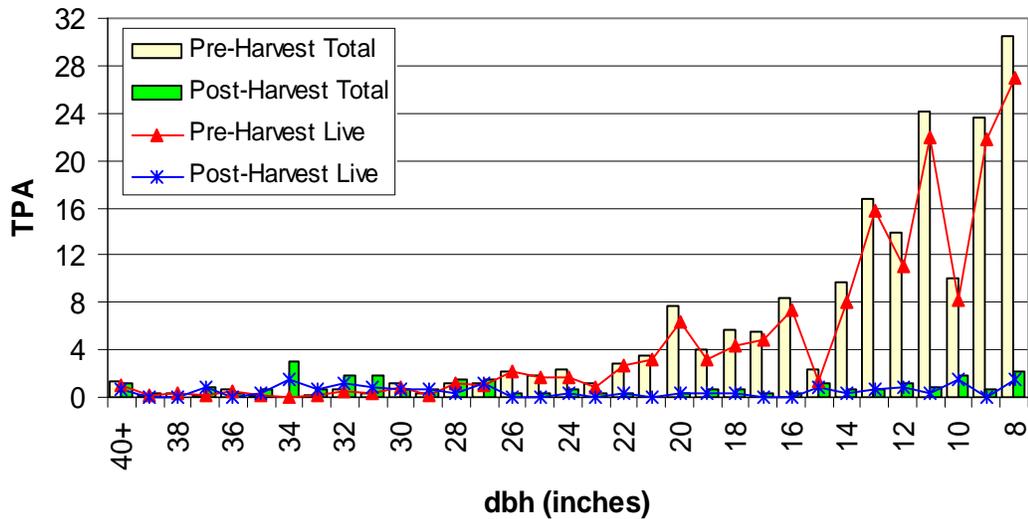
Waterline 2 U7 NRF: Cumulative Total (Live + Dead) TPA



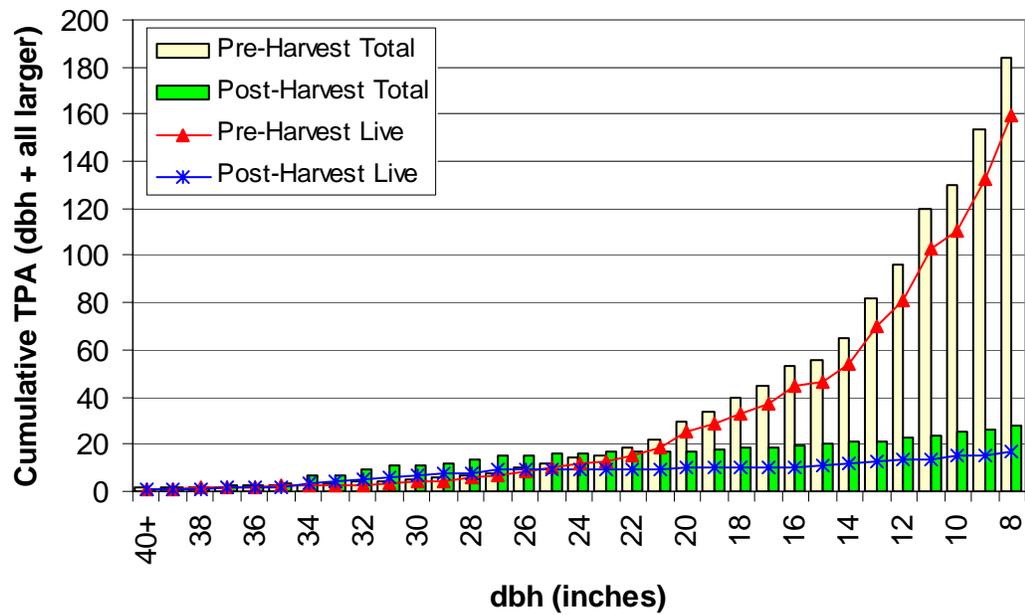


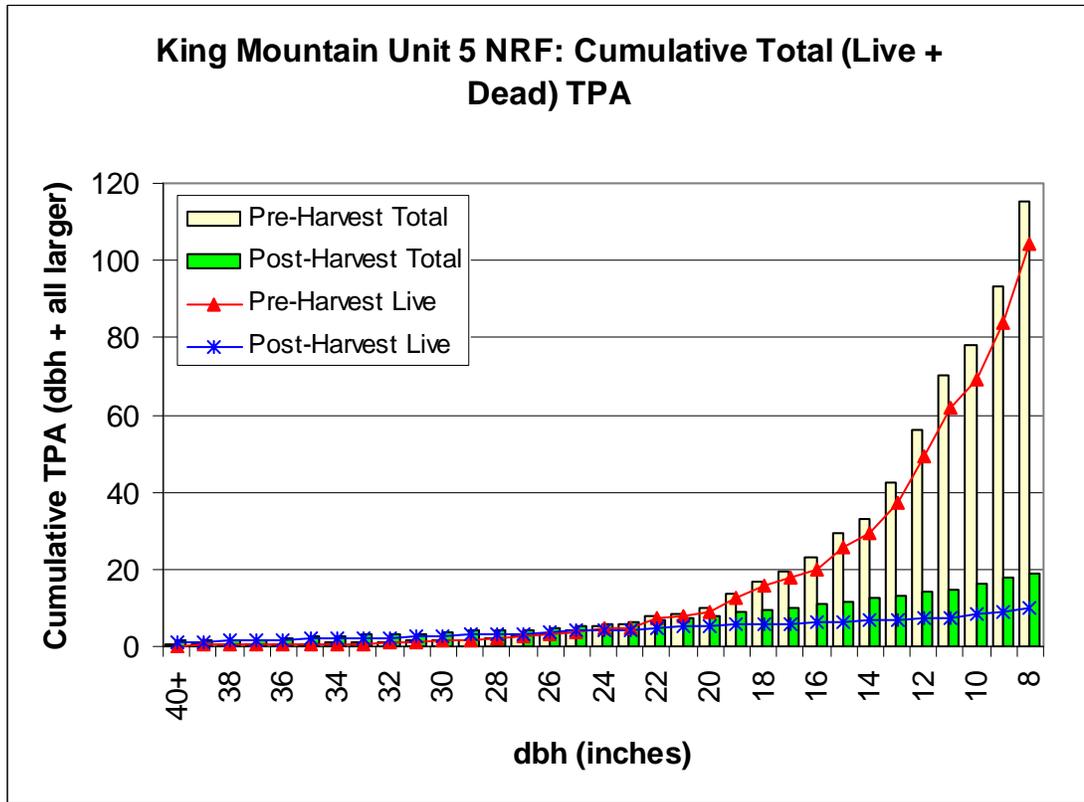
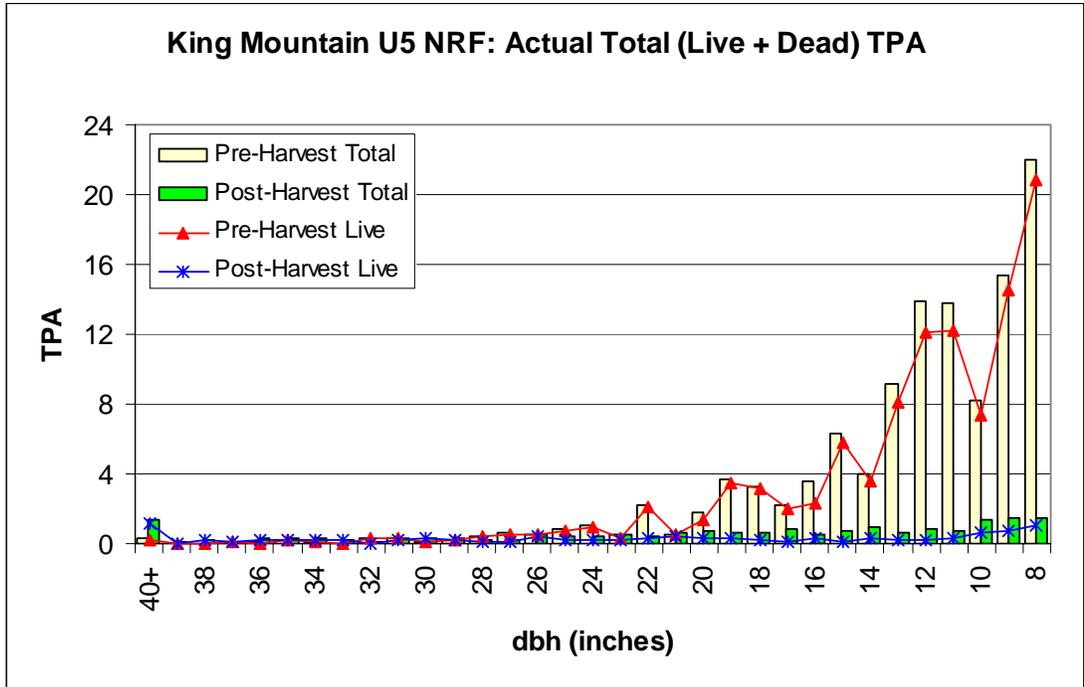


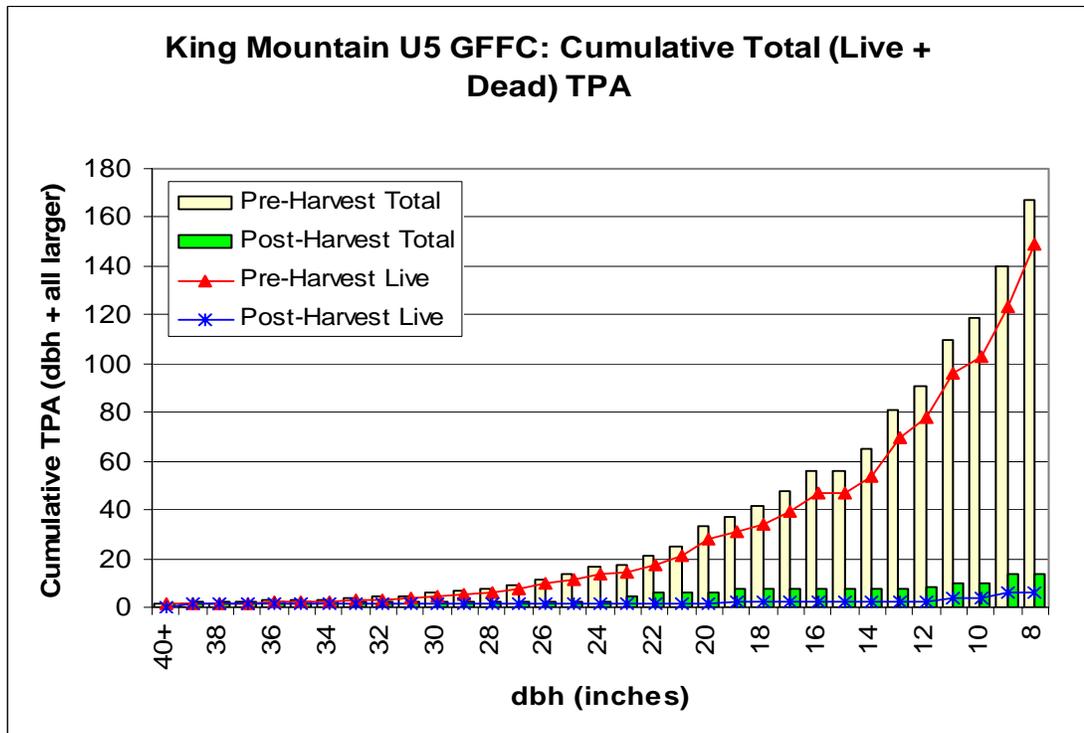
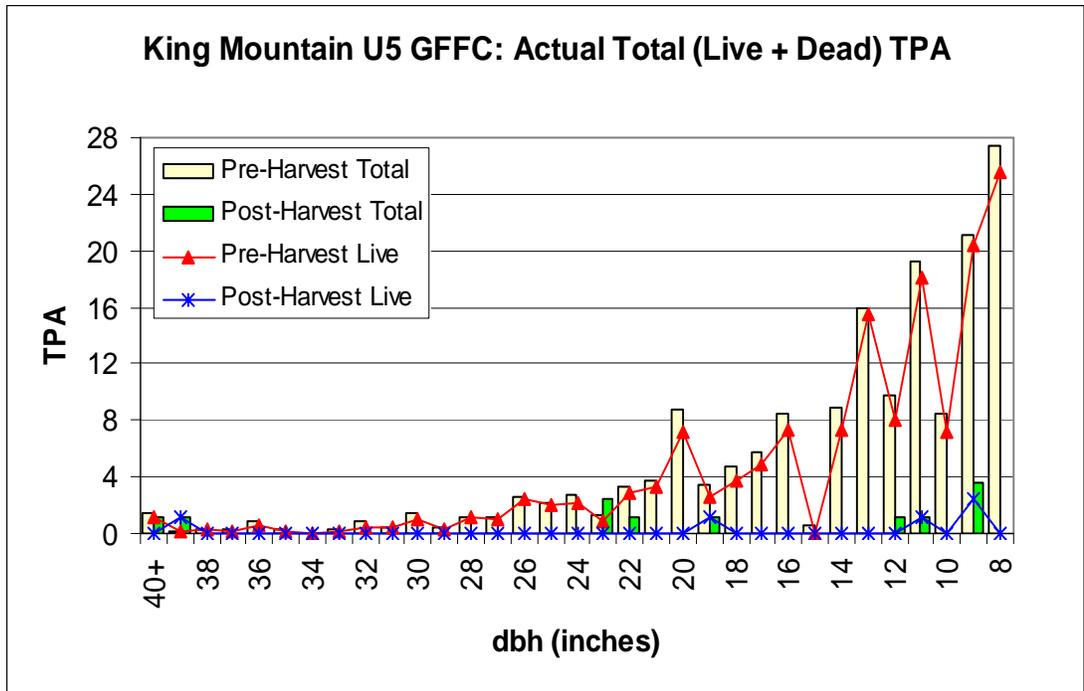
King Mountain U4 SubAF Cryic Warm: Actual Total (Live + Dead) TPA



King Mountain U4 SubAF Cryic Warm: Cumulative Total (Live + Dead) TPA







ONE-TIME REVIEWS

The Klickitat spotted owl amendment includes several requirements for items that only need to be monitored once, including:

- Adjusting the planning unit boundary to exclude the portion north of the Yakama reservation.

-
- Re-designating NRF management areas.
 - Re-designating/renaming dispersal management areas to DFC.
 - Creating owl nest site plans for unoccupied and occupied sites.

The team checked all of these items, and found that all had been accomplished and were fully compliant with the requirements of HCP Amendment No. 1.

Observations and Recommendations

In the Klickitat Planning Unit, lack of clear monitoring criteria, combined with forest health issues, made it impossible to determine strategy compliance. In nearly all sale units, more than the required number of trees per acre were left; these may or may not have been from the largest diameter classes. Due to the continuing high mortality in such sales, leaving more than the minimum number of healthy trees whenever possible will increase the chances of maintaining living legacy trees. Those trees that do not survive may still contribute to habitat by providing snags and large down woody debris.

For future monitoring of legacy trees, the team plans to take pre-harvest measurements. This will also be useful when determining habitat suitability while monitoring activities in NRF or DFC management areas that necessitate leaving suitable sub-mature or suitable young-forest habitats. Collecting both pre- and post-harvest data will allow the team to make a better correlation regarding tree species and diameters and habitat suitability in the post-harvest stands. Using ten-year-old inventory data in stands with high mortality is not adequate for determining strategy compliance.

Although the team looked at stand composition on a timber sale unit basis, such analyses will likely not be done the same way in the future. Instead, the team will analyze stand composition on a sub-landscape basis to verify that appropriate levels of the habitat types are being left. This will allow the team to assess habitat compliance on a larger scale. It will also consider older stands that have had a chance to develop into desired conditions, rather than recently harvested stands that are still developing.

Based on the team's experiences and findings, as well as feedback from other agency staff, the team is currently working to modify the monitoring protocol. One area of particular interest is finding a sampling technique and intensity that allows agency staff to collect the most data using the fewest resources. This will be particularly important when monitoring stands that currently are or must retain suitable spotted owl habitat, and thus require the collection of more data (on, e.g., snags, down wood, and canopy closure). A study is being done to compare sampling techniques (fixed radius plot vs. high-intensity variable radius plots) to determine which gives the best pre-and post-harvest information. In addition, the team will work with agency inventory staff to refine the team's definitions of live and dead trees and collect data in a manner consistent with inventory data. This will allow the inventory staff to use more recent data from the monitored stands, which can be used to refine modeling and other processes.

Appendix 3A – Office Review Form for the Northern Spotted Owl Strategy in the Klickitat Planning Unit

Timber Sale Name _____ Timber Sale Units _____

TS Agreement ID _____ Office Reviewed by _____

Sub-landscape _____ Field Reviewed by _____

1. NRF Management Area? Yes _____ No _____ NRF Threshold % _____

NRF Total Acres _____ NRF Threshold Acres _____

NRF Actual Acres _____ Surplus/Deficit Acres _____

If the activity is in a NRF management area (#1 above checked yes) complete the following:

- a. Is the activity in suitable NRF habitat? _____ Yes _____ No
- b. Is there documentation that this activity does not put the sub-landscape over the 5% harvest threshold of suitable NRF habitat for the appropriate 2-year time period? _____ Yes _____ No _____ N/A
- c. Is the intent of the activity to _____ create or _____ maintain NRF habitat?
- d. Is the sub-landscape above or below the threshold for NRF? (50% in Trout Lake and Glenwood, 33% in Husum) _____ Above (go to e) _____ Below (must meet NRF habitat definition post harvest – use form...)
- e. Is the activity a regeneration harvest _____ Yes (legacy trees - use form...) _____ No

How does this activity promote or maintain the habitat threshold? _____

Husum Sub-Landscape Only (Near-NRF non-binding commitment)

Near-NRF Threshold% 33%

Landscape NRF Acres 26,104 Near-NRF Threshold Acres 8701

Near-NRF Actual Acres _____ Surplus/Deficit Acres _____

How does this activity promote or maintain the habitat threshold? _____

2. DFC Management Area? Yes ____ No ____ DFC Threshold % _____

| Veg. Series | Total Acres | Threshold Acres | Actual Acres | Surplus+/-/Deficit-Acres |
|-------------------------|-------------|-----------------|--------------|--------------------------|
| Ponderosa Pine Frost | | | | |
| D.-Fir (frigid-warm) | | | | |
| G. Fir (frigid-warm) | | | | |
| G. Fir (frigid-cool) | | | | |
| G. Fir (frigid-cold) | | | | |
| SAF (cryic-warm) | | | | |
| Whitebark Pine/Mountain | | | | |

If the activity is in a DFC management area (including PPDFC) (#2 above checked yes) complete the following:

- a) Is the activity in suitable DFC habitat? ____ Yes ____ No
- b) Is the intent of the activity to ____ create or ____ maintain DFC habitat?
- c) Is the sub-landscape above or below the threshold for DFC? (50% for Trout Lake Glenwood, and Klickitat) ____ Above (go to d) ____ Below (must meet habitat threshold, use form...)
- d) Is the activity a regeneration harvest? ____ Yes (legacy tree requirements, use form...) ____ No

How does this activity promote or maintain the habitat threshold? _____

3. Harvest Type _____

4. Owl circles:

Name _____

Site# _____

Status (occupied/unoccupied) _____

Activity planned in consultation with USFWS? ____ Yes ____ No

How documented? _____

Name _____

Site# _____

Status (occupied/unoccupied)_____

Activity planned in consultation with USFWS? _____ Yes _____ No

How documented? _____

Name _____

Site# _____

Status (occupied/unoccupied)_____

Activity planned in consultation with USFWS? _____ Yes _____ No

How documented? _____

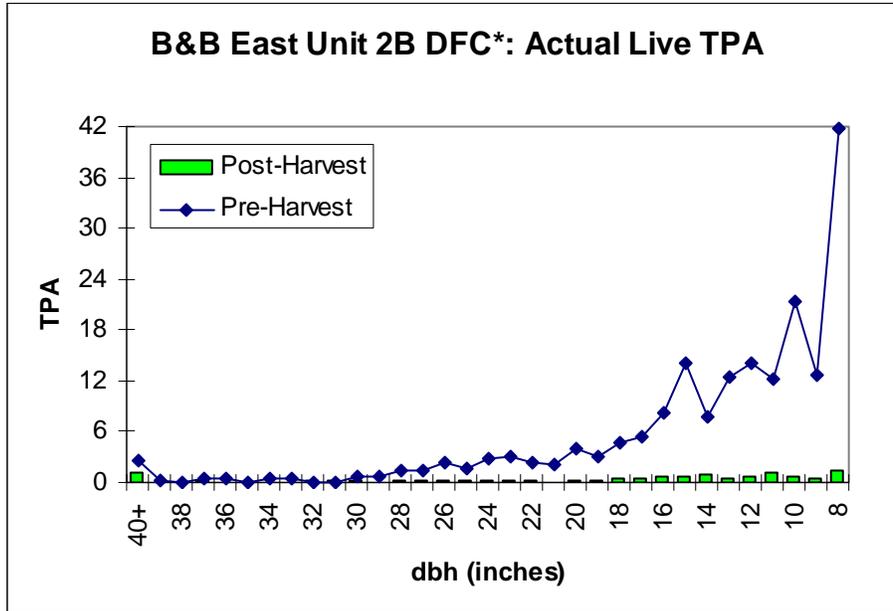
5. Were all owl nest site plan requirements documented and followed? _____ Yes
_____ No _____ N/A

Explain _____

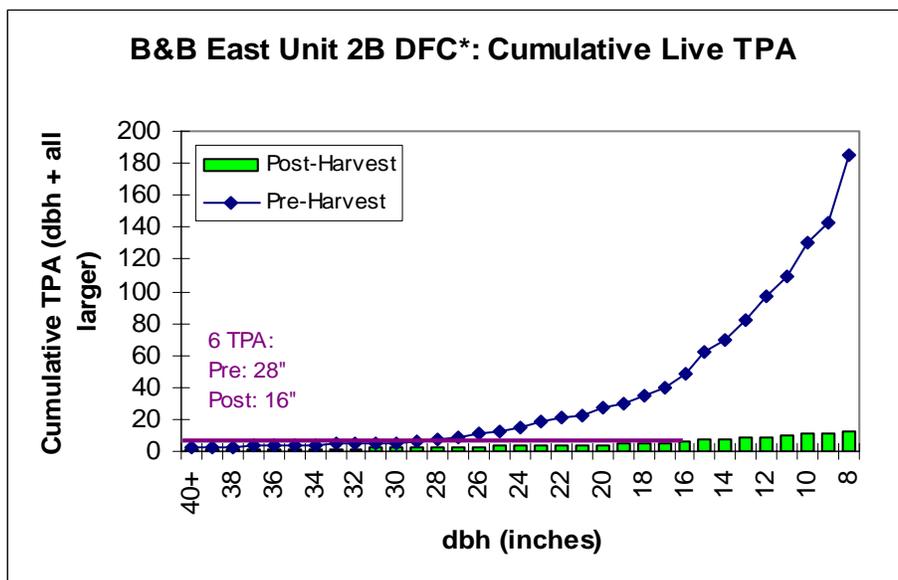
6. Were timing restrictions documented and followed? _____ Yes _____ No
_____ N/A

Explain _____

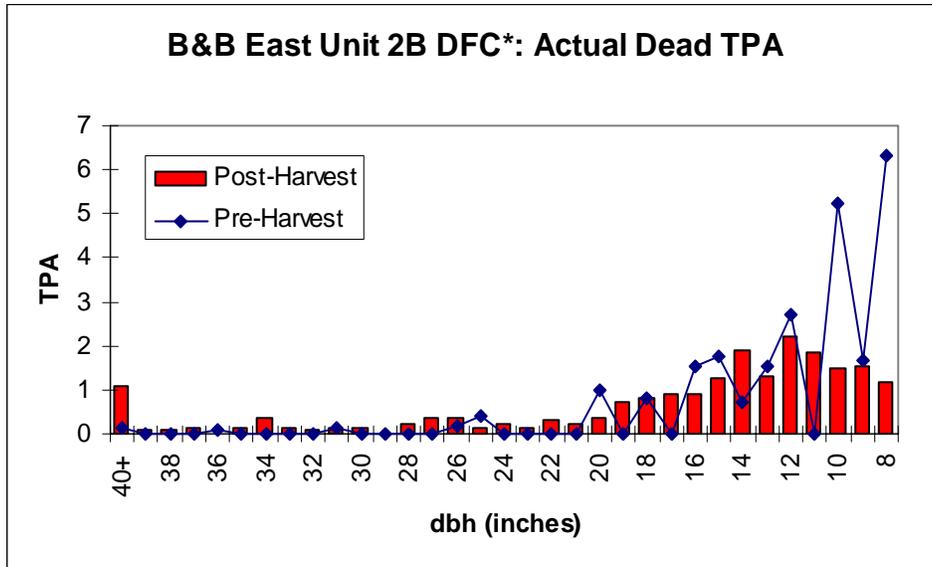
Appendix 3B. Graphs Showing Actual and Cumulative Live and Dead Trees Per Acre (TPA) for Each Monitored Harvest Unit



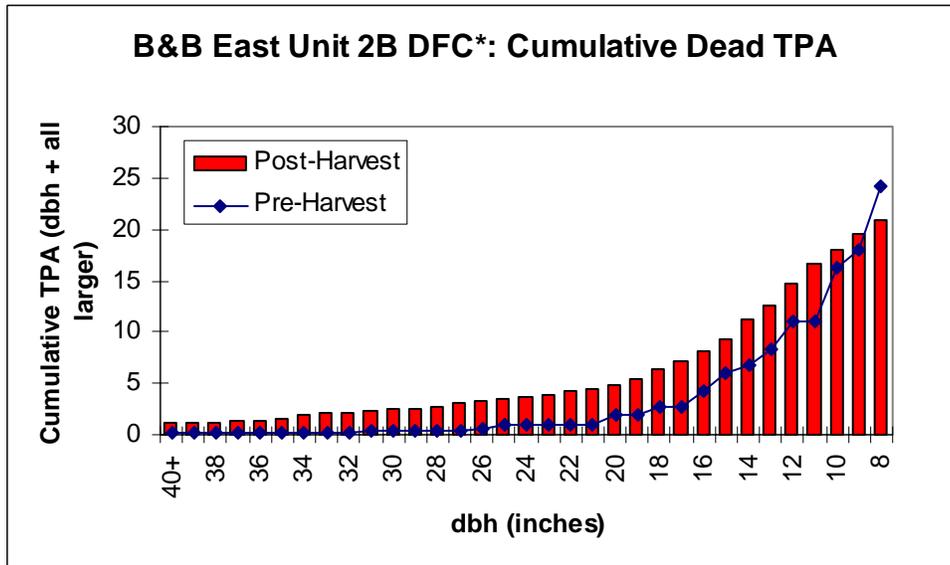
*Due to a data collection error, no distinction was made between the two DFC vegetation series when gathering post-harvest data for this unit.



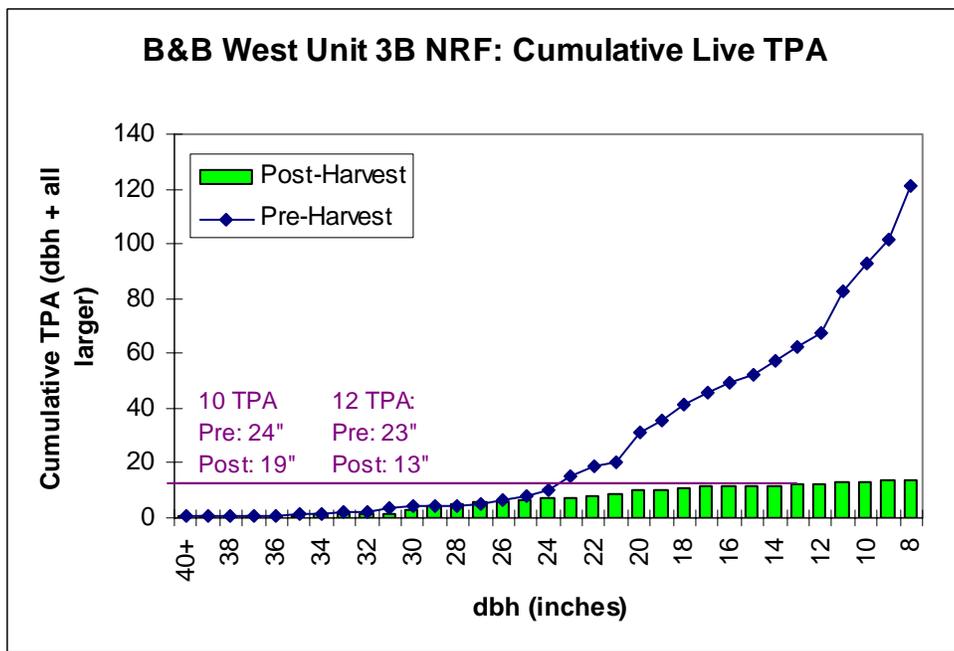
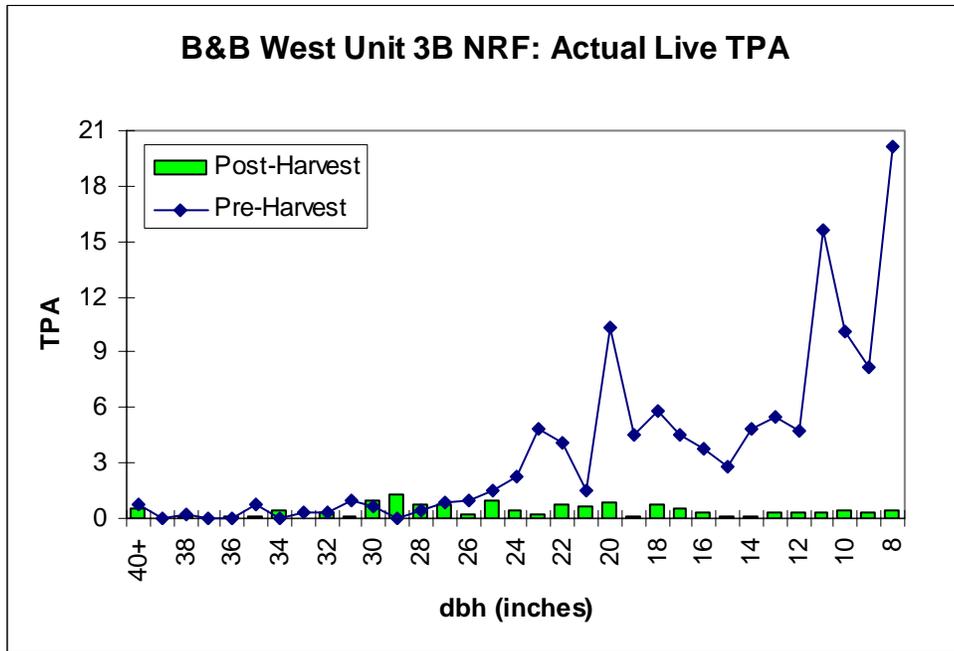
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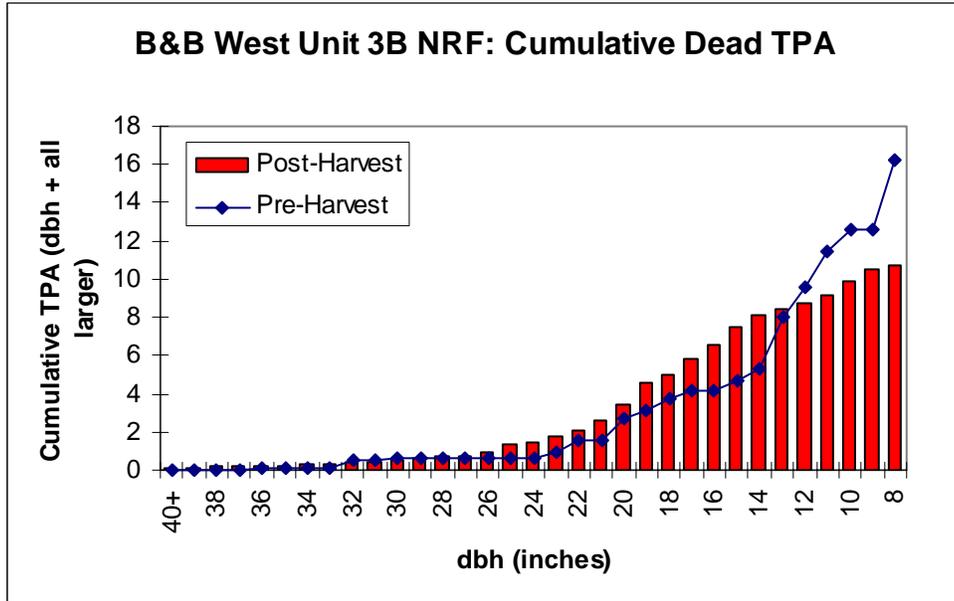
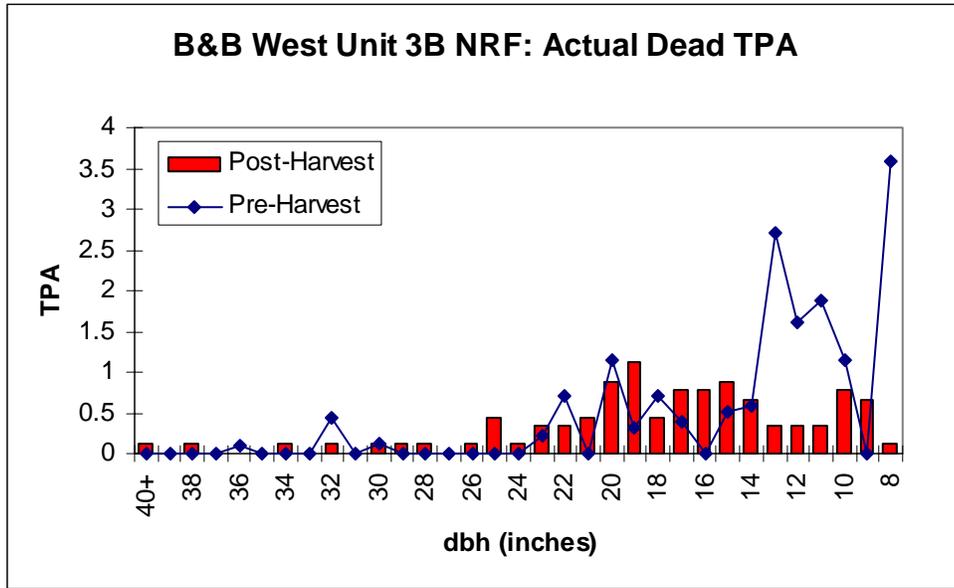


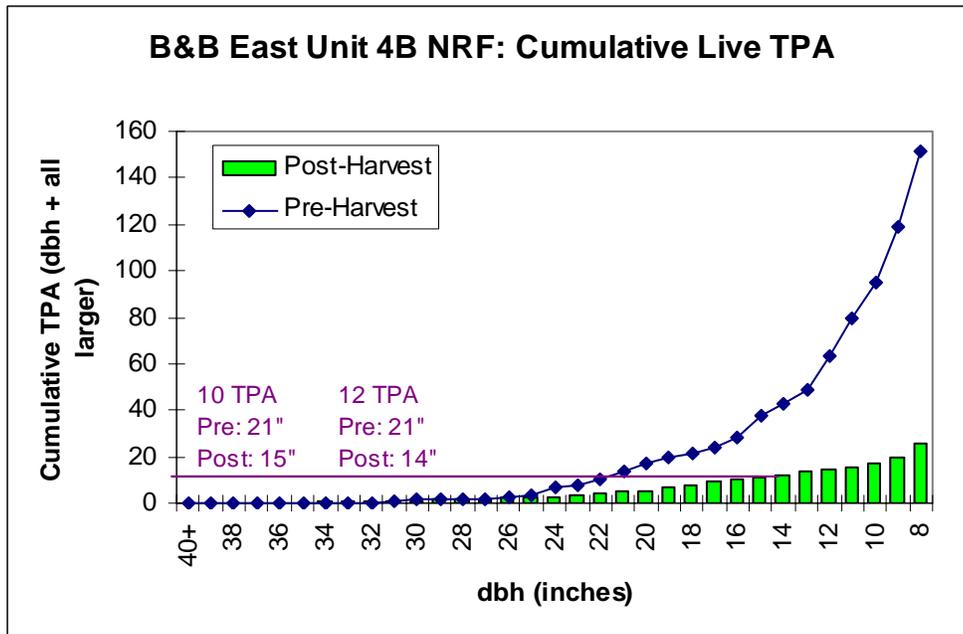
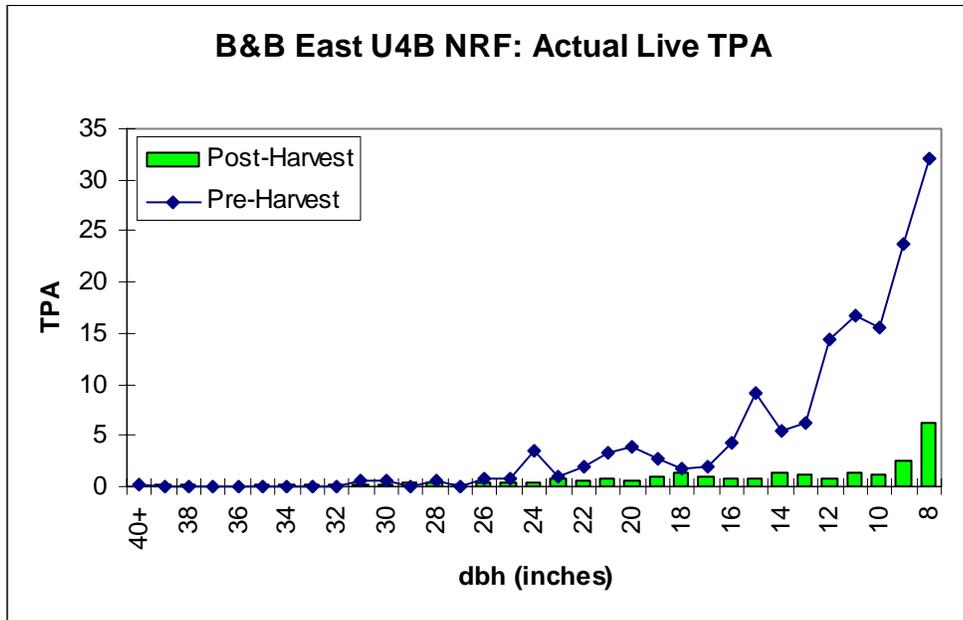
*Due to a data collection error, no distinction was made between the two DFC vegetation series when gathering post-harvest data for this unit.

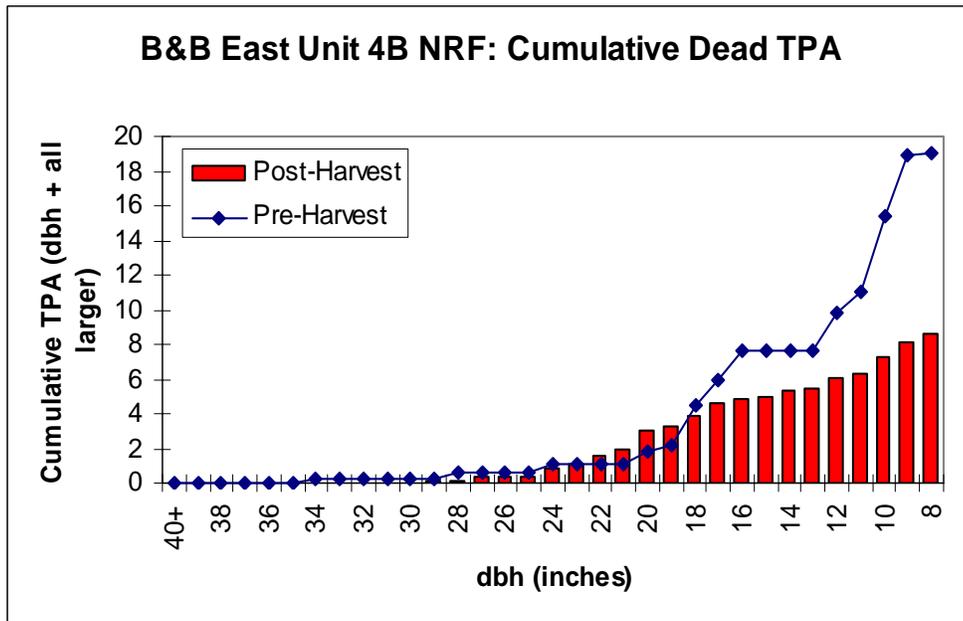
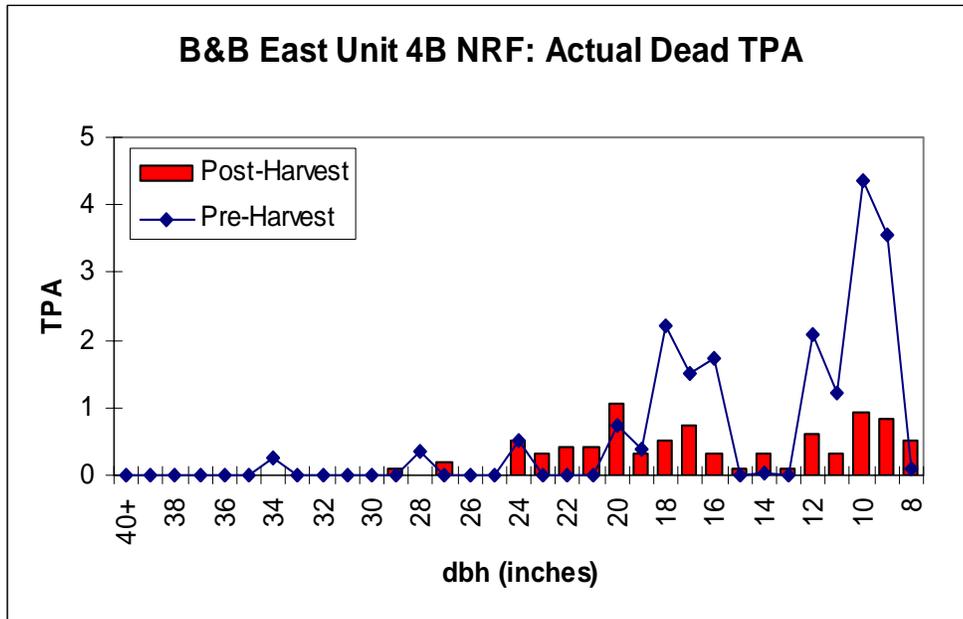


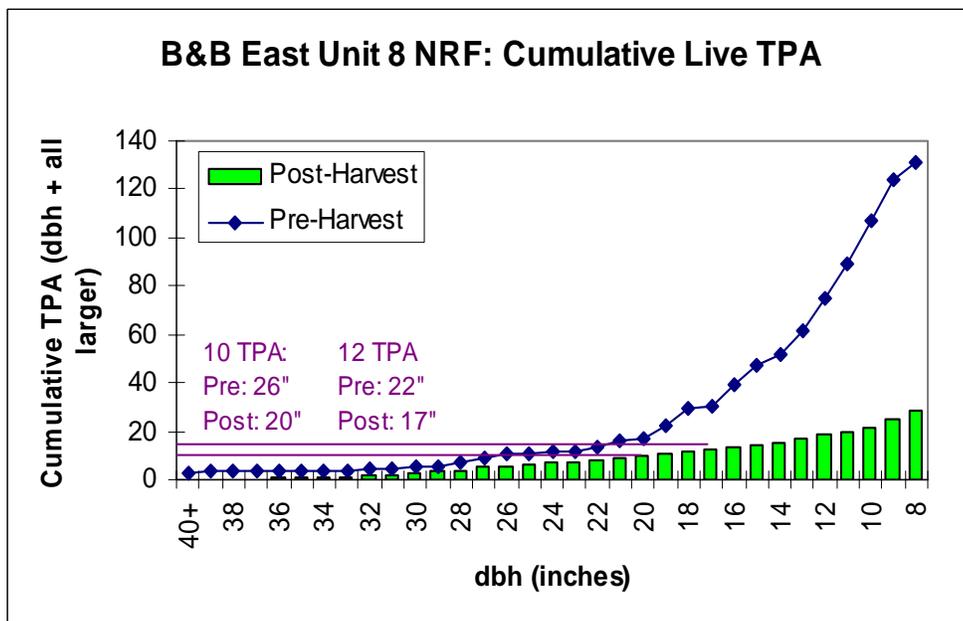
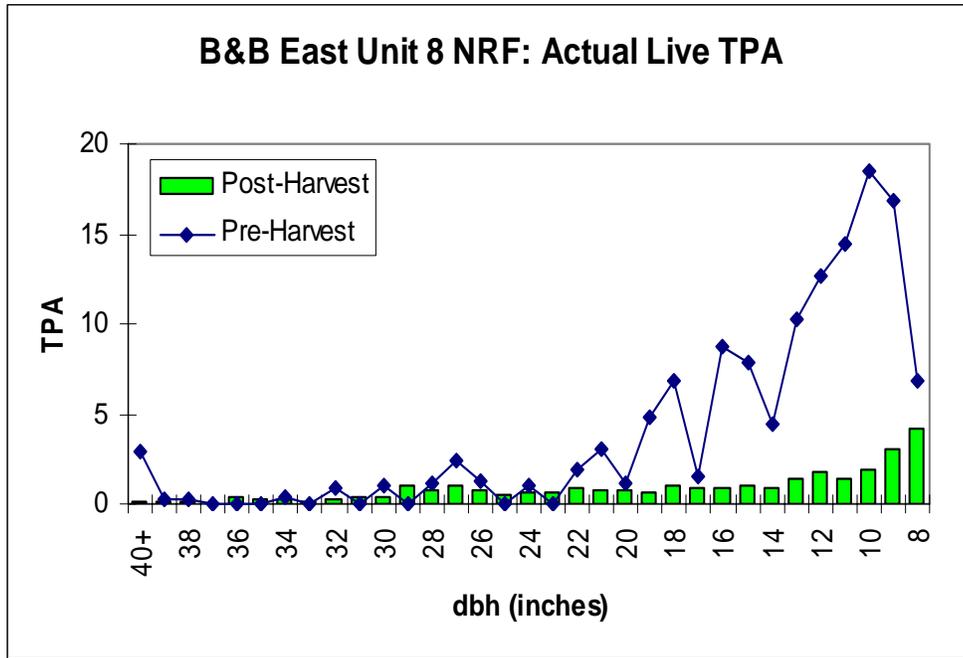
*Due to a data collection error, no distinction was made between the two DFC vegetation series when gathering post-harvest data for this unit.

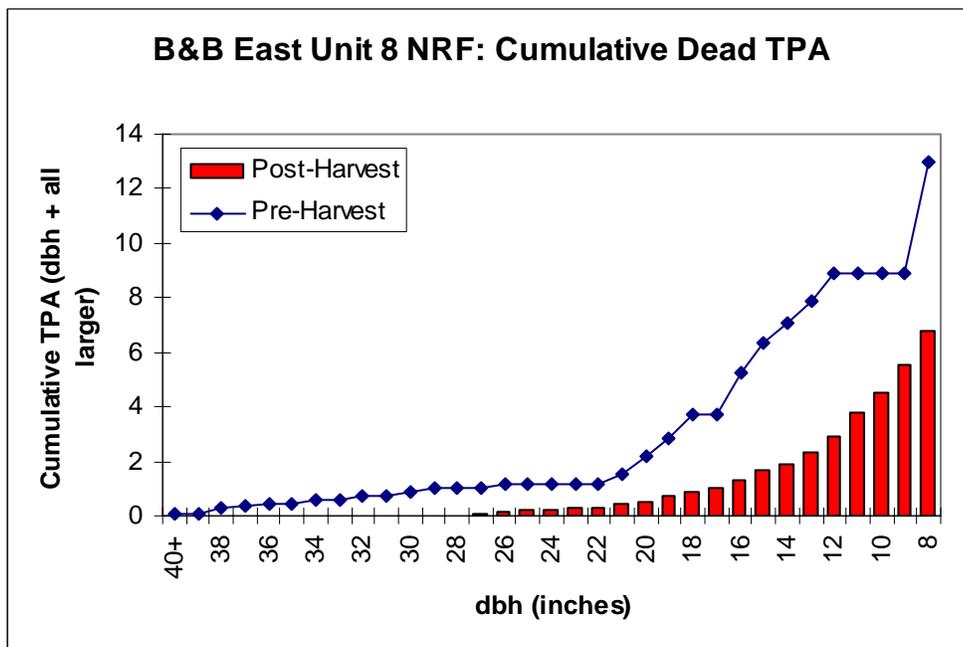
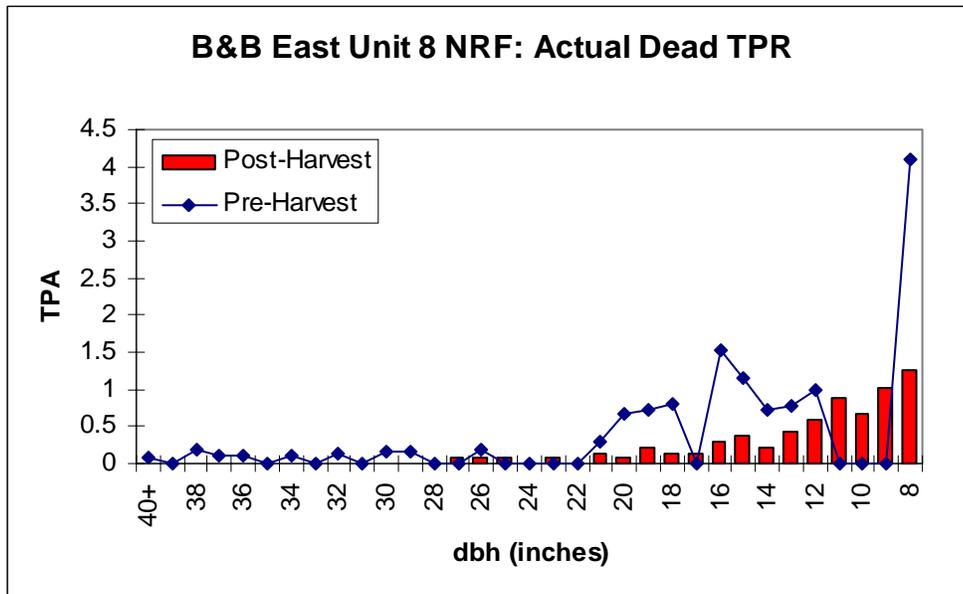


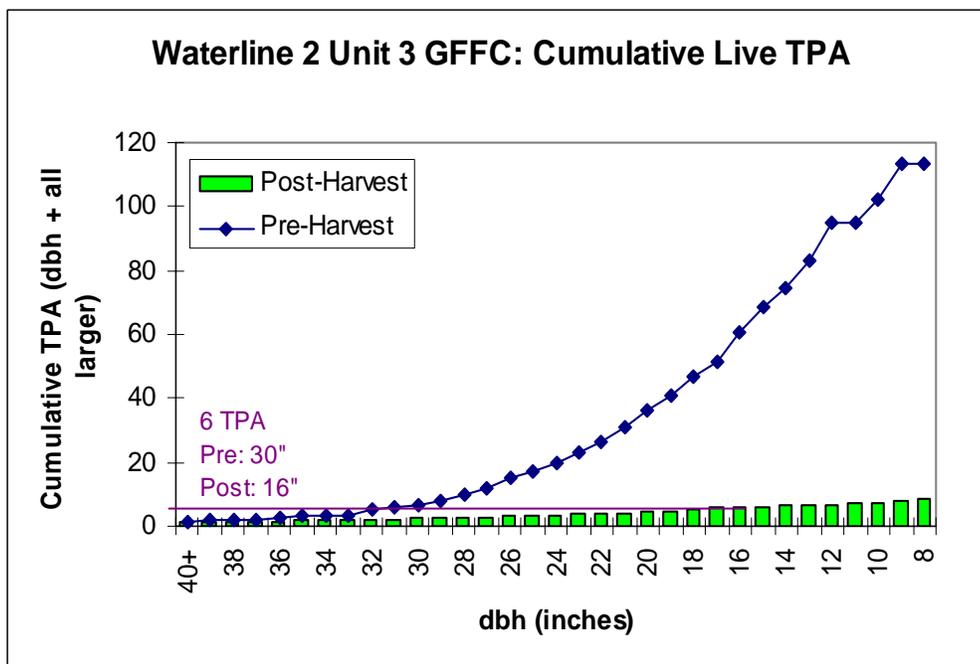
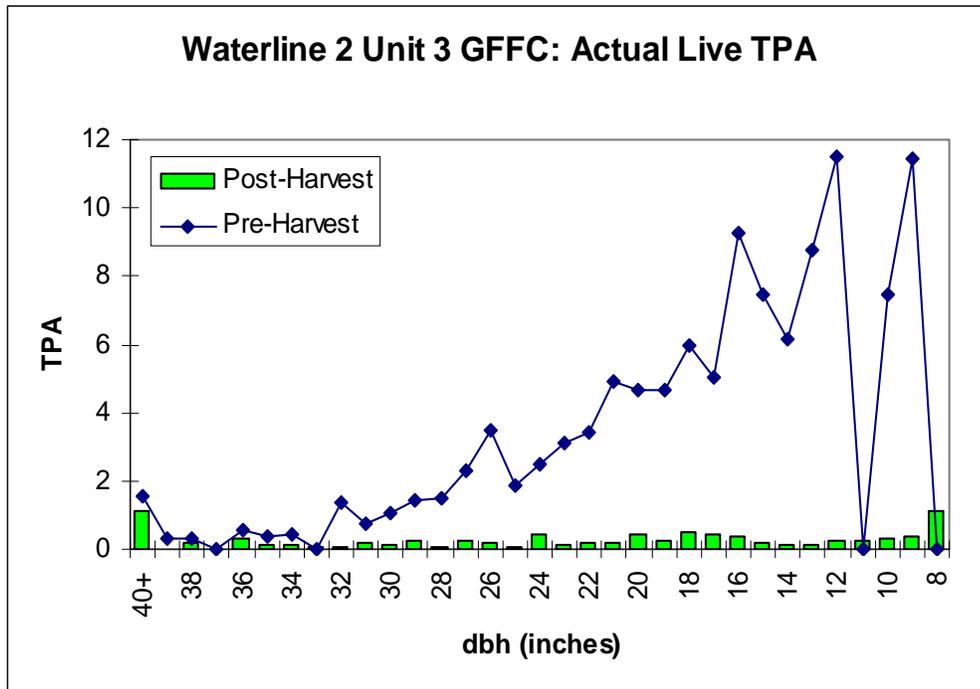


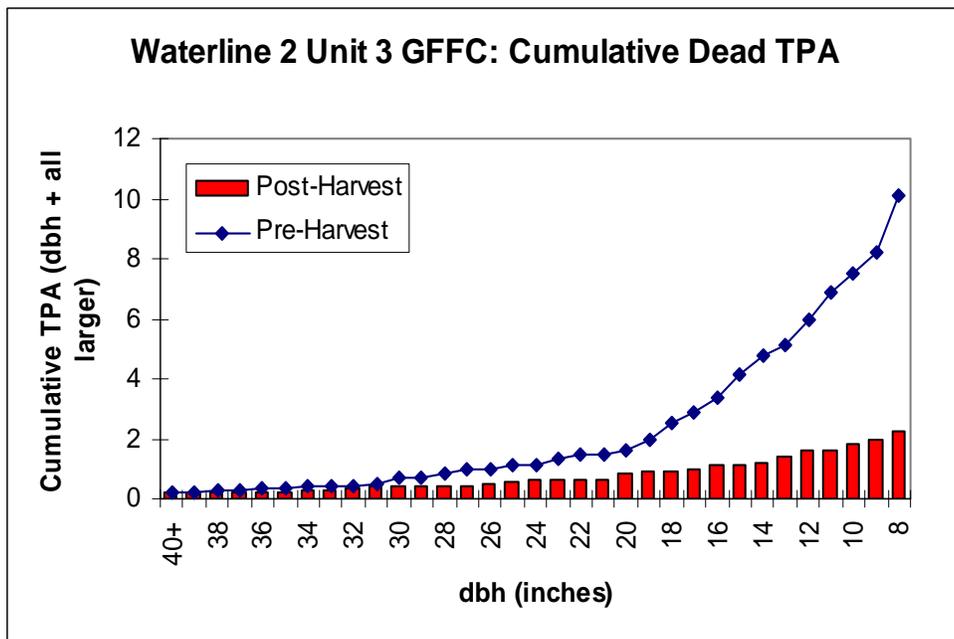
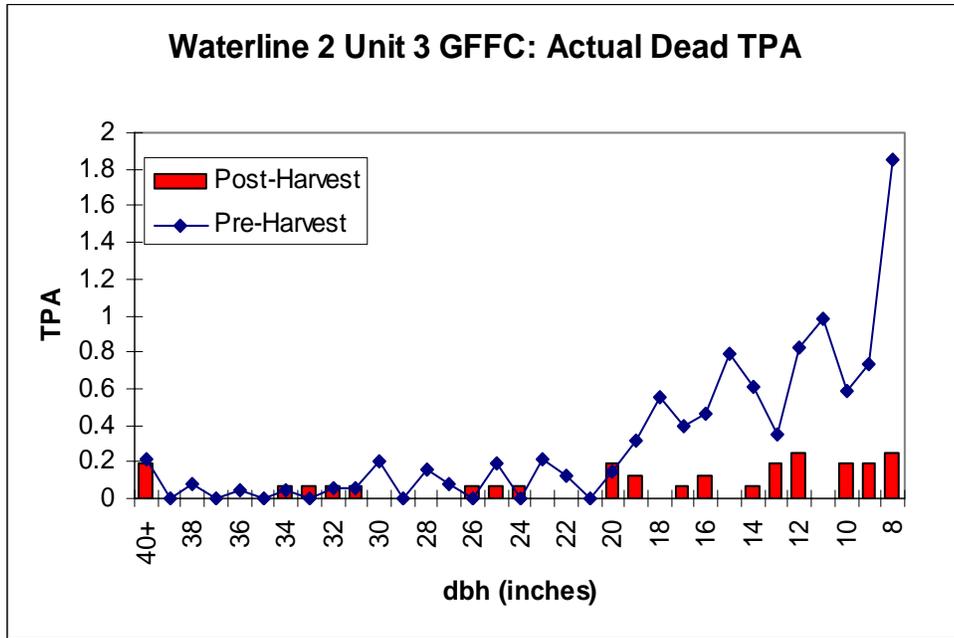


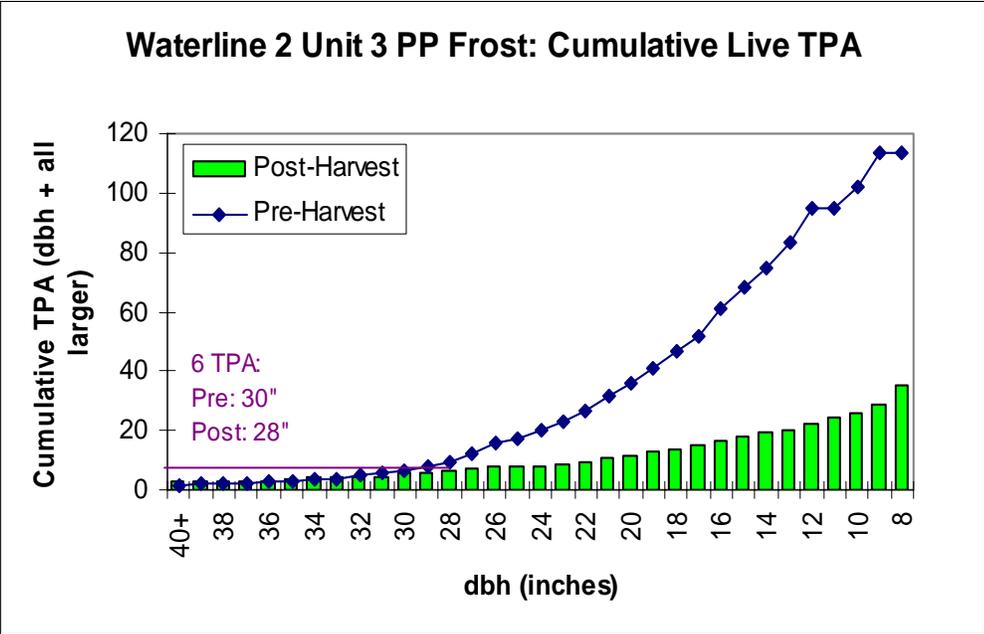
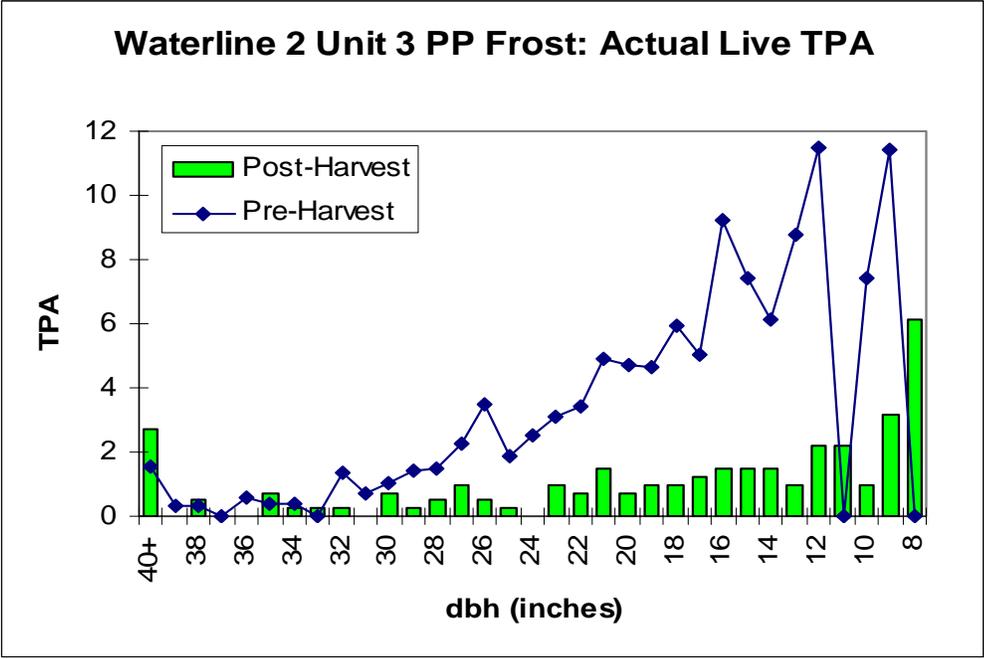




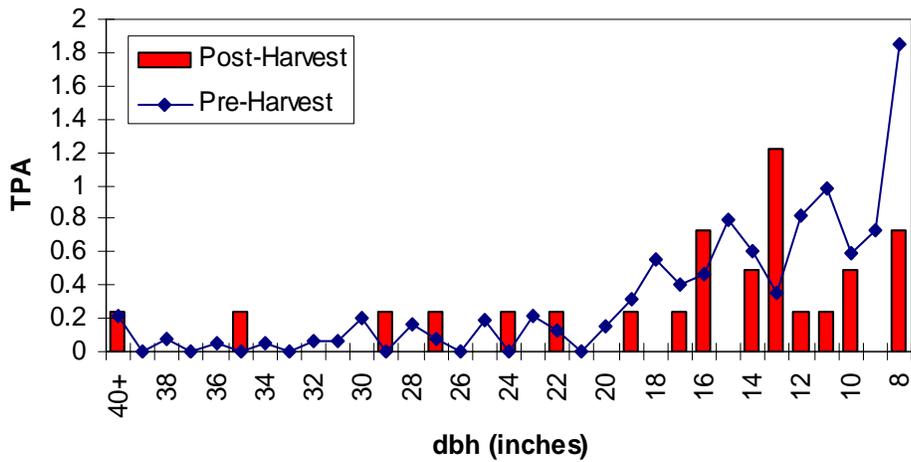




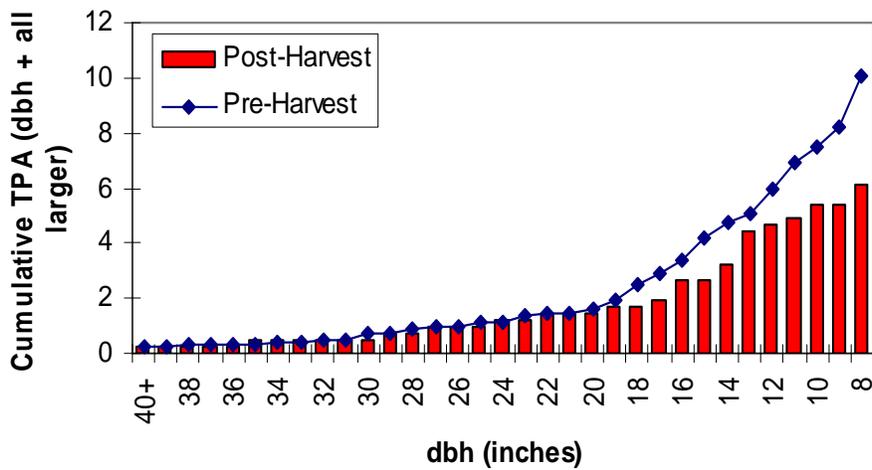


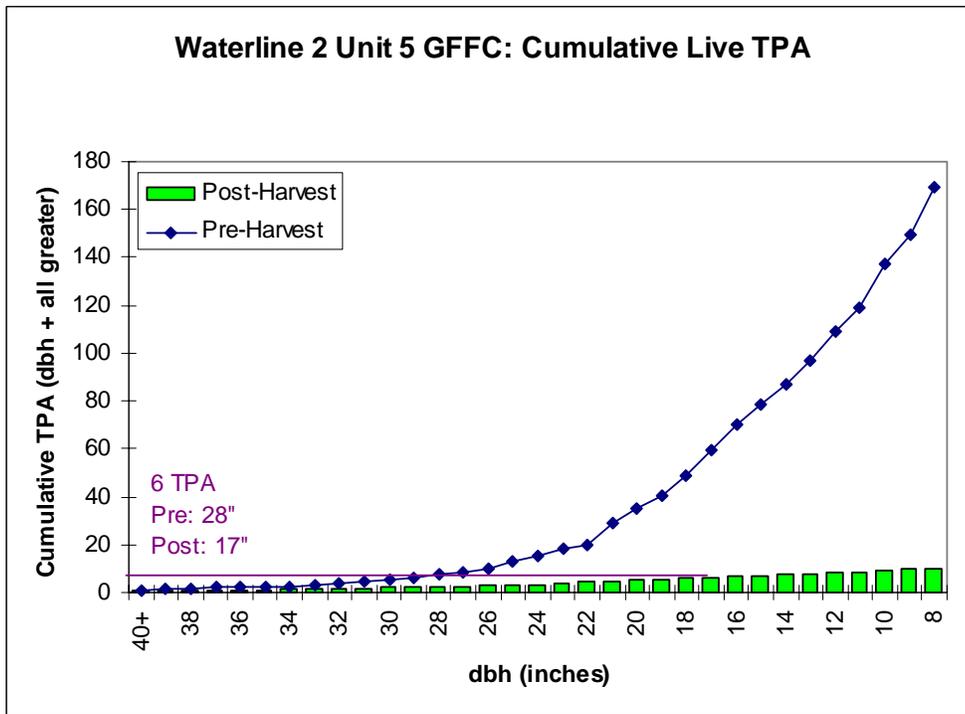
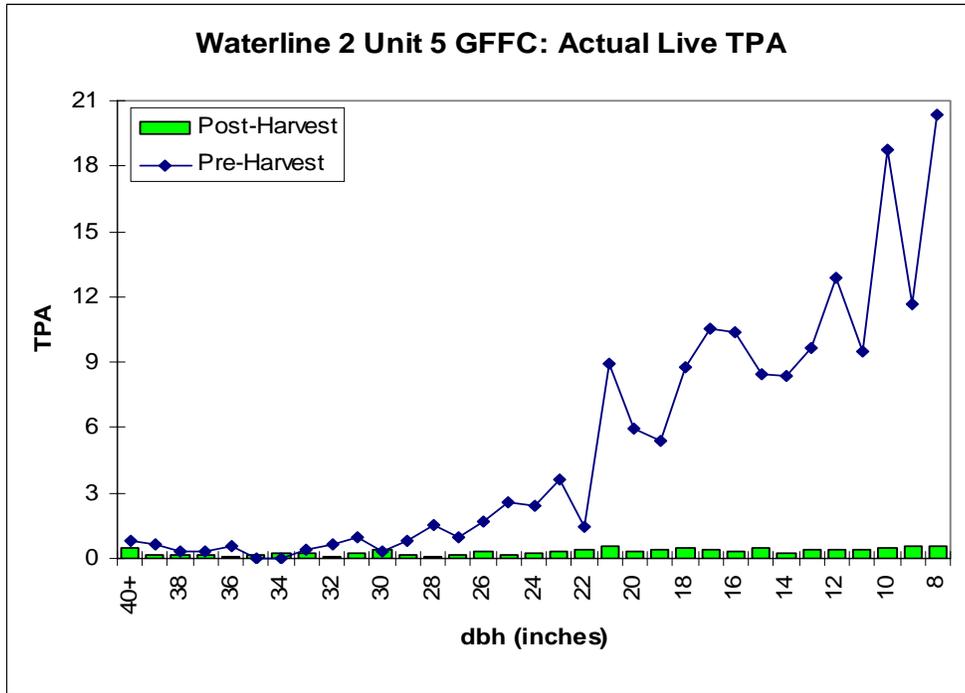


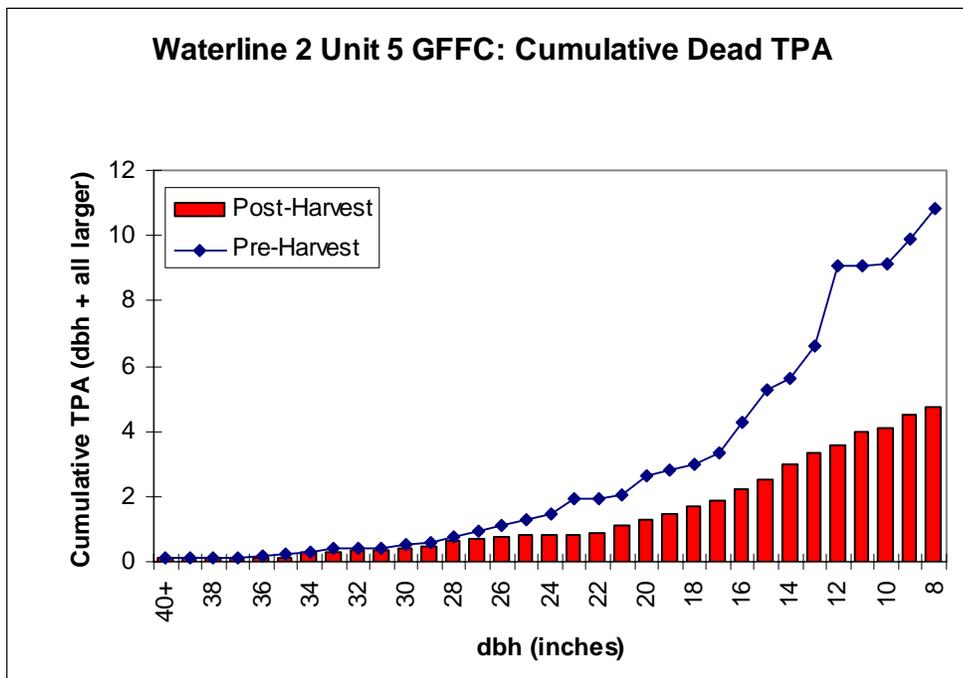
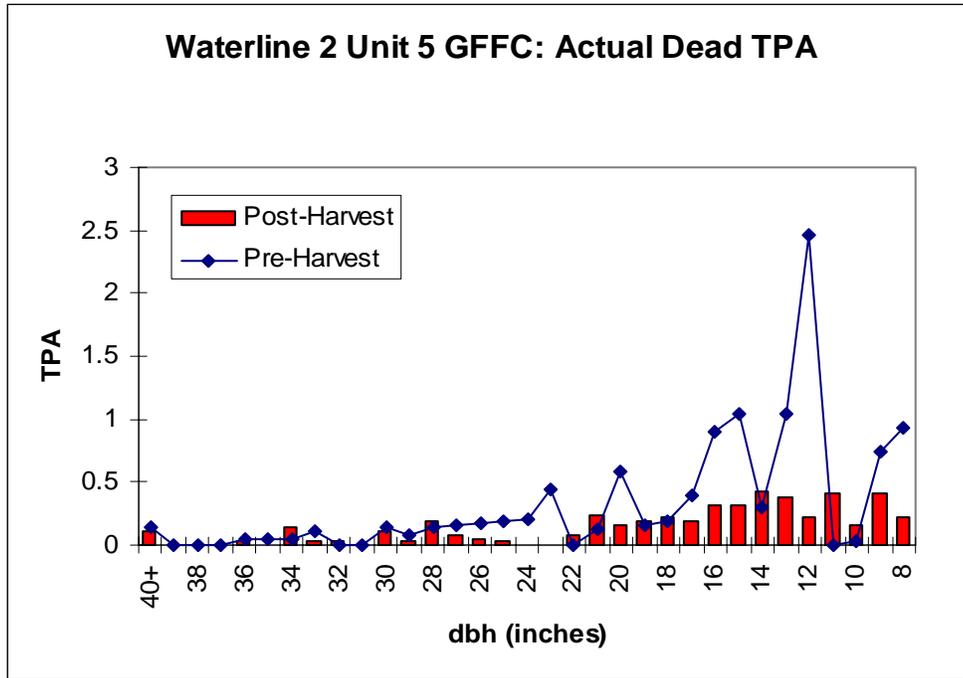
Waterline 2 Unit 3 PP Frost: Actual Dead TPA

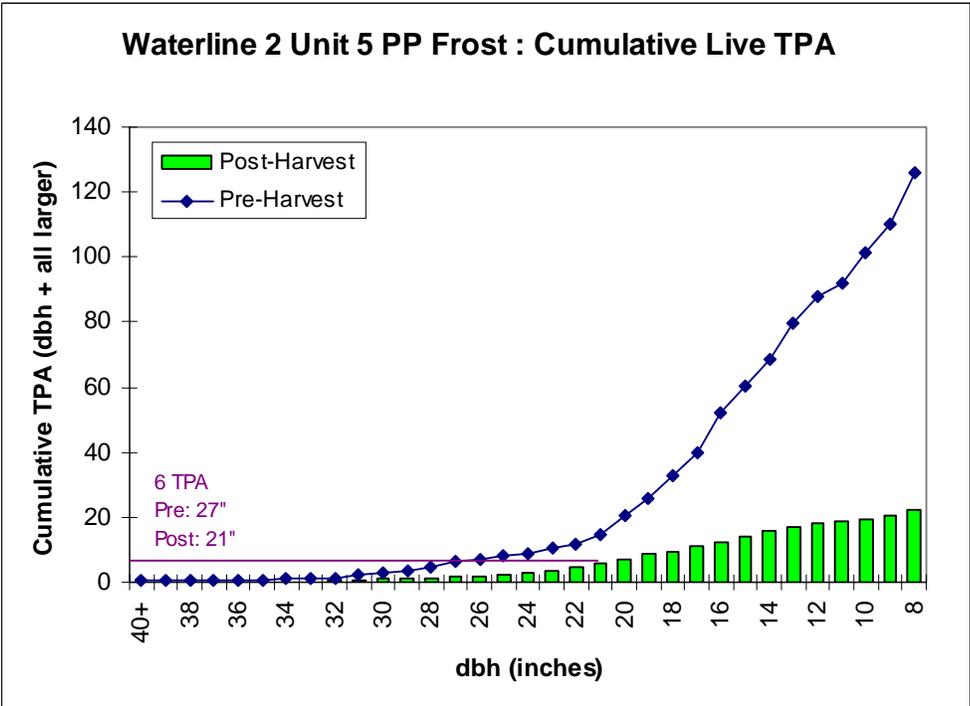
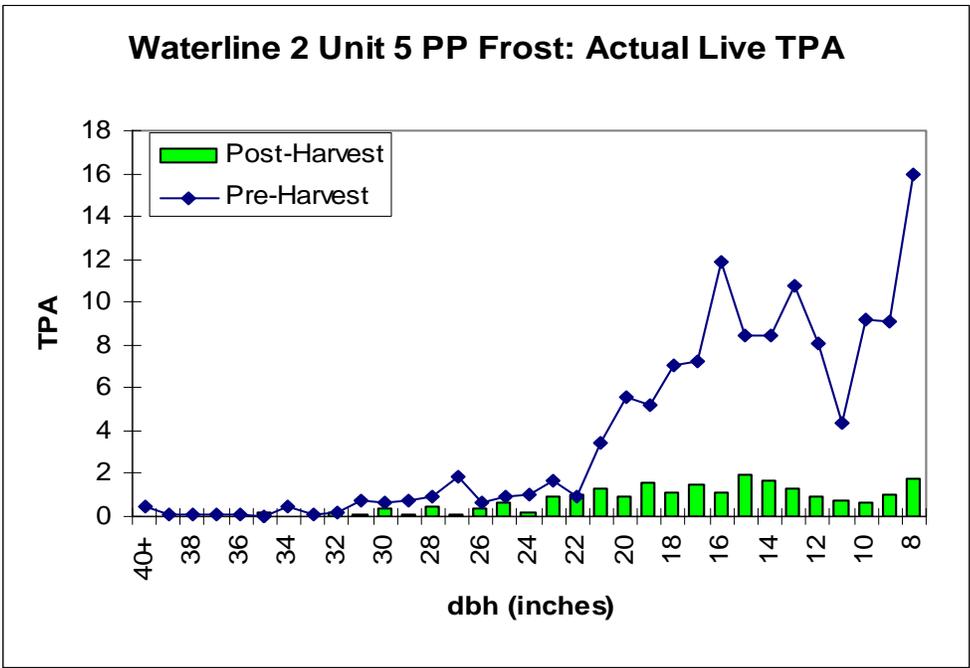


Waterline 2 Unit 3 PP Frost: Cumulative Dead TPA

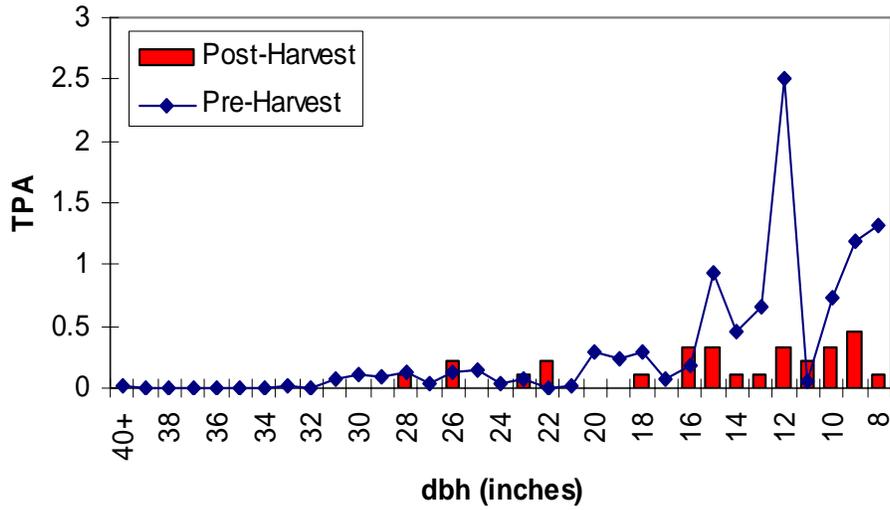




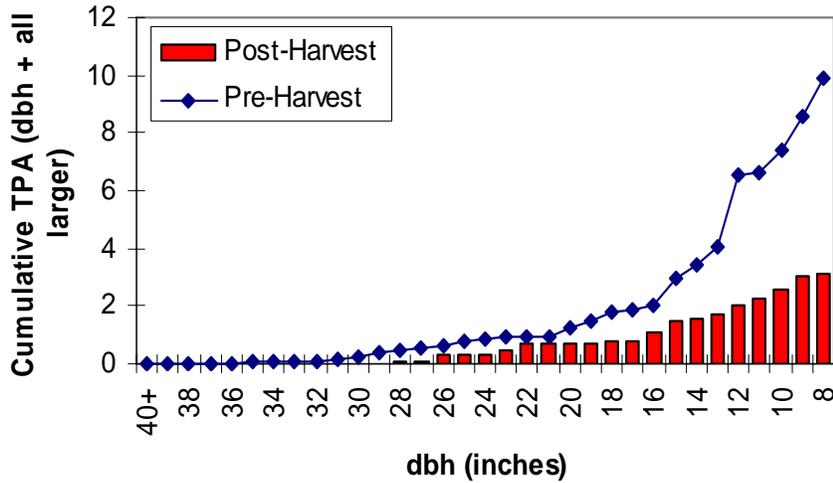


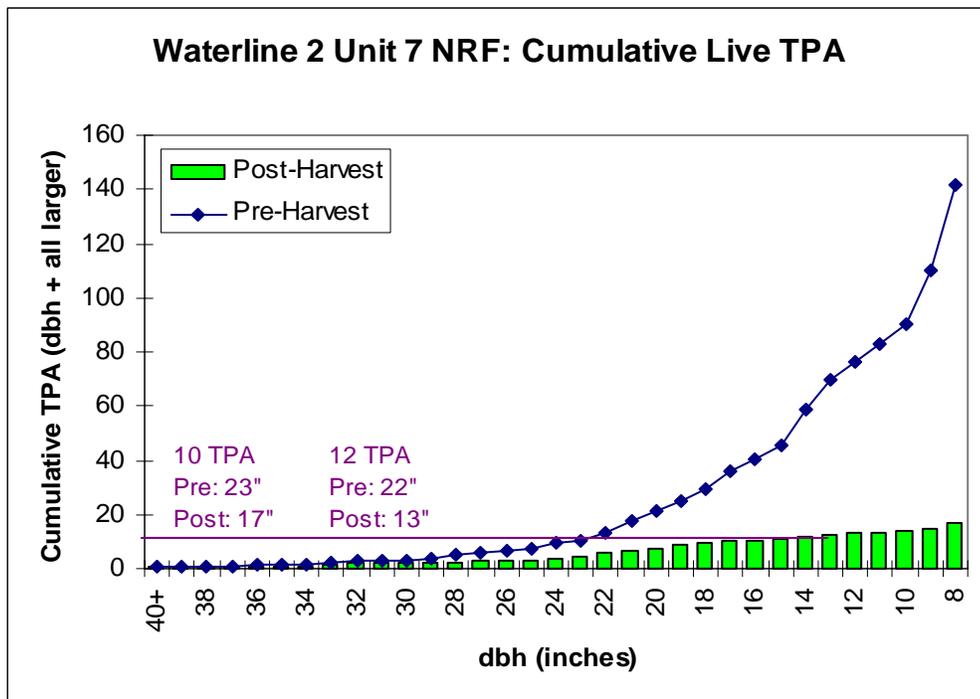
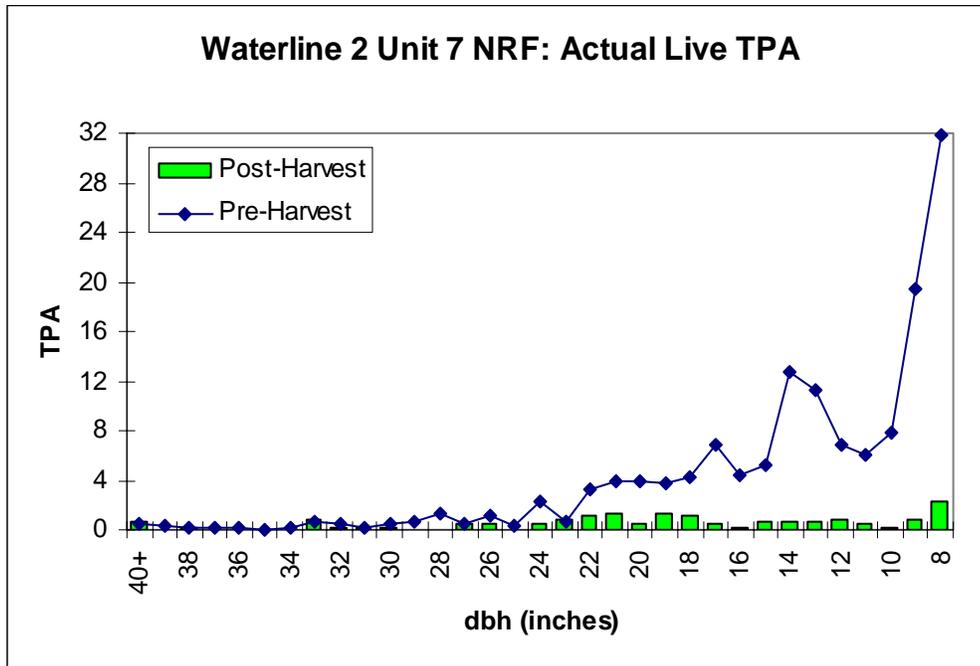


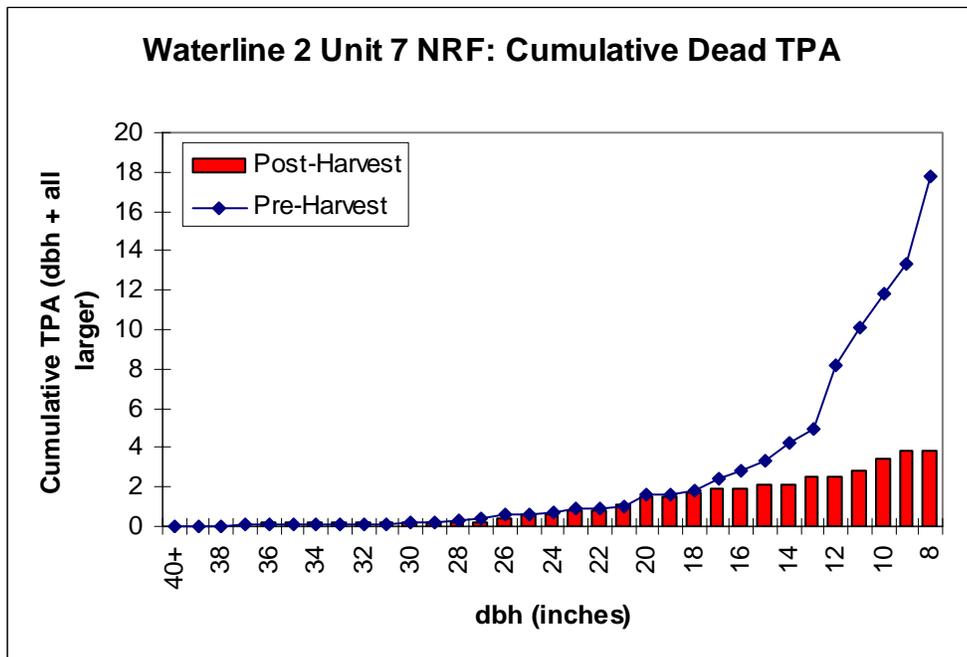
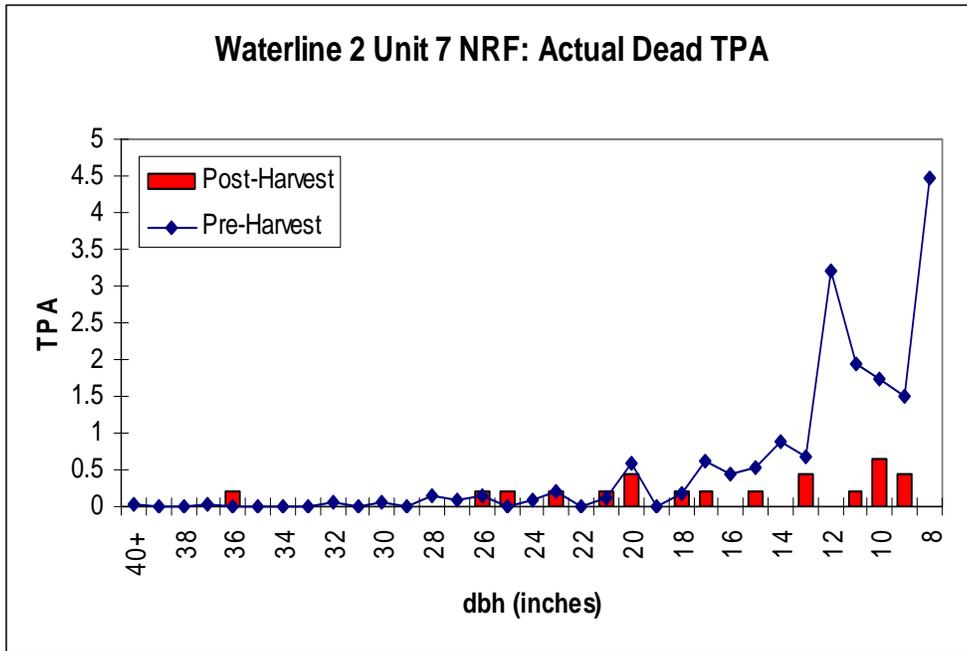
Waterline 2 Unit 5 PP Frost: Actual Dead TPA

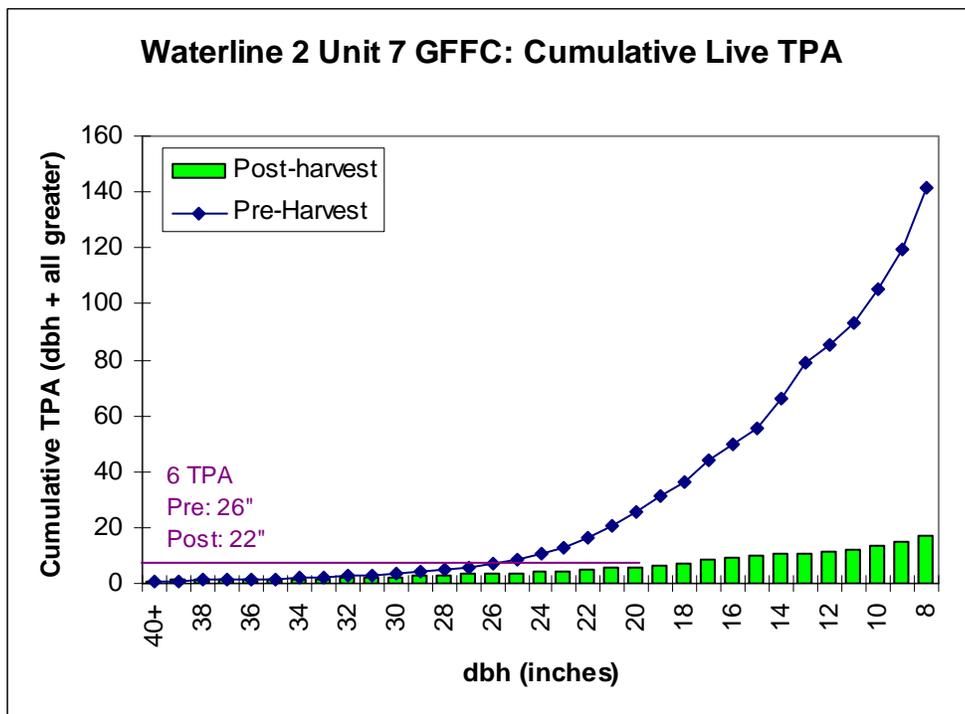
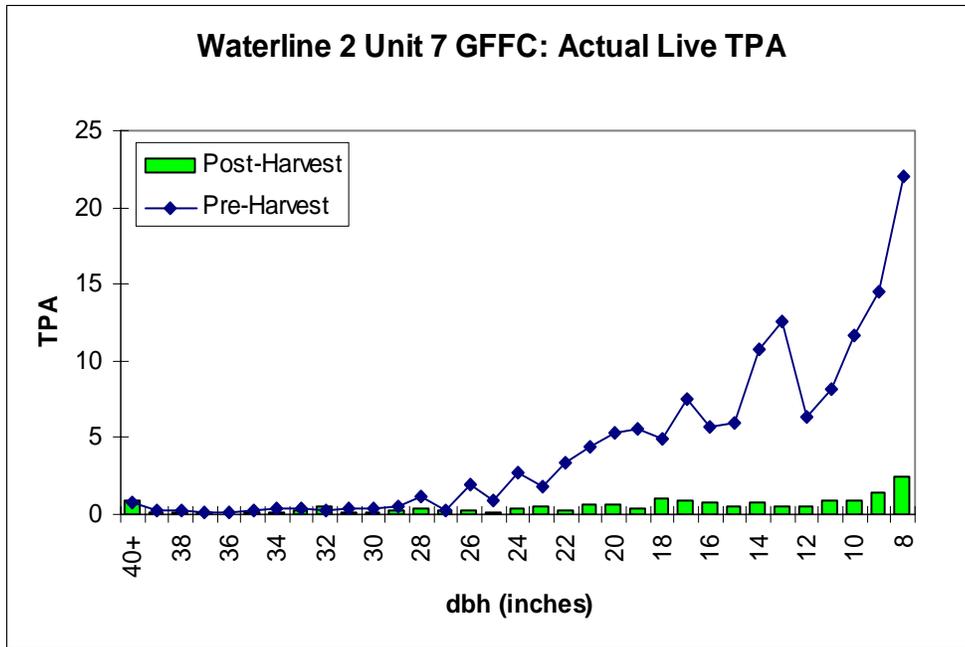


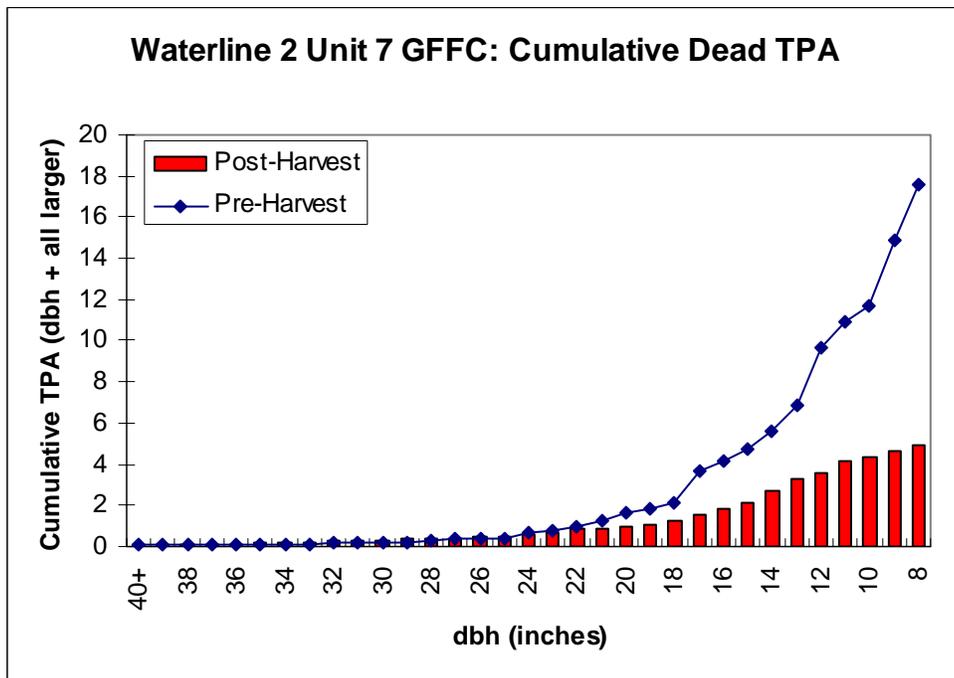
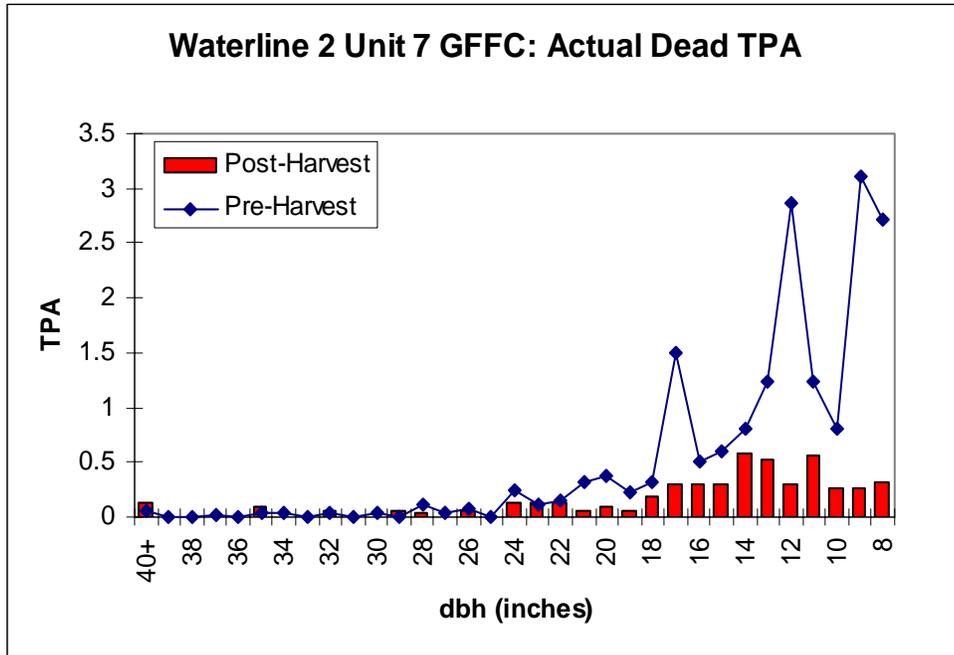
Waterline 2 Unit 5 PP Frost: Cumulative Dead TPA

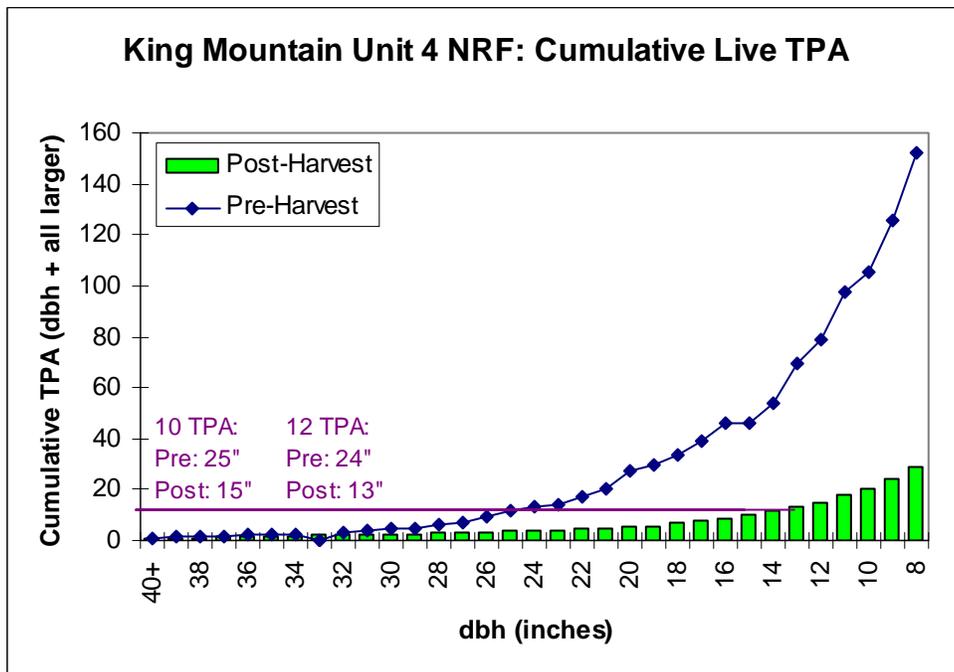
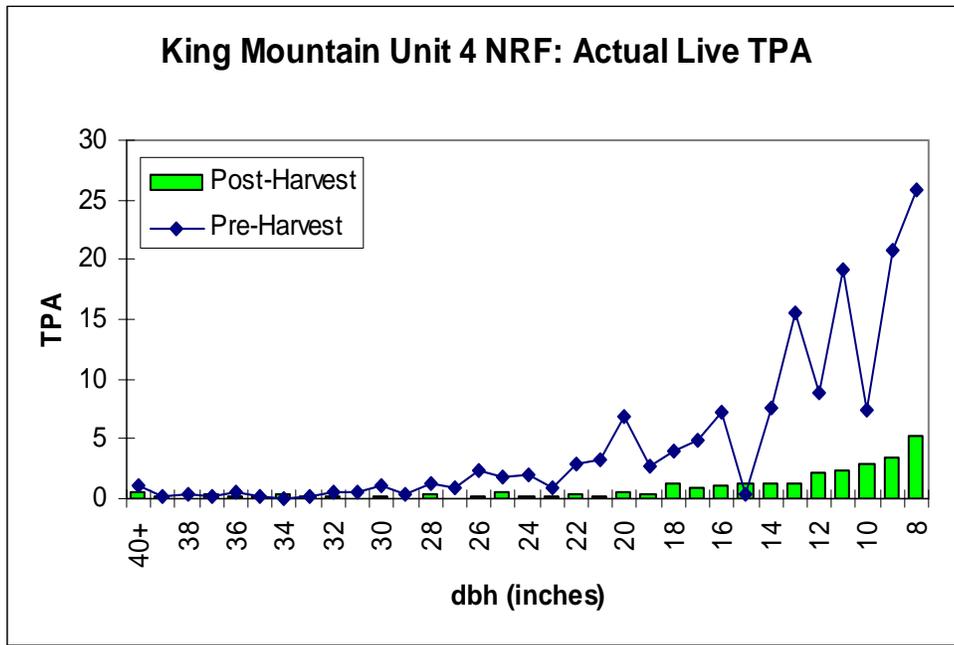


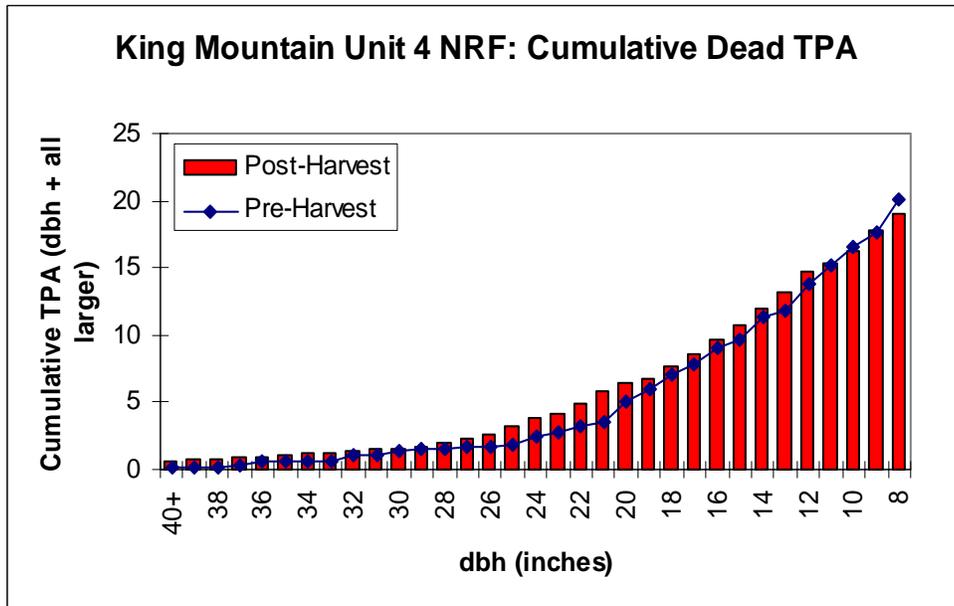
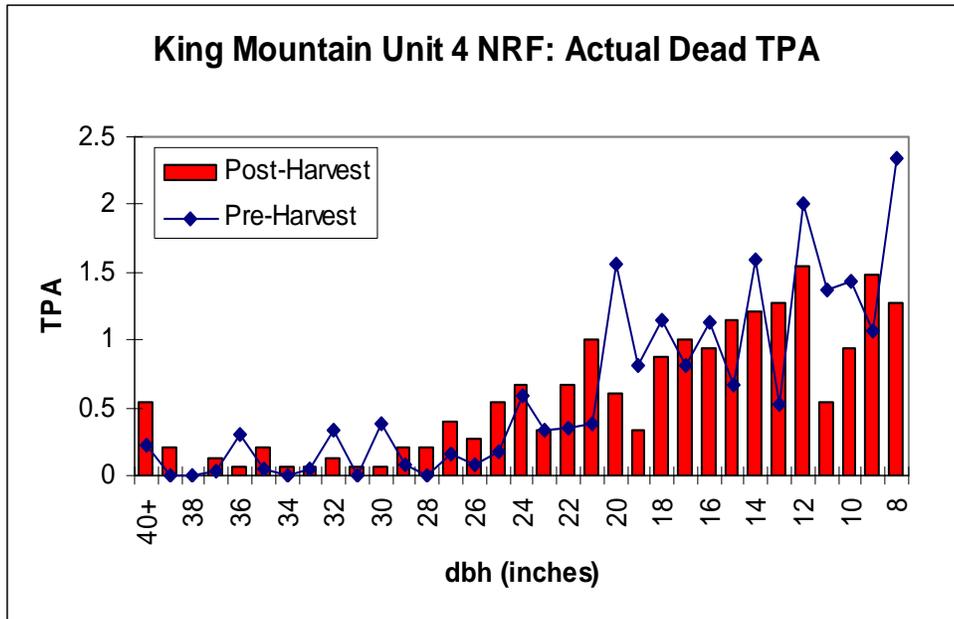


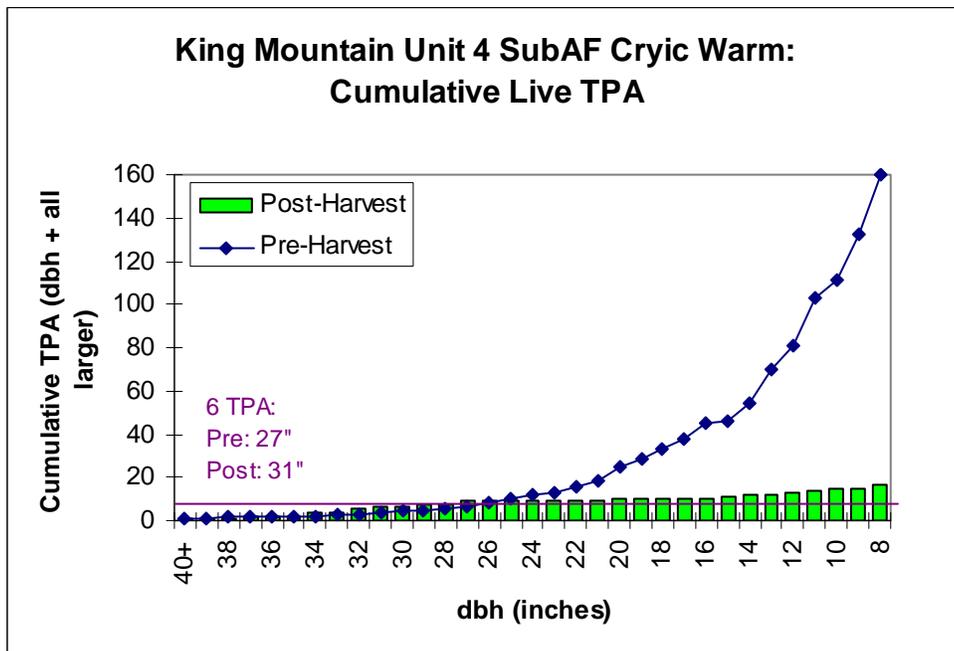
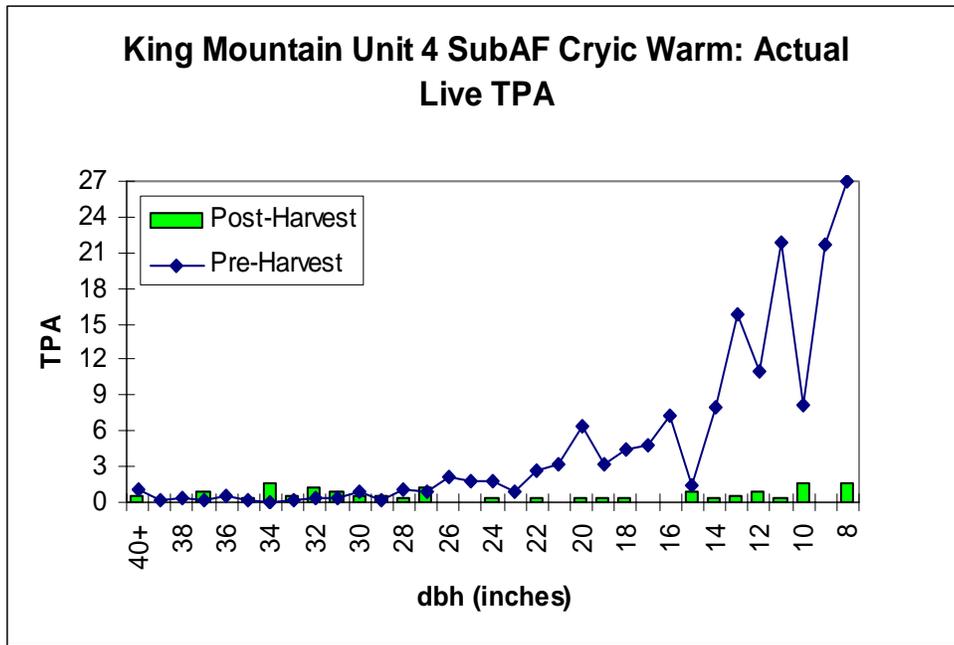


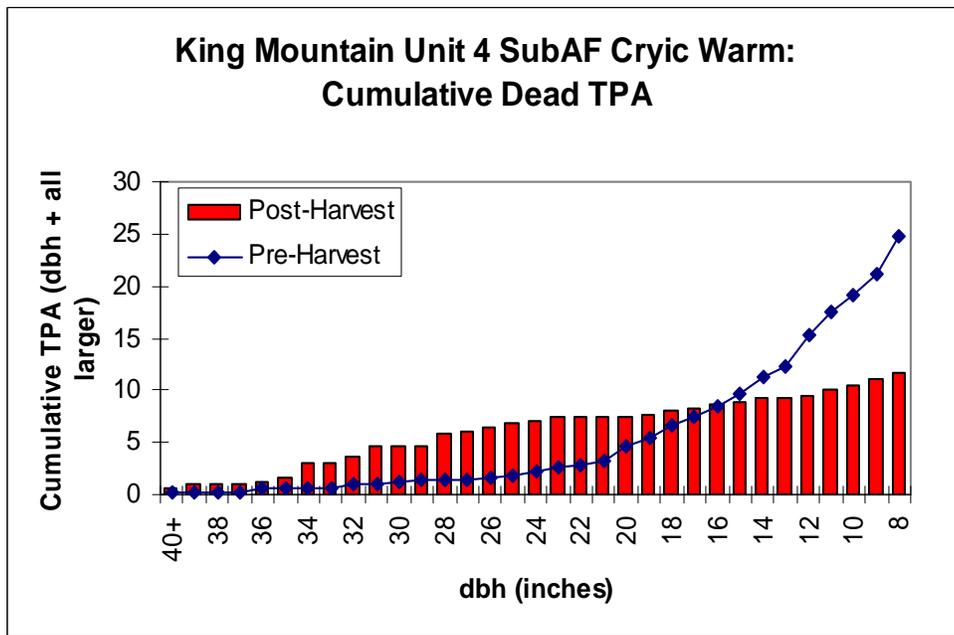
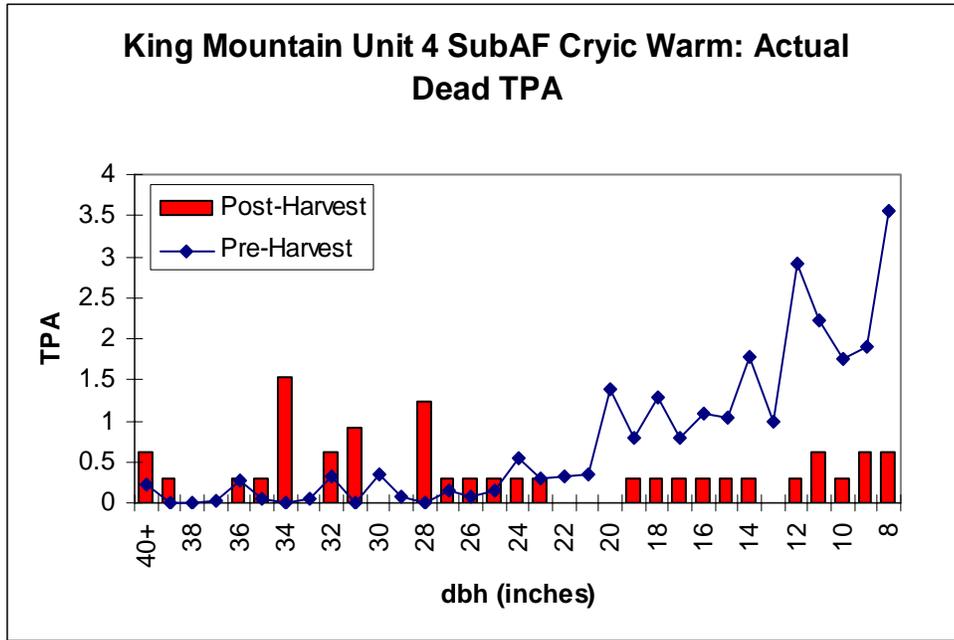


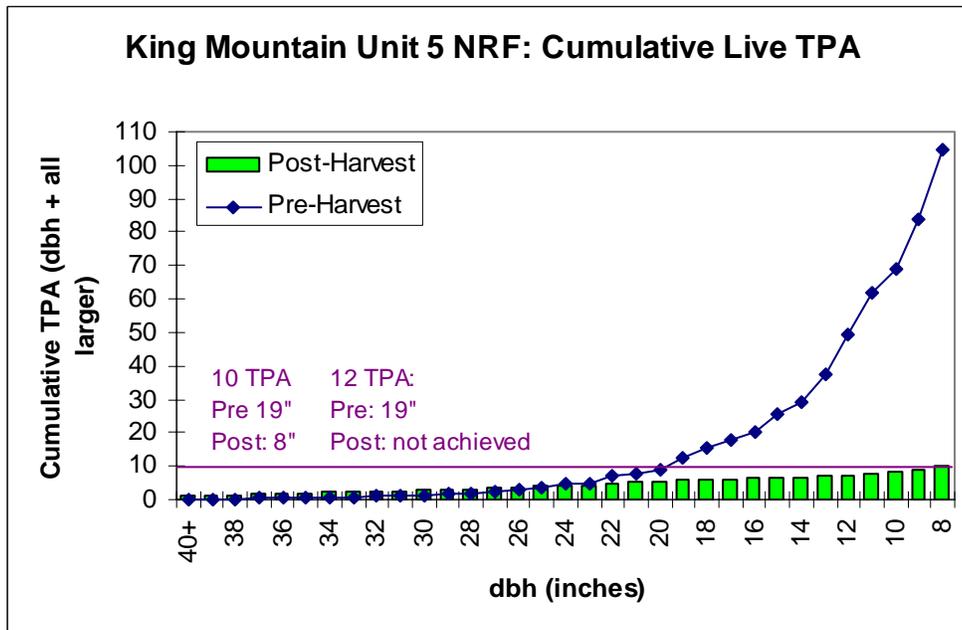
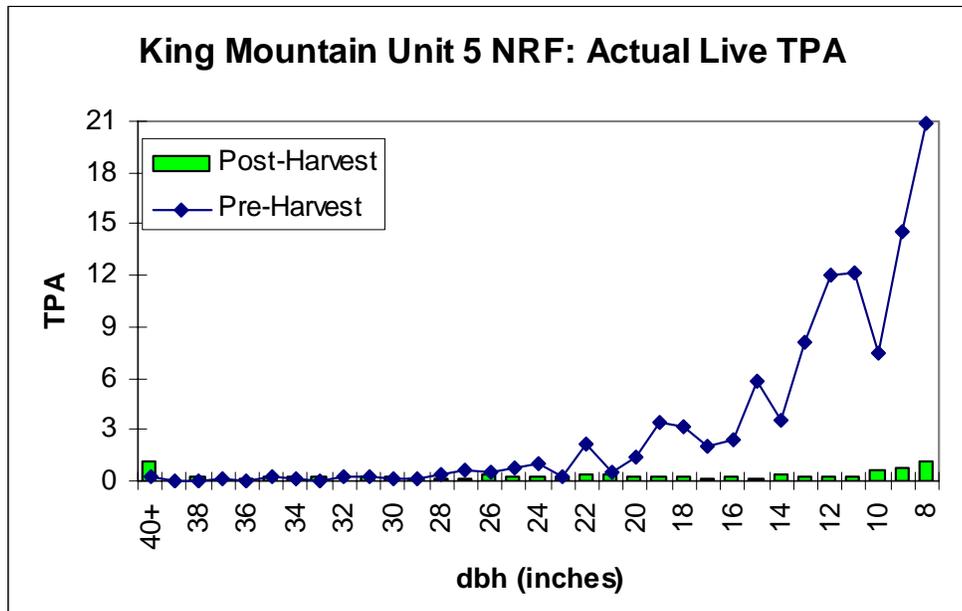


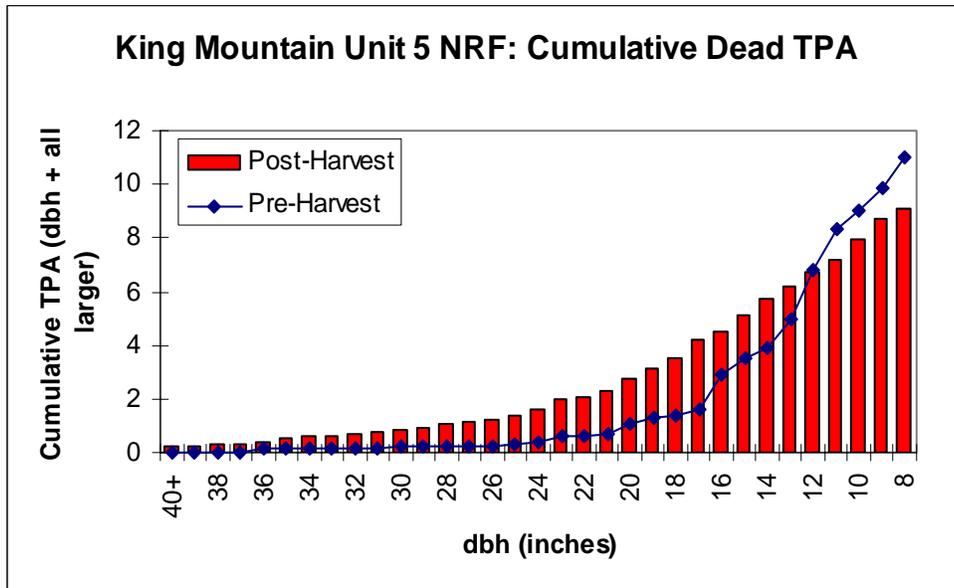
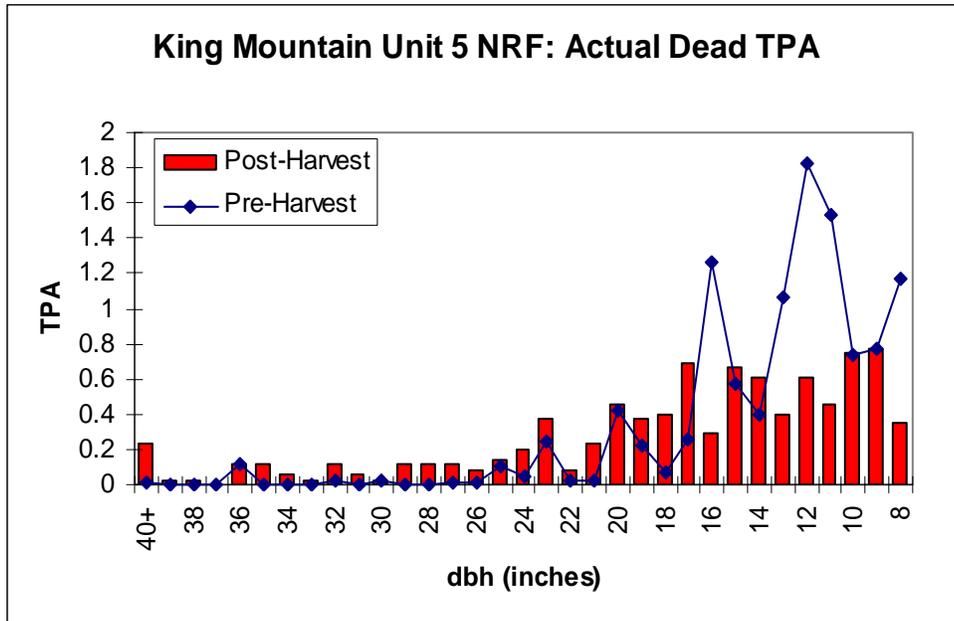


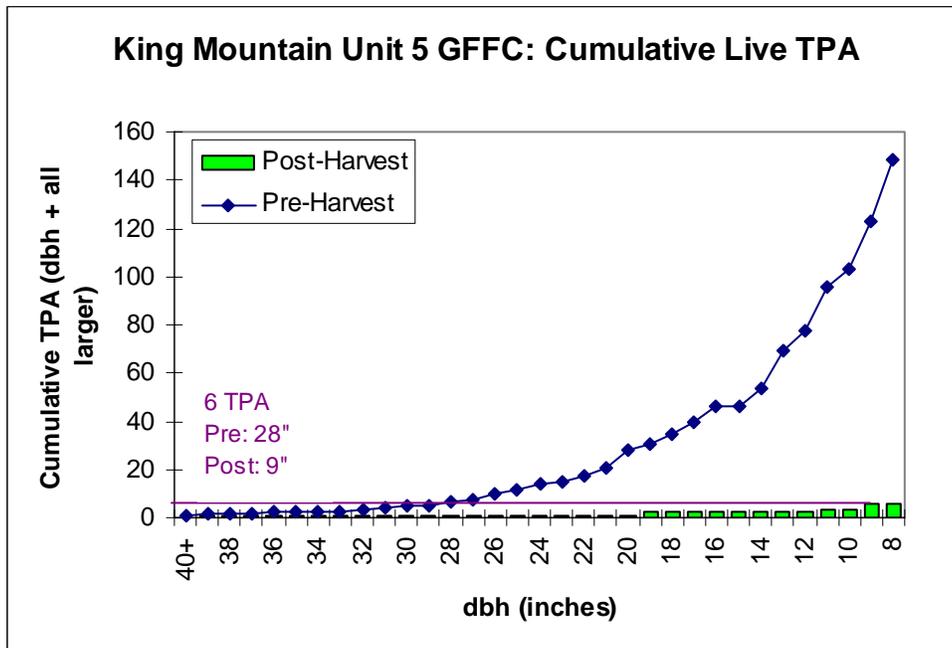
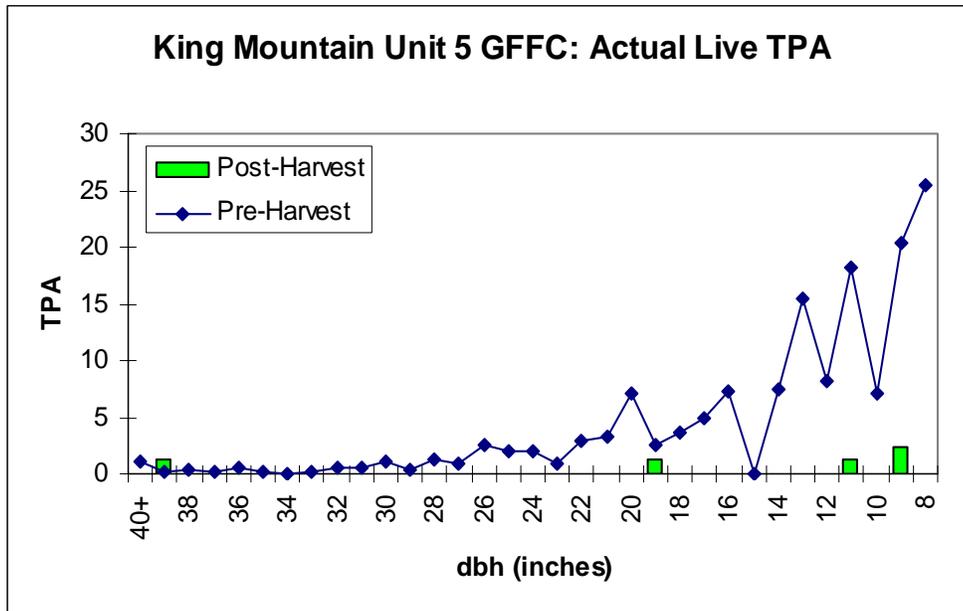


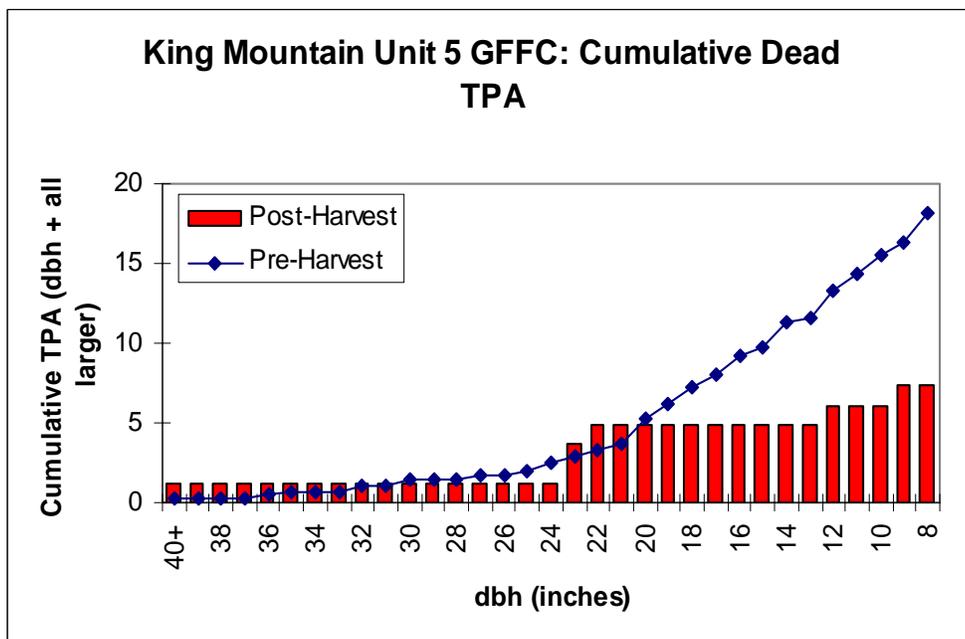
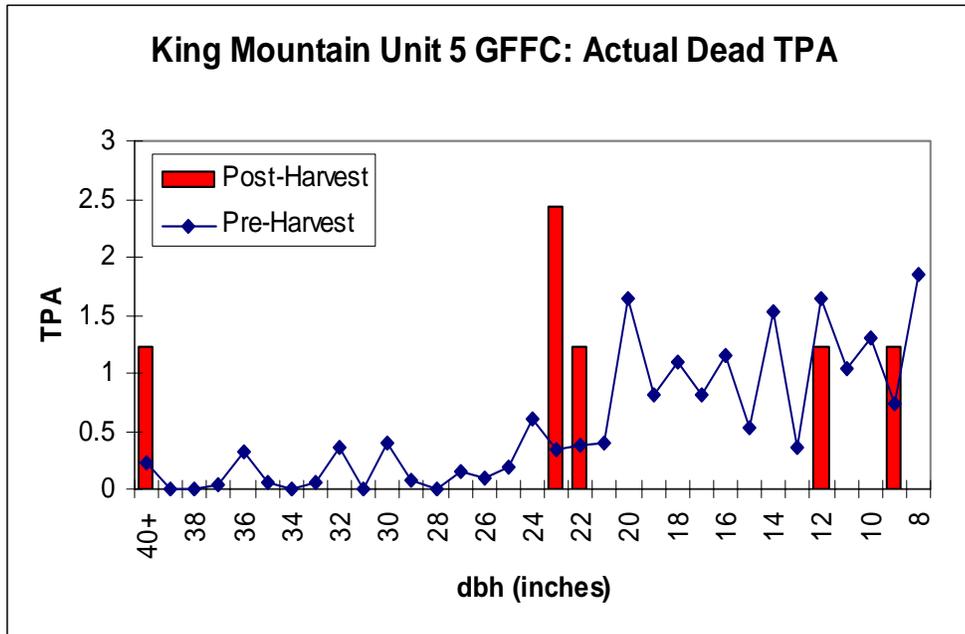












Appendix 3C. Data Used to Make the Pre-and Post Harvest Tree Per Acre (TPA) Graphs in Chapter 3 and Appendix 3B

| B&B East U2B DFC* Actual TPA | | | | | | |
|------------------------------|---------------------|---------------------|----------------------|----------------------|----------------------|-----------------------|
| dbh (inches) | Pre-Harvest Live | Pre-Harvest Dead | Pre-Harvest Total | Post-Harvest Live | Post-Harvest Dead | Post-Harvest Total |
| 40+ | 2.59 | 0.13 | 2.72 | 1.18 | 1.10 | 2.28 |
| 39 | 0.34 | 0.00 | 0.34 | 0.00 | 0.07 | 0.07 |
| 38 | 0.00 | 0.00 | 0.00 | 0.07 | 0.07 | 0.15 |
| 37 | 0.38 | 0.00 | 0.38 | 0.15 | 0.15 | 0.29 |
| 36 | 0.41 | 0.10 | 0.51 | 0.07 | 0.00 | 0.07 |
| 35 | 0.00 | 0.00 | 0.00 | 0.07 | 0.15 | 0.22 |
| 34 | 0.45 | 0.00 | 0.45 | 0.07 | 0.37 | 0.44 |
| 33 | 0.48 | 0.00 | 0.48 | 0.00 | 0.15 | 0.15 |
| 32 | 0.00 | 0.00 | 0.00 | 0.22 | 0.07 | 0.29 |
| 31 | 0.00 | 0.14 | 0.14 | 0.22 | 0.15 | 0.37 |
| 30 | 0.60 | 0.00 | 0.60 | 0.29 | 0.15 | 0.44 |
| 29 | 0.62 | 0.00 | 0.62 | 0.00 | 0.00 | 0.00 |
| 28 | 1.35 | 0.00 | 1.35 | 0.22 | 0.22 | 0.44 |
| 27 | 1.44 | 0.00 | 1.44 | 0.22 | 0.37 | 0.59 |
| 26 | 2.33 | 0.19 | 2.52 | 0.15 | 0.37 | 0.51 |
| 25 | 1.64 | 0.42 | 2.06 | 0.29 | 0.15 | 0.44 |
| 24 | 2.78 | 0.00 | 2.78 | 0.29 | 0.22 | 0.51 |
| 23 | 3.01 | 0.00 | 3.01 | 0.29 | 0.15 | 0.44 |
| 22 | 2.23 | 0.00 | 2.23 | 0.22 | 0.29 | 0.51 |
| 21 | 2.00 | 0.00 | 2.00 | 0.00 | 0.22 | 0.22 |
| 20 | 3.88 | 0.99 | 4.87 | 0.29 | 0.37 | 0.66 |
| 19 | 3.01 | 0.00 | 3.01 | 0.15 | 0.74 | 0.88 |
| 18 | 4.78 | 0.80 | 5.58 | 0.44 | 0.81 | 1.25 |
| 17 | 5.40 | 0.00 | 5.40 | 0.44 | 0.88 | 1.32 |
| 16 | 8.30 | 1.53 | 9.83 | 0.74 | 0.88 | 1.62 |
| 15 | 14.02 | 1.78 | 15.80 | 0.74 | 1.25 | 1.99 |
| 14 | 7.76 | 0.72 | 8.48 | 0.96 | 1.91 | 2.87 |
| 13 | 12.48 | 1.54 | 14.02 | 0.44 | 1.32 | 1.76 |
| 12 | 14.17 | 2.73 | 16.90 | 0.81 | 2.21 | 3.01 |
| 11 | 12.24 | 0.00 | 12.24 | 1.25 | 1.84 | 3.09 |
| 10 | 21.31 | 5.24 | 26.55 | 0.74 | 1.47 | 2.21 |
| 9 | 12.66 | 1.65 | 14.31 | 0.44 | 1.54 | 1.99 |
| 8 | 41.66 | 6.31 | 47.97 | 1.32 | 1.18 | 2.50 |

*Due to a data collection error, no distinction was made between the two DFC vegetation series when gathering post-harvest data for this unit.

| B&B East U2B DFC* Cumulative TPA | | | | | | |
|---|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 2.59 | 0.13 | 2.72 | 1.18 | 1.10 | 2.28 |
| 39 | 2.93 | 0.13 | 3.06 | 1.18 | 1.18 | 2.35 |
| 38 | 2.93 | 0.13 | 3.06 | 1.25 | 1.25 | 2.50 |
| 37 | 3.31 | 0.13 | 3.44 | 1.40 | 1.40 | 2.79 |
| 36 | 3.72 | 0.23 | 3.95 | 1.47 | 1.40 | 2.87 |
| 35 | 3.72 | 0.23 | 3.95 | 1.54 | 1.54 | 3.09 |
| 34 | 4.17 | 0.23 | 4.40 | 1.62 | 1.91 | 3.53 |
| 33 | 4.65 | 0.23 | 4.88 | 1.62 | 2.06 | 3.68 |
| 32 | 4.65 | 0.23 | 4.88 | 1.84 | 2.13 | 3.97 |
| 31 | 4.65 | 0.37 | 5.02 | 2.06 | 2.28 | 4.34 |
| 30 | 5.25 | 0.37 | 5.62 | 2.35 | 2.43 | 4.78 |
| 29 | 5.87 | 0.37 | 6.24 | 2.35 | 2.43 | 4.78 |
| 28 | 7.22 | 0.37 | 7.59 | 2.57 | 2.65 | 5.22 |
| 27 | 8.66 | 0.37 | 9.03 | 2.79 | 3.01 | 5.81 |
| 26 | 10.99 | 0.56 | 11.55 | 2.94 | 3.38 | 6.32 |
| 25 | 12.63 | 0.98 | 13.61 | 3.24 | 3.53 | 6.76 |
| 24 | 15.41 | 0.98 | 16.39 | 3.53 | 3.75 | 7.28 |
| 23 | 18.42 | 0.98 | 19.40 | 3.82 | 3.90 | 7.72 |
| 22 | 20.65 | 0.98 | 21.63 | 4.04 | 4.19 | 8.24 |
| 21 | 22.97 | 0.98 | 23.95 | 4.04 | 4.41 | 8.46 |
| 20 | 26.85 | 1.97 | 28.82 | 4.34 | 4.78 | 9.12 |
| 19 | 29.86 | 1.97 | 31.83 | 4.49 | 5.51 | 10.00 |
| 18 | 34.64 | 2.77 | 37.41 | 4.93 | 6.32 | 11.25 |
| 17 | 40.04 | 2.77 | 42.81 | 5.37 | 7.21 | 12.57 |
| 16 | 48.34 | 4.30 | 52.64 | 6.10 | 8.09 | 14.19 |
| 15 | 62.36 | 6.08 | 68.44 | 6.84 | 9.34 | 16.18 |
| 14 | 70.12 | 6.80 | 76.92 | 7.79 | 11.25 | 19.04 |
| 13 | 82.60 | 8.34 | 90.94 | 8.24 | 12.57 | 20.81 |
| 12 | 96.77 | 11.07 | 107.84 | 9.04 | 14.78 | 23.82 |
| 11 | 109.01 | 11.07 | 120.08 | 10.29 | 16.62 | 26.91 |
| 10 | 130.32 | 16.31 | 146.63 | 11.03 | 18.09 | 29.12 |
| 9 | 142.98 | 17.96 | 160.94 | 11.47 | 19.63 | 31.10 |
| 8 | 184.64 | 24.27 | 208.91 | 12.79 | 20.81 | 33.60 |

*Due to a data collection error, no distinction was made between the two DFC vegetation series when gathering post-harvest data for this unit.

| B&B West U3B NRF Actual TPA | | | | | | |
|--|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.76 | 0.00 | 0.76 | 0.56 | 0.11 | 0.67 |
| 39 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 38 | 0.22 | 0.00 | 0.22 | 0.11 | 0.11 | 0.22 |
| 37 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 36 | 0.00 | 0.09 | 0.09 | 0.11 | 0.00 | 0.11 |
| 35 | 0.80 | 0.00 | 0.80 | 0.11 | 0.00 | 0.11 |
| 34 | 0.00 | 0.00 | 0.00 | 0.44 | 0.11 | 0.56 |
| 33 | 0.30 | 0.00 | 0.30 | 0.00 | 0.00 | 0.00 |
| 32 | 0.31 | 0.45 | 0.76 | 0.33 | 0.11 | 0.44 |
| 31 | 0.99 | 0.00 | 0.99 | 0.11 | 0.00 | 0.11 |
| 30 | 0.70 | 0.13 | 0.83 | 1.00 | 0.11 | 1.11 |
| 29 | 0.00 | 0.00 | 0.00 | 1.33 | 0.11 | 1.44 |
| 28 | 0.42 | 0.00 | 0.42 | 0.78 | 0.11 | 0.89 |
| 27 | 0.89 | 0.00 | 0.89 | 0.78 | 0.00 | 0.78 |
| 26 | 0.94 | 0.00 | 0.94 | 0.22 | 0.11 | 0.33 |
| 25 | 1.56 | 0.00 | 1.56 | 1.00 | 0.44 | 1.44 |
| 24 | 2.23 | 0.00 | 2.23 | 0.44 | 0.11 | 0.56 |
| 23 | 4.88 | 0.22 | 5.10 | 0.22 | 0.33 | 0.56 |
| 22 | 4.04 | 0.71 | 4.75 | 0.78 | 0.33 | 1.11 |
| 21 | 1.49 | 0.00 | 1.49 | 0.67 | 0.44 | 1.11 |
| 20 | 10.36 | 1.15 | 11.51 | 0.89 | 0.89 | 1.78 |
| 19 | 4.51 | 0.32 | 4.83 | 0.11 | 1.11 | 1.22 |
| 18 | 5.86 | 0.71 | 6.57 | 0.78 | 0.44 | 1.22 |
| 17 | 4.48 | 0.40 | 4.88 | 0.56 | 0.78 | 1.33 |
| 16 | 3.78 | 0.00 | 3.78 | 0.33 | 0.78 | 1.11 |
| 15 | 2.81 | 0.51 | 3.32 | 0.11 | 0.89 | 1.00 |
| 14 | 4.85 | 0.58 | 5.43 | 0.11 | 0.67 | 0.78 |
| 13 | 5.49 | 2.71 | 8.20 | 0.33 | 0.33 | 0.67 |
| 12 | 4.74 | 1.60 | 6.34 | 0.33 | 0.33 | 0.67 |
| 11 | 15.60 | 1.89 | 17.49 | 0.33 | 0.33 | 0.67 |
| 10 | 10.16 | 1.15 | 11.31 | 0.44 | 0.78 | 1.22 |
| 9 | 8.14 | 0.00 | 8.14 | 0.33 | 0.67 | 1.00 |
| 8 | 20.11 | 3.58 | 23.69 | 0.44 | 0.11 | 0.56 |

| B&B West U3B NRF Cumulative TPA | | | | | | |
|--|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.76 | 0 | 0.76 | 0.56 | 0.11 | 0.67 |
| 39 | 0.76 | 0 | 0.76 | 0.56 | 0.11 | 0.67 |
| 38 | 0.98 | 0 | 0.98 | 0.67 | 0.22 | 0.89 |
| 37 | 0.98 | 0 | 0.98 | 0.67 | 0.22 | 0.89 |
| 36 | 0.98 | 0.09 | 1.07 | 0.78 | 0.22 | 1.00 |
| 35 | 1.78 | 0.09 | 1.87 | 0.89 | 0.22 | 1.11 |
| 34 | 1.78 | 0.09 | 1.87 | 1.33 | 0.33 | 1.67 |
| 33 | 2.08 | 0.09 | 2.17 | 1.33 | 0.33 | 1.67 |
| 32 | 2.39 | 0.54 | 2.93 | 1.67 | 0.44 | 2.11 |
| 31 | 3.38 | 0.54 | 3.92 | 1.78 | 0.44 | 2.22 |
| 30 | 4.08 | 0.67 | 4.75 | 2.78 | 0.56 | 3.33 |
| 29 | 4.08 | 0.67 | 4.75 | 4.11 | 0.67 | 4.78 |
| 28 | 4.5 | 0.67 | 5.17 | 4.89 | 0.78 | 5.67 |
| 27 | 5.39 | 0.67 | 6.06 | 5.67 | 0.78 | 6.44 |
| 26 | 6.33 | 0.67 | 7.00 | 5.89 | 0.89 | 6.78 |
| 25 | 7.89 | 0.67 | 8.56 | 6.89 | 1.33 | 8.22 |
| 24 | 10.12 | 0.67 | 10.79 | 7.33 | 1.44 | 8.78 |
| 23 | 15 | 0.89 | 15.89 | 7.56 | 1.78 | 9.33 |
| 22 | 19.04 | 1.6 | 20.64 | 8.33 | 2.11 | 10.44 |
| 21 | 20.53 | 1.6 | 22.13 | 9.00 | 2.56 | 11.56 |
| 20 | 30.89 | 2.75 | 33.64 | 9.89 | 3.44 | 13.33 |
| 19 | 35.4 | 3.07 | 38.47 | 10.00 | 4.56 | 14.56 |
| 18 | 41.26 | 3.78 | 45.04 | 10.78 | 5.00 | 15.78 |
| 17 | 45.74 | 4.18 | 49.92 | 11.33 | 5.78 | 17.11 |
| 16 | 49.52 | 4.18 | 53.70 | 11.67 | 6.56 | 18.22 |
| 15 | 52.33 | 4.69 | 57.02 | 11.78 | 7.44 | 19.22 |
| 14 | 57.18 | 5.27 | 62.45 | 11.89 | 8.11 | 20.00 |
| 13 | 62.67 | 7.98 | 70.65 | 12.22 | 8.44 | 20.67 |
| 12 | 67.41 | 9.58 | 76.99 | 12.56 | 8.78 | 21.33 |
| 11 | 83.01 | 11.47 | 94.48 | 12.89 | 9.11 | 22.00 |
| 10 | 93.17 | 12.62 | 105.79 | 13.33 | 9.89 | 23.22 |
| 9 | 101.31 | 12.62 | 113.93 | 13.67 | 10.56 | 24.22 |
| 8 | 121.42 | 16.2 | 137.62 | 14.11 | 10.67 | 24.78 |

| B&B East U4B NRF Actual TPA | | | | | | |
|--|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.28 | 0.00 | 0.28 | 0.00 | 0.00 | 0.00 |
| 39 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.10 |
| 38 | 0.01 | 0.00 | 0.01 | 0.10 | 0.00 | 0.10 |
| 37 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| 36 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| 35 | 0.01 | 0.00 | 0.01 | 0.21 | 0.00 | 0.21 |
| 34 | 0.00 | 0.24 | 0.24 | 0.10 | 0.00 | 0.10 |
| 33 | 0.00 | 0.00 | 0.00 | 0.21 | 0.00 | 0.21 |
| 32 | 0.01 | 0.00 | 0.01 | 0.10 | 0.00 | 0.10 |
| 31 | 0.53 | 0.00 | 0.53 | 0.10 | 0.00 | 0.10 |
| 30 | 0.55 | 0.00 | 0.55 | 0.10 | 0.00 | 0.10 |
| 29 | 0.00 | 0.00 | 0.00 | 0.31 | 0.10 | 0.42 |
| 28 | 0.65 | 0.36 | 1.01 | 0.31 | 0.00 | 0.31 |
| 27 | 0.02 | 0.00 | 0.02 | 0.21 | 0.21 | 0.42 |
| 26 | 0.74 | 0.00 | 0.74 | 0.31 | 0.00 | 0.31 |
| 25 | 0.80 | 0.00 | 0.80 | 0.31 | 0.00 | 0.31 |
| 24 | 3.50 | 0.50 | 4.00 | 0.42 | 0.52 | 0.94 |
| 23 | 0.91 | 0.00 | 0.91 | 0.73 | 0.31 | 1.04 |
| 22 | 1.97 | 0.00 | 1.97 | 0.63 | 0.42 | 1.04 |
| 21 | 3.34 | 0.00 | 3.34 | 0.73 | 0.42 | 1.15 |
| 20 | 3.82 | 0.73 | 4.55 | 0.52 | 1.04 | 1.56 |
| 19 | 2.67 | 0.39 | 3.06 | 1.04 | 0.31 | 1.35 |
| 18 | 1.79 | 2.22 | 4.01 | 1.46 | 0.52 | 1.98 |
| 17 | 2.03 | 1.49 | 3.53 | 1.04 | 0.73 | 1.77 |
| 16 | 4.36 | 1.73 | 6.09 | 0.83 | 0.31 | 1.15 |
| 15 | 9.22 | 0.00 | 9.22 | 0.83 | 0.10 | 0.94 |
| 14 | 5.36 | 0.03 | 5.39 | 1.46 | 0.31 | 1.77 |
| 13 | 6.23 | 0.00 | 6.23 | 1.25 | 0.10 | 1.35 |
| 12 | 14.29 | 2.07 | 16.36 | 0.83 | 0.63 | 1.46 |
| 11 | 16.65 | 1.23 | 17.88 | 1.46 | 0.31 | 1.77 |
| 10 | 15.64 | 4.36 | 20.00 | 1.25 | 0.94 | 2.19 |
| 9 | 23.67 | 3.54 | 27.21 | 2.50 | 0.83 | 3.33 |
| 8 | 32.07 | 0.09 | 32.16 | 6.15 | 0.52 | 6.67 |

| B&B East U4B NRF Cumulative TPA | | | | | | |
|--|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.28 | 0.00 | 0.28 | 0.00 | 0.00 | 0.00 |
| 39 | 0.28 | 0.00 | 0.28 | 0.10 | 0.00 | 0.10 |
| 38 | 0.29 | 0.00 | 0.29 | 0.21 | 0.00 | 0.21 |
| 37 | 0.30 | 0.00 | 0.30 | 0.21 | 0.00 | 0.21 |
| 36 | 0.31 | 0.00 | 0.31 | 0.21 | 0.00 | 0.21 |
| 35 | 0.32 | 0.00 | 0.32 | 0.42 | 0.00 | 0.42 |
| 34 | 0.32 | 0.24 | 0.56 | 0.52 | 0.00 | 0.52 |
| 33 | 0.32 | 0.24 | 0.56 | 0.73 | 0.00 | 0.73 |
| 32 | 0.33 | 0.24 | 0.57 | 0.83 | 0.00 | 0.83 |
| 31 | 0.86 | 0.24 | 1.10 | 0.94 | 0.00 | 0.94 |
| 30 | 1.41 | 0.24 | 1.65 | 1.04 | 0.00 | 1.04 |
| 29 | 1.41 | 0.24 | 1.65 | 1.35 | 0.10 | 1.46 |
| 28 | 2.05 | 0.60 | 2.66 | 1.67 | 0.10 | 1.77 |
| 27 | 2.07 | 0.60 | 2.67 | 1.88 | 0.31 | 2.19 |
| 26 | 2.81 | 0.60 | 3.41 | 2.19 | 0.31 | 2.50 |
| 25 | 3.61 | 0.60 | 4.21 | 2.50 | 0.31 | 2.81 |
| 24 | 7.11 | 1.10 | 8.21 | 2.92 | 0.83 | 3.75 |
| 23 | 8.02 | 1.10 | 9.12 | 3.65 | 1.15 | 4.79 |
| 22 | 9.99 | 1.10 | 11.09 | 4.27 | 1.56 | 5.83 |
| 21 | 13.33 | 1.10 | 14.43 | 5.00 | 1.98 | 6.98 |
| 20 | 17.15 | 1.83 | 18.98 | 5.52 | 3.02 | 8.54 |
| 19 | 19.82 | 2.22 | 22.04 | 6.56 | 3.33 | 9.90 |
| 18 | 21.61 | 4.44 | 26.05 | 8.02 | 3.85 | 11.88 |
| 17 | 23.64 | 5.94 | 29.58 | 9.06 | 4.58 | 13.65 |
| 16 | 28.00 | 7.66 | 35.66 | 9.90 | 4.90 | 14.79 |
| 15 | 37.22 | 7.66 | 44.88 | 10.73 | 5.00 | 15.73 |
| 14 | 42.58 | 7.69 | 50.27 | 12.19 | 5.31 | 17.50 |
| 13 | 48.81 | 7.69 | 56.50 | 13.44 | 5.42 | 18.85 |
| 12 | 63.10 | 9.76 | 72.86 | 14.27 | 6.04 | 20.31 |
| 11 | 79.75 | 10.99 | 90.74 | 15.73 | 6.35 | 22.08 |
| 10 | 95.39 | 15.35 | 110.74 | 16.98 | 7.29 | 24.27 |
| 9 | 119.06 | 18.89 | 137.95 | 19.48 | 8.13 | 27.60 |
| 8 | 151.13 | 18.98 | 170.11 | 25.63 | 8.65 | 34.27 |

| B&B East U8 NRF Actual TPA | | | | | | |
|---------------------------------------|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 2.97 | 0.08 | 3.05 | 0.15 | 0.00 | 0.15 |
| 39 | 0.28 | 0.00 | 0.28 | 0.07 | 0.00 | 0.07 |
| 38 | 0.30 | 0.18 | 0.48 | 0.07 | 0.00 | 0.07 |
| 37 | 0.00 | 0.10 | 0.10 | 0.00 | 0.00 | 0.00 |
| 36 | 0.00 | 0.10 | 0.10 | 0.37 | 0.00 | 0.37 |
| 35 | 0.00 | 0.00 | 0.00 | 0.22 | 0.00 | 0.22 |
| 34 | 0.39 | 0.11 | 0.50 | 0.29 | 0.00 | 0.29 |
| 33 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.07 |
| 32 | 0.85 | 0.13 | 0.98 | 0.29 | 0.00 | 0.29 |
| 31 | 0.00 | 0.00 | 0.00 | 0.37 | 0.00 | 0.37 |
| 30 | 0.98 | 0.15 | 1.13 | 0.37 | 0.00 | 0.37 |
| 29 | 0.00 | 0.16 | 0.16 | 0.96 | 0.00 | 0.96 |
| 28 | 1.13 | 0.00 | 1.13 | 0.74 | 0.00 | 0.74 |
| 27 | 2.41 | 0.00 | 2.41 | 1.03 | 0.07 | 1.10 |
| 26 | 1.29 | 0.19 | 1.48 | 0.74 | 0.07 | 0.81 |
| 25 | 0.00 | 0.00 | 0.00 | 0.51 | 0.07 | 0.59 |
| 24 | 1.00 | 0.00 | 1.00 | 0.59 | 0.00 | 0.59 |
| 23 | 0.00 | 0.00 | 0.00 | 0.66 | 0.07 | 0.74 |
| 22 | 1.85 | 0.00 | 1.85 | 0.88 | 0.00 | 0.88 |
| 21 | 3.03 | 0.30 | 3.33 | 0.81 | 0.15 | 0.96 |
| 20 | 1.15 | 0.66 | 1.81 | 0.81 | 0.07 | 0.88 |
| 19 | 4.87 | 0.72 | 5.59 | 0.59 | 0.22 | 0.81 |
| 18 | 6.83 | 0.81 | 7.64 | 1.03 | 0.15 | 1.18 |
| 17 | 1.56 | 0.00 | 1.56 | 0.88 | 0.15 | 1.03 |
| 16 | 8.73 | 1.53 | 10.26 | 0.88 | 0.29 | 1.18 |
| 15 | 7.88 | 1.16 | 9.04 | 0.96 | 0.37 | 1.32 |
| 14 | 4.43 | 0.72 | 5.15 | 0.88 | 0.22 | 1.10 |
| 13 | 10.23 | 0.77 | 11.00 | 1.40 | 0.44 | 1.84 |
| 12 | 12.62 | 0.99 | 13.61 | 1.76 | 0.59 | 2.35 |
| 11 | 14.37 | 0.00 | 14.37 | 1.40 | 0.88 | 2.28 |
| 10 | 18.43 | 0.00 | 18.43 | 1.91 | 0.66 | 2.57 |
| 9 | 16.88 | 0.00 | 16.88 | 3.09 | 1.03 | 4.12 |
| 8 | 6.88 | 4.09 | 10.97 | 4.19 | 1.25 | 5.44 |

| B&B East U8 NRF Cumulative TPA | | | | | | |
|---|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 2.97 | 0.08 | 3.05 | 0.15 | 0.00 | 0.15 |
| 39 | 3.25 | 0.08 | 3.33 | 0.22 | 0.00 | 0.22 |
| 38 | 3.55 | 0.26 | 3.81 | 0.29 | 0.00 | 0.29 |
| 37 | 3.55 | 0.36 | 3.91 | 0.29 | 0.00 | 0.29 |
| 36 | 3.55 | 0.46 | 4.01 | 0.66 | 0.00 | 0.66 |
| 35 | 3.55 | 0.46 | 4.01 | 0.88 | 0.00 | 0.88 |
| 34 | 3.94 | 0.57 | 4.51 | 1.18 | 0.00 | 1.18 |
| 33 | 3.94 | 0.57 | 4.51 | 1.25 | 0.00 | 1.25 |
| 32 | 4.79 | 0.70 | 5.49 | 1.54 | 0.00 | 1.54 |
| 31 | 4.79 | 0.70 | 5.49 | 1.91 | 0.00 | 1.91 |
| 30 | 5.77 | 0.85 | 6.62 | 2.28 | 0.00 | 2.28 |
| 29 | 5.77 | 1.01 | 6.78 | 3.24 | 0.00 | 3.24 |
| 28 | 6.90 | 1.01 | 7.91 | 3.97 | 0.00 | 3.97 |
| 27 | 9.31 | 1.01 | 10.32 | 5.00 | 0.07 | 5.07 |
| 26 | 10.60 | 1.20 | 11.80 | 5.74 | 0.15 | 5.88 |
| 25 | 10.60 | 1.20 | 11.80 | 6.25 | 0.22 | 6.47 |
| 24 | 11.34 | 1.20 | 12.54 | 6.84 | 0.22 | 7.06 |
| 23 | 11.34 | 1.20 | 12.54 | 7.50 | 0.29 | 7.79 |
| 22 | 13.19 | 1.20 | 14.39 | 8.38 | 0.29 | 8.68 |
| 21 | 16.22 | 1.50 | 17.72 | 9.19 | 0.44 | 9.63 |
| 20 | 17.37 | 2.16 | 19.53 | 10.00 | 0.51 | 10.51 |
| 19 | 22.24 | 2.88 | 25.12 | 10.59 | 0.74 | 11.32 |
| 18 | 29.07 | 3.69 | 32.76 | 11.62 | 0.88 | 12.50 |
| 17 | 30.63 | 3.69 | 34.32 | 12.50 | 1.03 | 13.53 |
| 16 | 39.36 | 5.22 | 44.58 | 13.38 | 1.32 | 14.71 |
| 15 | 47.24 | 6.38 | 53.62 | 14.34 | 1.69 | 16.03 |
| 14 | 51.67 | 7.10 | 58.77 | 15.22 | 1.91 | 17.13 |
| 13 | 61.90 | 7.87 | 69.77 | 16.62 | 2.35 | 18.97 |
| 12 | 74.52 | 8.86 | 83.38 | 18.38 | 2.94 | 21.32 |
| 11 | 88.89 | 8.86 | 97.75 | 19.78 | 3.82 | 23.60 |
| 10 | 107.32 | 8.86 | 116.18 | 21.69 | 4.49 | 26.18 |
| 9 | 124.20 | 8.86 | 133.06 | 24.78 | 5.51 | 30.29 |
| 8 | 131.08 | 12.95 | 144.03 | 28.97 | 6.76 | 35.74 |

| Waterline 2 U3 GFFC Actual TPA | | | | | | |
|---------------------------------------|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 1.58 | 0.21 | 1.79 | 1.12 | 0.19 | 1.31 |
| 39 | 0.31 | 0.00 | 0.31 | 0.00 | 0.00 | 0.00 |
| 38 | 0.33 | 0.08 | 0.41 | 0.19 | 0.00 | 0.19 |
| 37 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 36 | 0.56 | 0.05 | 0.61 | 0.31 | 0.00 | 0.31 |
| 35 | 0.40 | 0.00 | 0.40 | 0.12 | 0.00 | 0.12 |
| 34 | 0.41 | 0.05 | 0.46 | 0.12 | 0.06 | 0.19 |
| 33 | 0.00 | 0.00 | 0.00 | 0.06 | 0.06 | 0.12 |
| 32 | 1.38 | 0.06 | 1.44 | 0.06 | 0.06 | 0.12 |
| 31 | 0.74 | 0.06 | 0.80 | 0.19 | 0.06 | 0.25 |
| 30 | 1.05 | 0.20 | 1.25 | 0.12 | 0.00 | 0.12 |
| 29 | 1.41 | 0.00 | 1.41 | 0.25 | 0.00 | 0.25 |
| 28 | 1.50 | 0.16 | 1.66 | 0.06 | 0.00 | 0.06 |
| 27 | 2.28 | 0.08 | 2.36 | 0.25 | 0.00 | 0.25 |
| 26 | 3.50 | 0.00 | 3.50 | 0.19 | 0.06 | 0.25 |
| 25 | 1.89 | 0.19 | 2.08 | 0.06 | 0.06 | 0.12 |
| 24 | 2.50 | 0.00 | 2.50 | 0.44 | 0.06 | 0.50 |
| 23 | 3.11 | 0.22 | 3.33 | 0.12 | 0.00 | 0.12 |
| 22 | 3.40 | 0.12 | 3.52 | 0.19 | 0.00 | 0.19 |
| 21 | 4.93 | 0.00 | 4.93 | 0.19 | 0.00 | 0.19 |
| 20 | 4.68 | 0.15 | 4.83 | 0.44 | 0.19 | 0.62 |
| 19 | 4.64 | 0.32 | 4.96 | 0.25 | 0.12 | 0.37 |
| 18 | 5.94 | 0.55 | 6.49 | 0.50 | 0.00 | 0.50 |
| 17 | 5.03 | 0.40 | 5.43 | 0.44 | 0.06 | 0.50 |
| 16 | 9.24 | 0.46 | 9.70 | 0.38 | 0.12 | 0.50 |
| 15 | 7.44 | 0.79 | 8.23 | 0.19 | 0.00 | 0.19 |
| 14 | 6.13 | 0.61 | 6.74 | 0.12 | 0.06 | 0.19 |
| 13 | 8.76 | 0.35 | 9.11 | 0.12 | 0.19 | 0.31 |
| 12 | 11.49 | 0.82 | 12.31 | 0.25 | 0.25 | 0.50 |
| 11 | 0.00 | 0.98 | 0.98 | 0.25 | 0.00 | 0.25 |
| 10 | 7.44 | 0.59 | 8.03 | 0.31 | 0.19 | 0.50 |
| 9 | 11.43 | 0.73 | 12.16 | 0.37 | 0.19 | 0.56 |
| 8 | 0.00 | 1.85 | 1.85 | 1.12 | 0.25 | 1.37 |

| Waterline 2 U3 GFFC Cumulative TPA | | | | | | |
|---|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 1.58 | 0.21 | 1.79 | 1.12 | 0.19 | 1.31 |
| 39 | 1.89 | 0.21 | 2.10 | 1.12 | 0.19 | 1.31 |
| 38 | 2.22 | 0.29 | 2.51 | 1.31 | 0.19 | 1.50 |
| 37 | 2.22 | 0.29 | 2.51 | 1.31 | 0.19 | 1.50 |
| 36 | 2.78 | 0.34 | 3.12 | 1.62 | 0.19 | 1.81 |
| 35 | 3.18 | 0.34 | 3.52 | 1.75 | 0.19 | 1.94 |
| 34 | 3.59 | 0.39 | 3.98 | 1.87 | 0.25 | 2.12 |
| 33 | 3.59 | 0.39 | 3.98 | 1.94 | 0.31 | 2.25 |
| 32 | 4.97 | 0.45 | 5.42 | 2.00 | 0.37 | 2.37 |
| 31 | 5.71 | 0.51 | 6.22 | 2.18 | 0.44 | 2.62 |
| 30 | 6.76 | 0.71 | 7.47 | 2.31 | 0.44 | 2.75 |
| 29 | 8.17 | 0.71 | 8.88 | 2.56 | 0.44 | 3.00 |
| 28 | 9.67 | 0.87 | 10.54 | 2.62 | 0.44 | 3.06 |
| 27 | 11.95 | 0.95 | 12.90 | 2.87 | 0.44 | 3.31 |
| 26 | 15.45 | 0.95 | 16.40 | 3.06 | 0.50 | 3.56 |
| 25 | 17.34 | 1.14 | 18.48 | 3.12 | 0.56 | 3.68 |
| 24 | 19.84 | 1.14 | 20.98 | 3.56 | 0.62 | 4.18 |
| 23 | 22.95 | 1.36 | 24.31 | 3.68 | 0.62 | 4.31 |
| 22 | 26.35 | 1.48 | 27.83 | 3.87 | 0.62 | 4.49 |
| 21 | 31.28 | 1.48 | 32.76 | 4.06 | 0.62 | 4.68 |
| 20 | 35.96 | 1.63 | 37.59 | 4.49 | 0.81 | 5.31 |
| 19 | 40.60 | 1.95 | 42.55 | 4.74 | 0.94 | 5.68 |
| 18 | 46.54 | 2.50 | 49.04 | 5.24 | 0.94 | 6.18 |
| 17 | 51.57 | 2.90 | 54.47 | 5.68 | 1.00 | 6.68 |
| 16 | 60.81 | 3.36 | 64.17 | 6.05 | 1.12 | 7.18 |
| 15 | 68.25 | 4.15 | 72.40 | 6.24 | 1.12 | 7.37 |
| 14 | 74.38 | 4.76 | 79.14 | 6.37 | 1.19 | 7.55 |
| 13 | 83.14 | 5.11 | 88.25 | 6.49 | 1.37 | 7.87 |
| 12 | 94.63 | 5.93 | 100.56 | 6.74 | 1.62 | 8.36 |
| 11 | 94.63 | 6.91 | 101.54 | 6.99 | 1.62 | 8.61 |
| 10 | 102.07 | 7.50 | 109.57 | 7.30 | 1.81 | 9.11 |
| 9 | 113.50 | 8.23 | 121.73 | 7.68 | 2.00 | 9.68 |
| 8 | 113.50 | 10.08 | 123.58 | 8.80 | 2.25 | 11.05 |

| Waterline 2 U3 PP Frost Actual TPA | | | | | | |
|---|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 1.58 | 0.21 | 1.79 | 2.70 | 0.25 | 2.94 |
| 39 | 0.31 | 0.00 | 0.31 | 0.00 | 0.00 | 0.00 |
| 38 | 0.33 | 0.08 | 0.41 | 0.49 | 0.00 | 0.49 |
| 37 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 36 | 0.56 | 0.05 | 0.61 | 0.00 | 0.00 | 0.00 |
| 35 | 0.40 | 0.00 | 0.40 | 0.74 | 0.25 | 0.98 |
| 34 | 0.41 | 0.05 | 0.46 | 0.25 | 0.00 | 0.25 |
| 33 | 0.00 | 0.00 | 0.00 | 0.25 | 0.00 | 0.25 |
| 32 | 1.38 | 0.06 | 1.44 | 0.25 | 0.00 | 0.25 |
| 31 | 0.74 | 0.06 | 0.80 | 0.00 | 0.00 | 0.00 |
| 30 | 1.05 | 0.20 | 1.25 | 0.74 | 0.00 | 0.74 |
| 29 | 1.41 | 0.00 | 1.41 | 0.25 | 0.25 | 0.49 |
| 28 | 1.50 | 0.16 | 1.66 | 0.49 | 0.00 | 0.49 |
| 27 | 2.28 | 0.08 | 2.36 | 0.98 | 0.25 | 1.23 |
| 26 | 3.50 | 0.00 | 3.50 | 0.49 | 0.00 | 0.49 |
| 25 | 1.89 | 0.19 | 2.08 | 0.25 | 0.00 | 0.25 |
| 24 | 2.50 | 0.00 | 2.50 | 0.00 | 0.25 | 0.25 |
| 23 | 3.11 | 0.22 | 3.33 | 0.98 | 0.00 | 0.98 |
| 22 | 3.40 | 0.12 | 3.52 | 0.74 | 0.25 | 0.98 |
| 21 | 4.93 | 0.00 | 4.93 | 1.47 | 0.00 | 1.47 |
| 20 | 4.68 | 0.15 | 4.83 | 0.74 | 0.00 | 0.74 |
| 19 | 4.64 | 0.32 | 4.96 | 0.98 | 0.25 | 1.23 |
| 18 | 5.94 | 0.55 | 6.49 | 0.98 | 0.00 | 0.98 |
| 17 | 5.03 | 0.40 | 5.43 | 1.23 | 0.25 | 1.47 |
| 16 | 9.24 | 0.46 | 9.70 | 1.47 | 0.73 | 2.20 |
| 15 | 7.44 | 0.79 | 8.23 | 1.47 | 0.00 | 1.47 |
| 14 | 6.13 | 0.61 | 6.74 | 1.47 | 0.49 | 1.96 |
| 13 | 8.76 | 0.35 | 9.11 | 0.98 | 1.23 | 2.21 |
| 12 | 11.49 | 0.82 | 12.31 | 2.21 | 0.25 | 2.45 |
| 11 | 0.00 | 0.98 | 0.98 | 2.21 | 0.25 | 2.45 |
| 10 | 7.44 | 0.59 | 8.03 | 0.98 | 0.49 | 1.47 |
| 9 | 11.43 | 0.73 | 12.16 | 3.19 | 0.00 | 3.19 |
| 8 | 0.00 | 1.85 | 1.85 | 6.13 | 0.74 | 6.86 |

| Waterline 2 U3 PP Frost Cumulative TPA | | | | | | |
|---|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 1.58 | 0.21 | 1.79 | 2.70 | 0.25 | 2.94 |
| 39 | 1.89 | 0.21 | 2.10 | 2.70 | 0.25 | 2.94 |
| 38 | 2.22 | 0.29 | 2.51 | 3.19 | 0.25 | 3.43 |
| 37 | 2.22 | 0.29 | 2.51 | 3.19 | 0.25 | 3.43 |
| 36 | 2.78 | 0.34 | 3.12 | 3.19 | 0.25 | 3.43 |
| 35 | 3.18 | 0.34 | 3.52 | 3.92 | 0.49 | 4.41 |
| 34 | 3.59 | 0.39 | 3.98 | 4.17 | 0.49 | 4.66 |
| 33 | 3.59 | 0.39 | 3.98 | 4.41 | 0.49 | 4.90 |
| 32 | 4.97 | 0.45 | 5.42 | 4.66 | 0.49 | 5.15 |
| 31 | 5.71 | 0.51 | 6.22 | 4.66 | 0.49 | 5.15 |
| 30 | 6.76 | 0.71 | 7.47 | 5.39 | 0.49 | 5.88 |
| 29 | 8.17 | 0.71 | 8.88 | 5.64 | 0.74 | 6.37 |
| 28 | 9.67 | 0.87 | 10.54 | 6.13 | 0.74 | 6.86 |
| 27 | 11.95 | 0.95 | 12.90 | 7.11 | 0.98 | 8.09 |
| 26 | 15.45 | 0.95 | 16.40 | 7.60 | 0.98 | 8.58 |
| 25 | 17.34 | 1.14 | 18.48 | 7.84 | 0.98 | 8.82 |
| 24 | 19.84 | 1.14 | 20.98 | 7.84 | 1.23 | 9.07 |
| 23 | 22.95 | 1.36 | 24.31 | 8.82 | 1.23 | 10.05 |
| 22 | 26.35 | 1.48 | 27.83 | 9.56 | 1.47 | 11.03 |
| 21 | 31.28 | 1.48 | 32.76 | 11.03 | 1.47 | 12.50 |
| 20 | 35.96 | 1.63 | 37.59 | 11.76 | 1.47 | 13.24 |
| 19 | 40.60 | 1.95 | 42.55 | 12.75 | 1.72 | 14.46 |
| 18 | 46.54 | 2.50 | 49.04 | 13.73 | 1.72 | 15.44 |
| 17 | 51.57 | 2.90 | 54.47 | 14.95 | 1.96 | 16.91 |
| 16 | 60.81 | 3.36 | 64.17 | 16.42 | 2.70 | 19.12 |
| 15 | 68.25 | 4.15 | 72.40 | 17.89 | 2.70 | 20.59 |
| 14 | 74.38 | 4.76 | 79.14 | 19.36 | 3.19 | 22.55 |
| 13 | 83.14 | 5.11 | 88.25 | 20.34 | 4.41 | 24.75 |
| 12 | 94.63 | 5.93 | 100.56 | 22.55 | 4.66 | 27.21 |
| 11 | 94.63 | 6.91 | 101.54 | 24.75 | 4.90 | 29.66 |
| 10 | 102.07 | 7.50 | 109.57 | 25.74 | 5.39 | 31.13 |
| 9 | 113.50 | 8.23 | 121.73 | 28.92 | 5.39 | 34.31 |
| 8 | 113.50 | 10.08 | 123.58 | 35.05 | 6.13 | 41.18 |

| Waterline 2 U5 GFFC Actual TPA | | | | | | |
|---------------------------------------|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.80 | 0.15 | 0.94 | 0.49 | 0.11 | 0.59 |
| 39 | 0.61 | 0.00 | 0.61 | 0.16 | 0.00 | 0.16 |
| 38 | 0.32 | 0.00 | 0.32 | 0.13 | 0.00 | 0.13 |
| 37 | 0.33 | 0.00 | 0.33 | 0.13 | 0.00 | 0.13 |
| 36 | 0.54 | 0.05 | 0.59 | 0.05 | 0.03 | 0.08 |
| 35 | 0.00 | 0.05 | 0.05 | 0.13 | 0.00 | 0.13 |
| 34 | 0.02 | 0.05 | 0.07 | 0.24 | 0.13 | 0.38 |
| 33 | 0.43 | 0.11 | 0.53 | 0.24 | 0.03 | 0.27 |
| 32 | 0.68 | 0.00 | 0.68 | 0.05 | 0.03 | 0.08 |
| 31 | 0.98 | 0.00 | 0.98 | 0.24 | 0.00 | 0.24 |
| 30 | 0.28 | 0.14 | 0.42 | 0.38 | 0.11 | 0.49 |
| 29 | 0.84 | 0.07 | 0.91 | 0.13 | 0.03 | 0.16 |
| 28 | 1.52 | 0.15 | 1.67 | 0.11 | 0.19 | 0.30 |
| 27 | 1.00 | 0.16 | 1.15 | 0.13 | 0.08 | 0.22 |
| 26 | 1.71 | 0.17 | 1.88 | 0.35 | 0.05 | 0.40 |
| 25 | 2.56 | 0.19 | 2.75 | 0.19 | 0.03 | 0.22 |
| 24 | 2.44 | 0.23 | 2.67 | 0.24 | 0.00 | 0.24 |
| 23 | 3.59 | 0.44 | 4.02 | 0.35 | 0.00 | 0.35 |
| 22 | 1.44 | 0.00 | 1.44 | 0.43 | 0.08 | 0.51 |
| 21 | 8.94 | 0.13 | 9.07 | 0.57 | 0.24 | 0.81 |
| 20 | 5.96 | 0.58 | 6.54 | 0.35 | 0.16 | 0.51 |
| 19 | 5.38 | 0.16 | 5.54 | 0.38 | 0.19 | 0.57 |
| 18 | 8.81 | 0.18 | 8.99 | 0.46 | 0.22 | 0.67 |
| 17 | 10.52 | 0.40 | 10.92 | 0.43 | 0.19 | 0.62 |
| 16 | 10.34 | 0.89 | 11.23 | 0.35 | 0.32 | 0.67 |
| 15 | 8.46 | 1.04 | 9.49 | 0.46 | 0.32 | 0.78 |
| 14 | 8.40 | 0.31 | 8.71 | 0.27 | 0.43 | 0.70 |
| 13 | 9.69 | 1.04 | 10.72 | 0.40 | 0.38 | 0.78 |
| 12 | 12.87 | 2.47 | 15.33 | 0.43 | 0.22 | 0.65 |
| 11 | 9.47 | 0.00 | 9.47 | 0.38 | 0.40 | 0.78 |
| 10 | 18.71 | 0.03 | 18.74 | 0.51 | 0.16 | 0.67 |
| 9 | 11.63 | 0.75 | 12.38 | 0.54 | 0.40 | 0.94 |
| 8 | 20.33 | 0.94 | 21.27 | 0.57 | 0.22 | 0.78 |

| Waterline 2 U5 GFFC Cumulative TPA | | | | | | |
|---|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.80 | 0.15 | 0.94 | 0.49 | 0.11 | 0.59 |
| 39 | 1.41 | 0.15 | 1.55 | 0.65 | 0.11 | 0.75 |
| 38 | 1.73 | 0.15 | 1.88 | 0.78 | 0.11 | 0.89 |
| 37 | 2.06 | 0.15 | 2.20 | 0.92 | 0.11 | 1.02 |
| 36 | 2.60 | 0.19 | 2.80 | 0.97 | 0.13 | 1.11 |
| 35 | 2.60 | 0.24 | 2.85 | 1.11 | 0.13 | 1.24 |
| 34 | 2.62 | 0.29 | 2.91 | 1.35 | 0.27 | 1.62 |
| 33 | 3.05 | 0.40 | 3.44 | 1.59 | 0.30 | 1.89 |
| 32 | 3.73 | 0.40 | 4.12 | 1.64 | 0.32 | 1.97 |
| 31 | 4.71 | 0.40 | 5.11 | 1.89 | 0.32 | 2.21 |
| 30 | 4.99 | 0.54 | 5.53 | 2.26 | 0.43 | 2.70 |
| 29 | 5.83 | 0.61 | 6.44 | 2.40 | 0.46 | 2.86 |
| 28 | 7.35 | 0.76 | 8.11 | 2.51 | 0.65 | 3.15 |
| 27 | 8.34 | 0.92 | 9.26 | 2.64 | 0.73 | 3.37 |
| 26 | 10.06 | 1.08 | 11.14 | 2.99 | 0.78 | 3.77 |
| 25 | 12.61 | 1.27 | 13.89 | 3.18 | 0.81 | 3.99 |
| 24 | 15.05 | 1.48 | 16.53 | 3.42 | 0.81 | 4.23 |
| 23 | 18.64 | 1.91 | 20.56 | 3.77 | 0.81 | 4.58 |
| 22 | 20.08 | 1.91 | 21.99 | 4.20 | 0.89 | 5.09 |
| 21 | 29.02 | 2.04 | 31.06 | 4.77 | 1.13 | 5.90 |
| 20 | 34.98 | 2.62 | 37.60 | 5.12 | 1.29 | 6.42 |
| 19 | 40.36 | 2.78 | 43.14 | 5.50 | 1.48 | 6.98 |
| 18 | 49.17 | 2.97 | 52.13 | 5.96 | 1.70 | 7.65 |
| 17 | 59.69 | 3.36 | 63.06 | 6.39 | 1.89 | 8.27 |
| 16 | 70.03 | 4.26 | 74.29 | 6.74 | 2.21 | 8.95 |
| 15 | 78.49 | 5.29 | 83.78 | 7.20 | 2.53 | 9.73 |
| 14 | 86.89 | 5.60 | 92.49 | 7.47 | 2.96 | 10.43 |
| 13 | 96.58 | 6.63 | 103.21 | 7.87 | 3.34 | 11.21 |
| 12 | 109.44 | 9.10 | 118.54 | 8.30 | 3.56 | 11.86 |
| 11 | 118.91 | 9.10 | 128.01 | 8.68 | 3.92 | 12.60 |
| 10 | 137.62 | 9.13 | 146.75 | 9.19 | 4.13 | 13.32 |
| 9 | 149.25 | 9.88 | 159.13 | 9.73 | 4.53 | 14.26 |
| 8 | 169.58 | 10.82 | 180.40 | 10.30 | 4.74 | 15.04 |

| Waterline 2 U5 PPDFC Actual TPA | | | | | | |
|--|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.47 | 0.03 | 0.49 | 0.00 | 0.00 | 0.00 |
| 39 | 0.11 | 0.00 | 0.11 | 0.00 | 0.00 | 0.00 |
| 38 | 0.06 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 |
| 37 | 0.06 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 |
| 36 | 0.10 | 0.01 | 0.11 | 0.00 | 0.00 | 0.00 |
| 35 | 0.00 | 0.01 | 0.01 | 0.22 | 0.00 | 0.22 |
| 34 | 0.43 | 0.01 | 0.44 | 0.00 | 0.00 | 0.00 |
| 33 | 0.08 | 0.02 | 0.10 | 0.00 | 0.00 | 0.00 |
| 32 | 0.14 | 0.00 | 0.14 | 0.22 | 0.00 | 0.22 |
| 31 | 0.70 | 0.08 | 0.78 | 0.11 | 0.00 | 0.11 |
| 30 | 0.61 | 0.11 | 0.72 | 0.34 | 0.00 | 0.34 |
| 29 | 0.75 | 0.10 | 0.85 | 0.11 | 0.00 | 0.11 |
| 28 | 0.91 | 0.13 | 1.04 | 0.45 | 0.11 | 0.56 |
| 27 | 1.89 | 0.03 | 1.92 | 0.11 | 0.00 | 0.11 |
| 26 | 0.69 | 0.14 | 0.83 | 0.34 | 0.22 | 0.56 |
| 25 | 0.92 | 0.15 | 1.07 | 0.67 | 0.00 | 0.67 |
| 24 | 0.98 | 0.04 | 1.02 | 0.22 | 0.00 | 0.22 |
| 23 | 1.63 | 0.08 | 1.72 | 0.90 | 0.11 | 1.01 |
| 22 | 0.88 | 0.01 | 0.89 | 1.01 | 0.22 | 1.23 |
| 21 | 3.41 | 0.02 | 3.44 | 1.35 | 0.00 | 1.35 |
| 20 | 5.60 | 0.29 | 5.89 | 0.90 | 0.00 | 0.90 |
| 19 | 5.23 | 0.24 | 5.47 | 1.57 | 0.00 | 1.57 |
| 18 | 7.08 | 0.29 | 7.36 | 1.12 | 0.11 | 1.23 |
| 17 | 7.23 | 0.07 | 7.30 | 1.46 | 0.00 | 1.46 |
| 16 | 11.86 | 0.18 | 12.04 | 1.12 | 0.34 | 1.46 |
| 15 | 8.42 | 0.92 | 9.35 | 1.91 | 0.34 | 2.24 |
| 14 | 8.43 | 0.46 | 8.89 | 1.68 | 0.11 | 1.79 |
| 13 | 10.79 | 0.66 | 11.46 | 1.35 | 0.11 | 1.46 |
| 12 | 8.09 | 2.50 | 10.59 | 0.90 | 0.34 | 1.23 |
| 11 | 4.31 | 0.06 | 4.37 | 0.78 | 0.22 | 1.01 |
| 10 | 9.16 | 0.74 | 9.90 | 0.67 | 0.34 | 1.01 |
| 9 | 9.13 | 1.19 | 10.33 | 1.01 | 0.45 | 1.46 |
| 8 | 16.00 | 1.31 | 17.31 | 1.79 | 0.11 | 1.91 |

| Waterline 2 U5 PPDFC Cumulative TPA | | | | | | |
|--|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.47 | 0.03 | 0.49 | 0.00 | 0.00 | 0.00 |
| 39 | 0.58 | 0.03 | 0.61 | 0.00 | 0.00 | 0.00 |
| 38 | 0.64 | 0.03 | 0.67 | 0.00 | 0.00 | 0.00 |
| 37 | 0.70 | 0.03 | 0.73 | 0.00 | 0.00 | 0.00 |
| 36 | 0.80 | 0.04 | 0.84 | 0.00 | 0.00 | 0.00 |
| 35 | 0.80 | 0.05 | 0.85 | 0.22 | 0.00 | 0.22 |
| 34 | 1.24 | 0.05 | 1.29 | 0.22 | 0.00 | 0.22 |
| 33 | 1.32 | 0.07 | 1.39 | 0.22 | 0.00 | 0.22 |
| 32 | 1.46 | 0.07 | 1.53 | 0.45 | 0.00 | 0.45 |
| 31 | 2.16 | 0.15 | 2.31 | 0.56 | 0.00 | 0.56 |
| 30 | 2.77 | 0.26 | 3.03 | 0.90 | 0.00 | 0.90 |
| 29 | 3.52 | 0.35 | 3.88 | 1.01 | 0.00 | 1.01 |
| 28 | 4.43 | 0.49 | 4.92 | 1.46 | 0.11 | 1.57 |
| 27 | 6.32 | 0.52 | 6.84 | 1.57 | 0.11 | 1.68 |
| 26 | 7.01 | 0.65 | 7.67 | 1.91 | 0.34 | 2.24 |
| 25 | 7.94 | 0.80 | 8.74 | 2.58 | 0.34 | 2.91 |
| 24 | 8.92 | 0.84 | 9.75 | 2.80 | 0.34 | 3.14 |
| 23 | 10.55 | 0.92 | 11.47 | 3.70 | 0.45 | 4.15 |
| 22 | 11.43 | 0.93 | 12.36 | 4.71 | 0.67 | 5.38 |
| 21 | 14.85 | 0.95 | 15.80 | 6.05 | 0.67 | 6.73 |
| 20 | 20.45 | 1.24 | 21.69 | 6.95 | 0.67 | 7.62 |
| 19 | 25.68 | 1.48 | 27.16 | 8.52 | 0.67 | 9.19 |
| 18 | 32.76 | 1.77 | 34.53 | 9.64 | 0.78 | 10.43 |
| 17 | 39.99 | 1.84 | 41.83 | 11.10 | 0.78 | 11.88 |
| 16 | 51.85 | 2.02 | 53.87 | 12.22 | 1.12 | 13.34 |
| 15 | 60.27 | 2.95 | 63.21 | 14.13 | 1.46 | 15.58 |
| 14 | 68.69 | 3.41 | 72.10 | 15.81 | 1.57 | 17.38 |
| 13 | 79.49 | 4.07 | 83.56 | 17.15 | 1.68 | 18.83 |
| 12 | 87.58 | 6.58 | 94.16 | 18.05 | 2.02 | 20.07 |
| 11 | 91.90 | 6.63 | 98.53 | 18.83 | 2.24 | 21.08 |
| 10 | 101.06 | 7.37 | 108.43 | 19.51 | 2.58 | 22.09 |
| 9 | 110.20 | 8.56 | 118.76 | 20.52 | 3.03 | 23.54 |
| 8 | 126.19 | 9.88 | 136.07 | 22.31 | 3.14 | 25.45 |

| Waterline 2 U7 NRF Actual TPA | | | | | | |
|--------------------------------------|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.52 | 0.04 | 0.56 | 0.64 | 0.00 | 0.64 |
| 39 | 0.25 | 0.00 | 0.25 | 0.00 | 0.00 | 0.00 |
| 38 | 0.13 | 0.00 | 0.13 | 0.21 | 0.00 | 0.21 |
| 37 | 0.14 | 0.04 | 0.18 | 0.00 | 0.00 | 0.00 |
| 36 | 0.15 | 0.00 | 0.15 | 0.00 | 0.21 | 0.21 |
| 35 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 34 | 0.17 | 0.00 | 0.17 | 0.00 | 0.00 | 0.00 |
| 33 | 0.72 | 0.00 | 0.72 | 0.85 | 0.00 | 0.85 |
| 32 | 0.57 | 0.06 | 0.63 | 0.21 | 0.00 | 0.21 |
| 31 | 0.20 | 0.00 | 0.20 | 0.21 | 0.00 | 0.21 |
| 30 | 0.42 | 0.06 | 0.48 | 0.21 | 0.00 | 0.21 |
| 29 | 0.69 | 0.00 | 0.69 | 0.00 | 0.00 | 0.00 |
| 28 | 1.25 | 0.15 | 1.40 | 0.00 | 0.00 | 0.00 |
| 27 | 0.53 | 0.08 | 0.61 | 0.43 | 0.00 | 0.43 |
| 26 | 1.16 | 0.16 | 1.32 | 0.43 | 0.21 | 0.64 |
| 25 | 0.31 | 0.00 | 0.31 | 0.00 | 0.21 | 0.21 |
| 24 | 2.36 | 0.10 | 2.46 | 0.43 | 0.00 | 0.43 |
| 23 | 0.72 | 0.22 | 0.94 | 0.85 | 0.21 | 1.07 |
| 22 | 3.19 | 0.00 | 3.19 | 1.07 | 0.00 | 1.07 |
| 21 | 3.99 | 0.13 | 4.12 | 1.28 | 0.21 | 1.50 |
| 20 | 3.89 | 0.58 | 4.47 | 0.43 | 0.43 | 0.85 |
| 19 | 3.73 | 0.00 | 3.73 | 1.28 | 0.00 | 1.28 |
| 18 | 4.25 | 0.18 | 4.43 | 1.07 | 0.21 | 1.28 |
| 17 | 6.78 | 0.61 | 7.39 | 0.43 | 0.21 | 0.64 |
| 16 | 4.45 | 0.44 | 4.89 | 0.21 | 0.00 | 0.21 |
| 15 | 5.25 | 0.53 | 5.78 | 0.64 | 0.21 | 0.85 |
| 14 | 12.75 | 0.87 | 13.62 | 0.64 | 0.00 | 0.64 |
| 13 | 11.22 | 0.68 | 11.90 | 0.64 | 0.43 | 1.07 |
| 12 | 6.84 | 3.22 | 10.06 | 0.85 | 0.00 | 0.85 |
| 11 | 6.06 | 1.94 | 8.00 | 0.43 | 0.21 | 0.64 |
| 10 | 7.90 | 1.73 | 9.63 | 0.21 | 0.64 | 0.85 |
| 9 | 19.46 | 1.50 | 20.96 | 0.85 | 0.43 | 1.28 |
| 8 | 31.88 | 4.48 | 36.36 | 2.35 | 0.00 | 2.35 |

| Waterline 2 U7 NRF Cumulative TPA | | | | | | |
|--|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.52 | 0.04 | 0.56 | 0.64 | 0.00 | 0.64 |
| 39 | 0.77 | 0.04 | 0.81 | 0.64 | 0.00 | 0.64 |
| 38 | 0.90 | 0.04 | 0.94 | 0.85 | 0.00 | 0.85 |
| 37 | 1.04 | 0.08 | 1.12 | 0.85 | 0.00 | 0.85 |
| 36 | 1.19 | 0.08 | 1.27 | 0.85 | 0.21 | 1.07 |
| 35 | 1.19 | 0.08 | 1.27 | 0.85 | 0.21 | 1.07 |
| 34 | 1.36 | 0.08 | 1.44 | 0.85 | 0.21 | 1.07 |
| 33 | 2.08 | 0.08 | 2.16 | 1.71 | 0.21 | 1.92 |
| 32 | 2.65 | 0.14 | 2.79 | 1.92 | 0.21 | 2.14 |
| 31 | 2.85 | 0.14 | 2.99 | 2.14 | 0.21 | 2.35 |
| 30 | 3.27 | 0.20 | 3.47 | 2.35 | 0.21 | 2.56 |
| 29 | 3.96 | 0.20 | 4.16 | 2.35 | 0.21 | 2.56 |
| 28 | 5.21 | 0.35 | 5.56 | 2.35 | 0.21 | 2.56 |
| 27 | 5.74 | 0.43 | 6.17 | 2.78 | 0.21 | 2.99 |
| 26 | 6.90 | 0.59 | 7.49 | 3.21 | 0.43 | 3.63 |
| 25 | 7.21 | 0.59 | 7.80 | 3.21 | 0.64 | 3.85 |
| 24 | 9.57 | 0.69 | 10.26 | 3.63 | 0.64 | 4.27 |
| 23 | 10.29 | 0.91 | 11.20 | 4.49 | 0.85 | 5.34 |
| 22 | 13.48 | 0.91 | 14.39 | 5.56 | 0.85 | 6.41 |
| 21 | 17.47 | 1.04 | 18.51 | 6.84 | 1.07 | 7.91 |
| 20 | 21.36 | 1.62 | 22.89 | 7.26 | 1.50 | 8.76 |
| 19 | 25.09 | 1.62 | 26.71 | 8.55 | 1.50 | 10.04 |
| 18 | 29.34 | 1.80 | 31.14 | 9.62 | 1.71 | 11.32 |
| 17 | 36.12 | 2.41 | 38.53 | 10.04 | 1.92 | 11.97 |
| 16 | 40.57 | 2.85 | 43.42 | 10.26 | 1.92 | 12.18 |
| 15 | 45.82 | 3.38 | 49.20 | 10.90 | 2.14 | 13.03 |
| 14 | 58.57 | 4.25 | 62.82 | 11.54 | 2.14 | 13.68 |
| 13 | 69.79 | 4.93 | 74.72 | 12.18 | 2.56 | 14.74 |
| 12 | 76.63 | 8.15 | 84.78 | 13.03 | 2.56 | 15.60 |
| 11 | 82.69 | 10.09 | 92.78 | 13.46 | 2.78 | 16.24 |
| 10 | 90.59 | 11.82 | 102.41 | 13.68 | 3.42 | 17.09 |
| 9 | 110.05 | 13.32 | 123.37 | 14.53 | 3.85 | 18.38 |
| 8 | 141.93 | 17.80 | 159.73 | 16.88 | 3.85 | 20.73 |

| Waterline 2 U7 GFFC Actual TPA | | | | | | |
|---------------------------------------|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.76 | 0.06 | 0.82 | 0.95 | 0.13 | 1.08 |
| 39 | 0.22 | 0.00 | 0.22 | 0.13 | 0.00 | 0.13 |
| 38 | 0.27 | 0.00 | 0.27 | 0.07 | 0.00 | 0.07 |
| 37 | 0.07 | 0.02 | 0.08 | 0.07 | 0.00 | 0.07 |
| 36 | 0.07 | 0.00 | 0.07 | 0.00 | 0.00 | 0.00 |
| 35 | 0.26 | 0.03 | 0.29 | 0.16 | 0.10 | 0.26 |
| 34 | 0.36 | 0.03 | 0.39 | 0.13 | 0.00 | 0.13 |
| 33 | 0.34 | 0.00 | 0.34 | 0.23 | 0.00 | 0.23 |
| 32 | 0.27 | 0.03 | 0.30 | 0.46 | 0.07 | 0.52 |
| 31 | 0.42 | 0.00 | 0.42 | 0.13 | 0.00 | 0.13 |
| 30 | 0.38 | 0.03 | 0.41 | 0.13 | 0.00 | 0.13 |
| 29 | 0.51 | 0.00 | 0.51 | 0.26 | 0.07 | 0.33 |
| 28 | 1.18 | 0.12 | 1.30 | 0.33 | 0.03 | 0.36 |
| 27 | 0.25 | 0.04 | 0.29 | 0.29 | 0.00 | 0.29 |
| 26 | 1.93 | 0.08 | 2.01 | 0.23 | 0.07 | 0.29 |
| 25 | 0.90 | 0.00 | 0.90 | 0.16 | 0.00 | 0.16 |
| 24 | 2.76 | 0.25 | 3.01 | 0.33 | 0.13 | 0.46 |
| 23 | 1.81 | 0.10 | 1.91 | 0.46 | 0.13 | 0.59 |
| 22 | 3.41 | 0.16 | 3.57 | 0.26 | 0.13 | 0.39 |
| 21 | 4.38 | 0.33 | 4.70 | 0.62 | 0.07 | 0.69 |
| 20 | 5.35 | 0.37 | 5.72 | 0.62 | 0.10 | 0.72 |
| 19 | 5.60 | 0.22 | 5.82 | 0.42 | 0.07 | 0.49 |
| 18 | 4.92 | 0.32 | 5.24 | 0.98 | 0.20 | 1.18 |
| 17 | 7.52 | 1.50 | 9.02 | 0.95 | 0.29 | 1.24 |
| 16 | 5.75 | 0.51 | 6.26 | 0.82 | 0.29 | 1.11 |
| 15 | 6.01 | 0.60 | 6.61 | 0.52 | 0.29 | 0.82 |
| 14 | 10.70 | 0.81 | 11.51 | 0.78 | 0.59 | 1.37 |
| 13 | 12.59 | 1.24 | 13.82 | 0.52 | 0.52 | 1.05 |
| 12 | 6.33 | 2.86 | 9.20 | 0.56 | 0.29 | 0.85 |
| 11 | 8.19 | 1.24 | 9.43 | 0.88 | 0.56 | 1.44 |
| 10 | 11.69 | 0.81 | 12.51 | 0.91 | 0.26 | 1.18 |
| 9 | 14.54 | 3.11 | 17.65 | 1.37 | 0.26 | 1.63 |
| 8 | 22.04 | 2.72 | 24.75 | 2.42 | 0.33 | 2.74 |

| Waterline 2 U7 GFFC Cumulative TPA | | | | | | |
|---|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.76 | 0.06 | 0.82 | 0.95 | 0.13 | 1.08 |
| 39 | 0.98 | 0.06 | 1.04 | 1.08 | 0.13 | 1.21 |
| 38 | 1.26 | 0.06 | 1.31 | 1.14 | 0.13 | 1.27 |
| 37 | 1.32 | 0.07 | 1.40 | 1.21 | 0.13 | 1.34 |
| 36 | 1.39 | 0.07 | 1.47 | 1.21 | 0.13 | 1.34 |
| 35 | 1.65 | 0.11 | 1.76 | 1.37 | 0.23 | 1.60 |
| 34 | 2.01 | 0.14 | 2.14 | 1.50 | 0.23 | 1.73 |
| 33 | 2.35 | 0.14 | 2.48 | 1.73 | 0.23 | 1.96 |
| 32 | 2.61 | 0.17 | 2.78 | 2.19 | 0.29 | 2.48 |
| 31 | 3.04 | 0.17 | 3.20 | 2.32 | 0.29 | 2.61 |
| 30 | 3.41 | 0.19 | 3.61 | 2.45 | 0.29 | 2.74 |
| 29 | 3.92 | 0.19 | 4.12 | 2.71 | 0.36 | 3.07 |
| 28 | 5.10 | 0.31 | 5.42 | 3.04 | 0.39 | 3.43 |
| 27 | 5.35 | 0.35 | 5.70 | 3.33 | 0.39 | 3.72 |
| 26 | 7.29 | 0.43 | 7.71 | 3.56 | 0.46 | 4.02 |
| 25 | 8.19 | 0.43 | 8.61 | 3.72 | 0.46 | 4.18 |
| 24 | 10.95 | 0.67 | 11.62 | 4.05 | 0.59 | 4.64 |
| 23 | 12.75 | 0.78 | 13.53 | 4.51 | 0.72 | 5.23 |
| 22 | 16.17 | 0.94 | 17.10 | 4.77 | 0.85 | 5.62 |
| 21 | 20.54 | 1.26 | 21.81 | 5.39 | 0.91 | 6.30 |
| 20 | 25.89 | 1.63 | 27.52 | 6.01 | 1.01 | 7.02 |
| 19 | 31.49 | 1.85 | 33.34 | 6.43 | 1.08 | 7.51 |
| 18 | 36.41 | 2.17 | 38.58 | 7.41 | 1.27 | 8.69 |
| 17 | 43.93 | 3.67 | 47.60 | 8.36 | 1.57 | 9.93 |
| 16 | 49.68 | 4.18 | 53.86 | 9.18 | 1.86 | 11.04 |
| 15 | 55.69 | 4.78 | 60.47 | 9.70 | 2.16 | 11.85 |
| 14 | 66.39 | 5.59 | 71.97 | 10.48 | 2.74 | 13.23 |
| 13 | 78.97 | 6.82 | 85.80 | 11.01 | 3.27 | 14.27 |
| 12 | 85.31 | 9.69 | 94.99 | 11.56 | 3.56 | 15.12 |
| 11 | 93.50 | 10.92 | 104.42 | 12.44 | 4.11 | 16.56 |
| 10 | 105.19 | 11.74 | 116.93 | 13.36 | 4.38 | 17.73 |
| 9 | 119.73 | 14.85 | 134.58 | 14.73 | 4.64 | 19.37 |
| 8 | 141.77 | 17.56 | 159.33 | 17.15 | 4.96 | 22.11 |

| King Mountain U4 NRF Actual TPA | | | | | | |
|--|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 1.14 | 0.23 | 1.36 | 0.60 | 0.54 | 1.14 |
| 39 | 0.15 | 0.00 | 0.15 | 0.20 | 0.20 | 0.40 |
| 38 | 0.31 | 0.00 | 0.31 | 0.07 | 0.00 | 0.07 |
| 37 | 0.18 | 0.04 | 0.22 | 0.34 | 0.13 | 0.47 |
| 36 | 0.52 | 0.31 | 0.83 | 0.13 | 0.07 | 0.20 |
| 35 | 0.19 | 0.05 | 0.24 | 0.20 | 0.20 | 0.40 |
| 34 | 0.00 | 0.00 | 0.00 | 0.34 | 0.07 | 0.40 |
| 33 | 0.20 | 0.05 | 0.25 | 0.13 | 0.07 | 0.20 |
| 32 | 0.46 | 0.34 | 0.80 | 0.27 | 0.13 | 0.40 |
| 31 | 0.47 | 0.00 | 0.47 | 0.07 | 0.07 | 0.13 |
| 30 | 1.01 | 0.38 | 1.40 | 0.20 | 0.07 | 0.27 |
| 29 | 0.28 | 0.07 | 0.35 | 0.07 | 0.20 | 0.27 |
| 28 | 1.18 | 0.00 | 1.18 | 0.40 | 0.20 | 0.60 |
| 27 | 0.98 | 0.16 | 1.14 | 0.07 | 0.40 | 0.47 |
| 26 | 2.39 | 0.09 | 2.47 | 0.20 | 0.27 | 0.47 |
| 25 | 1.87 | 0.18 | 2.05 | 0.47 | 0.54 | 1.01 |
| 24 | 1.99 | 0.59 | 2.59 | 0.27 | 0.67 | 0.94 |
| 23 | 0.90 | 0.33 | 1.23 | 0.20 | 0.34 | 0.54 |
| 22 | 2.83 | 0.35 | 3.18 | 0.40 | 0.67 | 1.07 |
| 21 | 3.24 | 0.38 | 3.63 | 0.20 | 1.01 | 1.21 |
| 20 | 6.93 | 1.56 | 8.49 | 0.47 | 0.60 | 1.07 |
| 19 | 2.77 | 0.81 | 3.58 | 0.40 | 0.34 | 0.74 |
| 18 | 3.90 | 1.15 | 5.05 | 1.28 | 0.87 | 2.15 |
| 17 | 4.86 | 0.81 | 5.67 | 0.87 | 1.01 | 1.88 |
| 16 | 7.29 | 1.13 | 8.42 | 1.07 | 0.94 | 2.01 |
| 15 | 0.38 | 0.67 | 1.06 | 1.34 | 1.14 | 2.48 |
| 14 | 7.55 | 1.60 | 9.15 | 1.34 | 1.21 | 2.55 |
| 13 | 15.58 | 0.53 | 16.11 | 1.34 | 1.28 | 2.62 |
| 12 | 8.94 | 2.00 | 10.94 | 2.21 | 1.54 | 3.76 |
| 11 | 19.22 | 1.37 | 20.59 | 2.42 | 0.54 | 2.95 |
| 10 | 7.44 | 1.44 | 8.88 | 2.82 | 0.94 | 3.76 |
| 9 | 20.78 | 1.07 | 21.84 | 3.49 | 1.48 | 4.97 |
| 8 | 25.93 | 2.34 | 28.27 | 5.23 | 1.28 | 6.51 |

| King Mountain U4 NRF Cumulative TPA | | | | | | |
|--|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 1.14 | 0.23 | 1.36 | 0.60 | 0.54 | 1.14 |
| 39 | 1.29 | 0.23 | 1.52 | 0.81 | 0.74 | 1.54 |
| 38 | 1.60 | 0.23 | 1.82 | 0.87 | 0.74 | 1.61 |
| 37 | 1.77 | 0.26 | 2.04 | 1.21 | 0.87 | 2.08 |
| 36 | 2.30 | 0.57 | 2.87 | 1.34 | 0.94 | 2.28 |
| 35 | 2.49 | 0.62 | 3.11 | 1.54 | 1.14 | 2.68 |
| 34 | 2.49 | 0.62 | 3.11 | 1.88 | 1.21 | 3.09 |
| 33 | 0.20 | 0.66 | 0.86 | 2.01 | 1.28 | 3.29 |
| 32 | 3.15 | 1.01 | 4.16 | 2.28 | 1.41 | 3.69 |
| 31 | 3.62 | 1.01 | 4.62 | 2.35 | 1.48 | 3.83 |
| 30 | 4.63 | 1.39 | 6.02 | 2.55 | 1.54 | 4.09 |
| 29 | 4.90 | 1.46 | 6.37 | 2.62 | 1.74 | 4.36 |
| 28 | 6.09 | 1.46 | 7.55 | 3.02 | 1.95 | 4.97 |
| 27 | 7.06 | 1.62 | 8.69 | 3.09 | 2.35 | 5.44 |
| 26 | 9.45 | 1.71 | 11.16 | 3.29 | 2.62 | 5.91 |
| 25 | 11.32 | 1.89 | 13.21 | 3.76 | 3.15 | 6.91 |
| 24 | 13.31 | 2.48 | 15.79 | 4.03 | 3.83 | 7.85 |
| 23 | 14.21 | 2.81 | 17.02 | 4.23 | 4.16 | 8.39 |
| 22 | 17.04 | 3.16 | 20.21 | 4.63 | 4.83 | 9.46 |
| 21 | 20.29 | 3.55 | 23.83 | 4.83 | 5.84 | 10.67 |
| 20 | 27.22 | 5.11 | 32.33 | 5.30 | 6.44 | 11.74 |
| 19 | 29.98 | 5.92 | 35.90 | 5.70 | 6.78 | 12.48 |
| 18 | 33.88 | 7.07 | 40.96 | 6.98 | 7.65 | 14.63 |
| 17 | 38.75 | 7.88 | 46.63 | 7.85 | 8.66 | 16.51 |
| 16 | 46.04 | 9.01 | 55.05 | 8.93 | 9.60 | 18.52 |
| 15 | 46.42 | 9.69 | 56.11 | 10.27 | 10.74 | 21.01 |
| 14 | 53.98 | 11.29 | 65.26 | 11.61 | 11.95 | 23.56 |
| 13 | 69.56 | 11.82 | 81.38 | 12.95 | 13.22 | 26.17 |
| 12 | 78.50 | 13.82 | 92.32 | 15.17 | 14.77 | 29.93 |
| 11 | 97.72 | 15.19 | 112.91 | 17.58 | 15.30 | 32.89 |
| 10 | 105.16 | 16.64 | 121.79 | 20.40 | 16.24 | 36.64 |
| 9 | 125.93 | 17.70 | 143.63 | 23.89 | 17.72 | 41.61 |
| 8 | 151.86 | 20.04 | 171.91 | 29.13 | 18.99 | 48.12 |

| King Mountain U4 SubAF Cryic Warm Actual TPA | | | | | | |
|---|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 1.06 | 0.21 | 1.27 | 0.61 | 0.61 | 1.23 |
| 39 | 0.13 | 0.00 | 0.13 | 0.00 | 0.31 | 0.31 |
| 38 | 0.27 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 |
| 37 | 0.18 | 0.03 | 0.21 | 0.92 | 0.00 | 0.92 |
| 36 | 0.46 | 0.27 | 0.73 | 0.00 | 0.31 | 0.31 |
| 35 | 0.17 | 0.04 | 0.21 | 0.31 | 0.31 | 0.61 |
| 34 | 0.00 | 0.00 | 0.00 | 1.53 | 1.53 | 3.07 |
| 33 | 0.18 | 0.04 | 0.22 | 0.61 | 0.00 | 0.61 |
| 32 | 0.43 | 0.32 | 0.75 | 1.23 | 0.61 | 1.84 |
| 31 | 0.41 | 0.00 | 0.41 | 0.92 | 0.92 | 1.84 |
| 30 | 0.89 | 0.35 | 1.24 | 0.61 | 0.00 | 0.61 |
| 29 | 0.24 | 0.08 | 0.32 | 0.61 | 0.00 | 0.61 |
| 28 | 1.11 | 0.00 | 1.11 | 0.31 | 1.23 | 1.53 |
| 27 | 0.94 | 0.16 | 1.10 | 1.23 | 0.31 | 1.53 |
| 26 | 2.18 | 0.08 | 2.26 | 0.00 | 0.31 | 0.31 |
| 25 | 1.69 | 0.16 | 1.85 | 0.00 | 0.31 | 0.31 |
| 24 | 1.76 | 0.54 | 2.30 | 0.31 | 0.31 | 0.61 |
| 23 | 0.85 | 0.30 | 1.15 | 0.00 | 0.31 | 0.31 |
| 22 | 2.61 | 0.31 | 2.92 | 0.31 | 0.00 | 0.31 |
| 21 | 3.18 | 0.34 | 3.52 | 0.00 | 0.00 | 0.00 |
| 20 | 6.39 | 1.38 | 7.76 | 0.31 | 0.00 | 0.31 |
| 19 | 3.15 | 0.79 | 3.95 | 0.31 | 0.31 | 0.61 |
| 18 | 4.39 | 1.28 | 5.67 | 0.31 | 0.31 | 0.61 |
| 17 | 4.78 | 0.79 | 5.56 | 0.00 | 0.31 | 0.31 |
| 16 | 7.31 | 1.08 | 8.38 | 0.00 | 0.31 | 0.31 |
| 15 | 1.33 | 1.03 | 2.37 | 0.92 | 0.31 | 1.23 |
| 14 | 7.96 | 1.77 | 9.73 | 0.31 | 0.31 | 0.61 |
| 13 | 15.73 | 0.98 | 16.71 | 0.61 | 0.00 | 0.61 |
| 12 | 11.02 | 2.91 | 13.92 | 0.92 | 0.31 | 1.23 |
| 11 | 21.89 | 2.23 | 24.12 | 0.31 | 0.61 | 0.92 |
| 10 | 8.23 | 1.76 | 9.99 | 1.53 | 0.31 | 1.84 |
| 9 | 21.71 | 1.90 | 23.61 | 0.00 | 0.61 | 0.61 |
| 8 | 26.92 | 3.56 | 30.48 | 1.53 | 0.61 | 2.15 |

| King Mountain U4 SubAF Cryic Warm Cumulative TPA | | | | | | |
|---|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 1.06 | 0.21 | 1.27 | 0.61 | 0.61 | 1.23 |
| 39 | 1.19 | 0.21 | 1.40 | 0.61 | 0.92 | 1.53 |
| 38 | 1.46 | 0.21 | 1.67 | 0.61 | 0.92 | 1.53 |
| 37 | 1.64 | 0.25 | 1.89 | 1.53 | 0.92 | 2.45 |
| 36 | 2.10 | 0.52 | 2.62 | 1.53 | 1.23 | 2.76 |
| 35 | 2.27 | 0.56 | 2.83 | 1.84 | 1.53 | 3.37 |
| 34 | 2.27 | 0.56 | 2.83 | 3.37 | 3.07 | 6.44 |
| 33 | 2.44 | 0.60 | 3.04 | 3.99 | 3.07 | 7.06 |
| 32 | 2.88 | 0.92 | 3.80 | 5.21 | 3.68 | 8.90 |
| 31 | 3.29 | 0.92 | 4.21 | 6.13 | 4.60 | 10.74 |
| 30 | 4.18 | 1.27 | 5.45 | 6.75 | 4.60 | 11.35 |
| 29 | 4.42 | 1.35 | 5.77 | 7.36 | 4.60 | 11.96 |
| 28 | 5.53 | 1.35 | 6.88 | 7.67 | 5.83 | 13.50 |
| 27 | 6.47 | 1.51 | 7.98 | 8.90 | 6.13 | 15.03 |
| 26 | 8.65 | 1.58 | 10.24 | 8.90 | 6.44 | 15.34 |
| 25 | 10.34 | 1.74 | 12.09 | 8.90 | 6.75 | 15.64 |
| 24 | 12.10 | 2.29 | 14.39 | 9.20 | 7.06 | 16.26 |
| 23 | 12.95 | 2.59 | 15.54 | 9.20 | 7.36 | 16.56 |
| 22 | 15.56 | 2.90 | 18.46 | 9.51 | 7.36 | 16.87 |
| 21 | 18.74 | 3.24 | 21.98 | 9.51 | 7.36 | 16.87 |
| 20 | 25.12 | 4.62 | 29.74 | 9.82 | 7.36 | 17.18 |
| 19 | 28.28 | 5.41 | 33.69 | 10.12 | 7.67 | 17.79 |
| 18 | 32.67 | 6.69 | 39.36 | 10.43 | 7.98 | 18.40 |
| 17 | 37.45 | 7.47 | 44.92 | 10.43 | 8.28 | 18.71 |
| 16 | 44.75 | 8.55 | 53.30 | 10.43 | 8.59 | 19.02 |
| 15 | 46.08 | 9.58 | 55.67 | 11.35 | 8.90 | 20.25 |
| 14 | 54.05 | 11.35 | 65.40 | 11.66 | 9.20 | 20.86 |
| 13 | 69.78 | 12.33 | 82.11 | 12.27 | 9.20 | 21.47 |
| 12 | 80.80 | 15.23 | 96.03 | 13.19 | 9.51 | 22.70 |
| 11 | 102.69 | 17.46 | 120.15 | 13.50 | 10.12 | 23.62 |
| 10 | 110.92 | 19.23 | 130.14 | 15.03 | 10.43 | 25.46 |
| 9 | 132.63 | 21.12 | 153.76 | 15.03 | 11.04 | 26.07 |
| 8 | 159.55 | 24.68 | 184.24 | 16.56 | 11.66 | 28.22 |

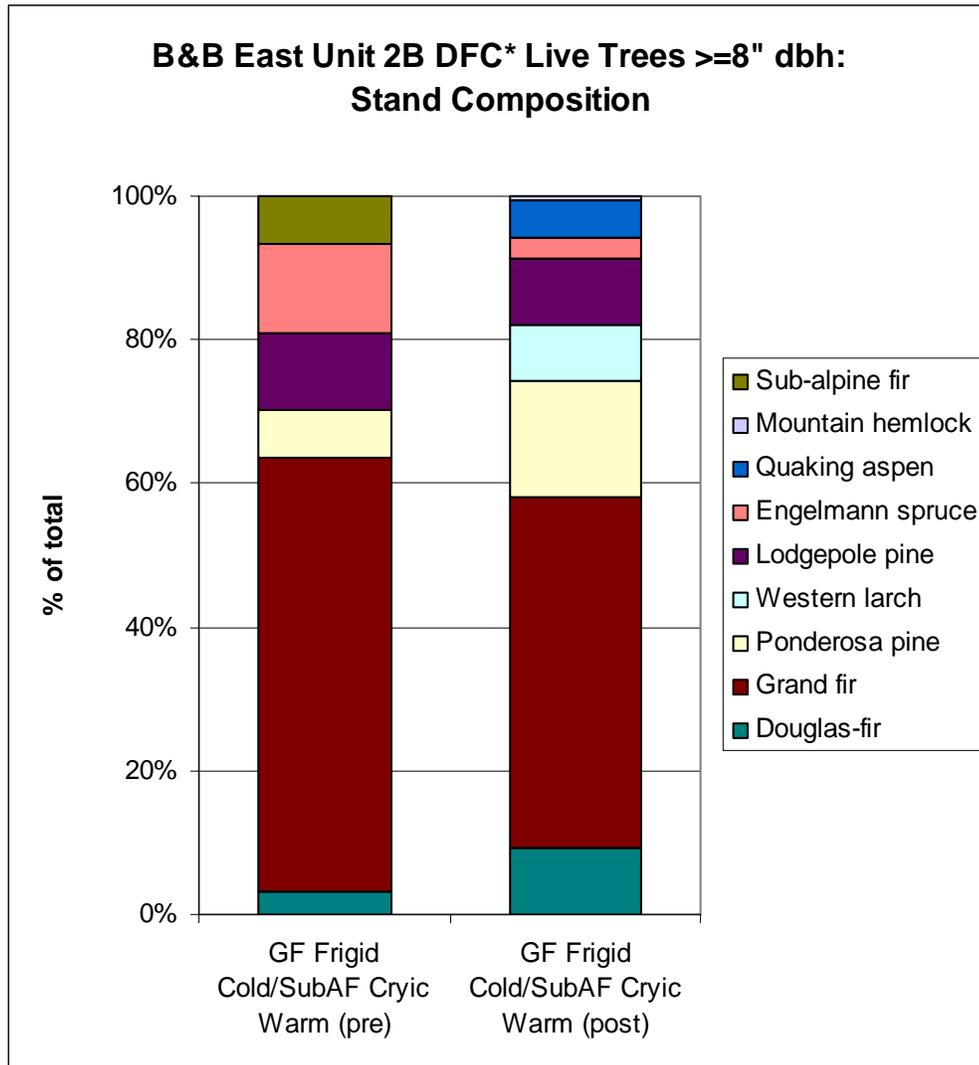
| King Mountain U5 NRF Actual TPA | | | | | | |
|--|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.26 | 0.02 | 0.27 | 1.12 | 0.23 | 1.35 |
| 39 | 0.01 | 0.00 | 0.01 | 0.03 | 0.03 | 0.06 |
| 38 | 0.02 | 0.00 | 0.02 | 0.23 | 0.03 | 0.26 |
| 37 | 0.10 | 0.00 | 0.10 | 0.12 | 0.00 | 0.12 |
| 36 | 0.04 | 0.12 | 0.15 | 0.17 | 0.12 | 0.29 |
| 35 | 0.21 | 0.00 | 0.21 | 0.20 | 0.12 | 0.32 |
| 34 | 0.10 | 0.00 | 0.10 | 0.23 | 0.06 | 0.29 |
| 33 | 0.01 | 0.00 | 0.02 | 0.20 | 0.03 | 0.23 |
| 32 | 0.27 | 0.02 | 0.29 | 0.03 | 0.12 | 0.14 |
| 31 | 0.28 | 0.00 | 0.28 | 0.23 | 0.06 | 0.29 |
| 30 | 0.07 | 0.03 | 0.10 | 0.29 | 0.03 | 0.32 |
| 29 | 0.16 | 0.00 | 0.16 | 0.17 | 0.12 | 0.29 |
| 28 | 0.39 | 0.00 | 0.39 | 0.12 | 0.12 | 0.23 |
| 27 | 0.57 | 0.01 | 0.58 | 0.14 | 0.12 | 0.26 |
| 26 | 0.52 | 0.01 | 0.53 | 0.40 | 0.09 | 0.49 |
| 25 | 0.71 | 0.11 | 0.82 | 0.26 | 0.14 | 0.40 |
| 24 | 0.97 | 0.04 | 1.01 | 0.26 | 0.20 | 0.46 |
| 23 | 0.29 | 0.25 | 0.53 | 0.20 | 0.37 | 0.58 |
| 22 | 2.15 | 0.03 | 2.17 | 0.32 | 0.09 | 0.40 |
| 21 | 0.48 | 0.03 | 0.51 | 0.37 | 0.23 | 0.60 |
| 20 | 1.39 | 0.42 | 1.81 | 0.29 | 0.46 | 0.75 |
| 19 | 3.46 | 0.22 | 3.68 | 0.29 | 0.37 | 0.66 |
| 18 | 3.18 | 0.08 | 3.25 | 0.23 | 0.40 | 0.63 |
| 17 | 1.97 | 0.26 | 2.23 | 0.12 | 0.69 | 0.81 |
| 16 | 2.34 | 1.26 | 3.60 | 0.29 | 0.29 | 0.58 |
| 15 | 5.79 | 0.58 | 6.36 | 0.12 | 0.66 | 0.78 |
| 14 | 3.59 | 0.40 | 3.99 | 0.32 | 0.60 | 0.92 |
| 13 | 8.10 | 1.07 | 9.16 | 0.26 | 0.40 | 0.66 |
| 12 | 12.07 | 1.83 | 13.89 | 0.20 | 0.60 | 0.81 |
| 11 | 12.21 | 1.53 | 13.74 | 0.29 | 0.46 | 0.75 |
| 10 | 7.42 | 0.74 | 8.16 | 0.66 | 0.75 | 1.41 |
| 9 | 14.57 | 0.78 | 15.34 | 0.75 | 0.78 | 1.52 |
| 8 | 20.84 | 1.17 | 22.01 | 1.09 | 0.35 | 1.44 |

| King Mountain U5 NRF Cumulative TPA | | | | | | |
|--|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 0.26 | 0.02 | 0.27 | 1.12 | 0.23 | 1.35 |
| 39 | 0.27 | 0.02 | 0.28 | 1.15 | 0.26 | 1.41 |
| 38 | 0.29 | 0.02 | 0.31 | 1.38 | 0.29 | 1.67 |
| 37 | 0.39 | 0.02 | 0.40 | 1.50 | 0.29 | 1.78 |
| 36 | 0.42 | 0.13 | 0.56 | 1.67 | 0.40 | 2.07 |
| 35 | 0.63 | 0.14 | 0.77 | 1.87 | 0.52 | 2.39 |
| 34 | 0.74 | 0.14 | 0.87 | 2.10 | 0.58 | 2.68 |
| 33 | 0.75 | 0.14 | 0.89 | 2.30 | 0.60 | 2.91 |
| 32 | 1.01 | 0.16 | 1.18 | 2.33 | 0.72 | 3.05 |
| 31 | 1.29 | 0.16 | 1.45 | 2.56 | 0.78 | 3.34 |
| 30 | 1.36 | 0.19 | 1.55 | 2.85 | 0.81 | 3.65 |
| 29 | 1.52 | 0.20 | 1.72 | 3.02 | 0.92 | 3.94 |
| 28 | 1.91 | 0.20 | 2.11 | 3.14 | 1.04 | 4.17 |
| 27 | 2.48 | 0.21 | 2.69 | 3.28 | 1.15 | 4.43 |
| 26 | 3.01 | 0.21 | 3.22 | 3.68 | 1.24 | 4.92 |
| 25 | 3.72 | 0.32 | 4.04 | 3.94 | 1.38 | 5.32 |
| 24 | 4.69 | 0.36 | 5.05 | 4.20 | 1.58 | 5.78 |
| 23 | 4.98 | 0.61 | 5.58 | 4.40 | 1.96 | 6.36 |
| 22 | 7.12 | 0.63 | 7.76 | 4.72 | 2.04 | 6.76 |
| 21 | 7.61 | 0.66 | 8.27 | 5.09 | 2.27 | 7.36 |
| 20 | 9.00 | 1.08 | 10.08 | 5.38 | 2.73 | 8.11 |
| 19 | 12.46 | 1.30 | 13.76 | 5.67 | 3.11 | 8.77 |
| 18 | 15.64 | 1.38 | 17.02 | 5.90 | 3.51 | 9.41 |
| 17 | 17.60 | 1.64 | 19.24 | 6.01 | 4.20 | 10.21 |
| 16 | 19.94 | 2.90 | 22.85 | 6.30 | 4.49 | 10.79 |
| 15 | 25.73 | 3.48 | 29.21 | 6.42 | 5.15 | 11.57 |
| 14 | 29.32 | 3.88 | 33.20 | 6.73 | 5.75 | 12.49 |
| 13 | 37.41 | 4.95 | 42.36 | 6.99 | 6.16 | 13.15 |
| 12 | 49.48 | 6.78 | 56.26 | 7.19 | 6.76 | 13.95 |
| 11 | 61.69 | 8.31 | 70.00 | 7.48 | 7.22 | 14.70 |
| 10 | 69.11 | 9.05 | 78.16 | 8.14 | 7.97 | 16.11 |
| 9 | 83.67 | 9.83 | 93.50 | 8.89 | 8.75 | 17.64 |
| 8 | 104.52 | 11.00 | 115.51 | 9.98 | 9.09 | 19.07 |

| King Mountain U5 GFFC Actual TPA | | | | | | |
|---|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 1.17 | 0.23 | 1.40 | 0.00 | 1.22 | 1.22 |
| 39 | 0.16 | 0.00 | 0.16 | 1.22 | 0.00 | 1.22 |
| 38 | 0.32 | 0.00 | 0.32 | 0.00 | 0.00 | 0.00 |
| 37 | 0.18 | 0.04 | 0.22 | 0.00 | 0.00 | 0.00 |
| 36 | 0.55 | 0.32 | 0.87 | 0.00 | 0.00 | 0.00 |
| 35 | 0.20 | 0.05 | 0.25 | 0.00 | 0.00 | 0.00 |
| 34 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 33 | 0.21 | 0.05 | 0.26 | 0.00 | 0.00 | 0.00 |
| 32 | 0.47 | 0.35 | 0.82 | 0.00 | 0.00 | 0.00 |
| 31 | 0.49 | 0.00 | 0.49 | 0.00 | 0.00 | 0.00 |
| 30 | 1.06 | 0.40 | 1.46 | 0.00 | 0.00 | 0.00 |
| 29 | 0.29 | 0.07 | 0.36 | 0.00 | 0.00 | 0.00 |
| 28 | 1.21 | 0.00 | 1.21 | 0.00 | 0.00 | 0.00 |
| 27 | 0.99 | 0.16 | 1.15 | 0.00 | 0.00 | 0.00 |
| 26 | 2.47 | 0.09 | 2.56 | 0.00 | 0.00 | 0.00 |
| 25 | 1.94 | 0.19 | 2.13 | 0.00 | 0.00 | 0.00 |
| 24 | 2.09 | 0.61 | 2.70 | 0.00 | 0.00 | 0.00 |
| 23 | 0.92 | 0.34 | 1.26 | 0.00 | 2.44 | 2.44 |
| 22 | 2.92 | 0.37 | 3.29 | 0.00 | 1.22 | 1.22 |
| 21 | 3.27 | 0.40 | 3.67 | 0.00 | 0.00 | 0.00 |
| 20 | 7.15 | 1.64 | 8.79 | 0.00 | 0.00 | 0.00 |
| 19 | 2.61 | 0.82 | 3.43 | 1.22 | 0.00 | 1.22 |
| 18 | 3.70 | 1.10 | 4.80 | 0.00 | 0.00 | 0.00 |
| 17 | 4.90 | 0.82 | 5.72 | 0.00 | 0.00 | 0.00 |
| 16 | 7.29 | 1.15 | 8.44 | 0.00 | 0.00 | 0.00 |
| 15 | 0.00 | 0.53 | 0.53 | 0.00 | 0.00 | 0.00 |
| 14 | 7.39 | 1.53 | 8.92 | 0.00 | 0.00 | 0.00 |
| 13 | 15.52 | 0.35 | 15.87 | 0.00 | 0.00 | 0.00 |
| 12 | 8.10 | 1.64 | 9.74 | 0.00 | 1.22 | 1.22 |
| 11 | 18.14 | 1.03 | 19.17 | 1.22 | 0.00 | 1.22 |
| 10 | 7.12 | 1.31 | 8.43 | 0.00 | 0.00 | 0.00 |
| 9 | 20.40 | 0.73 | 21.13 | 2.44 | 1.22 | 3.66 |
| 8 | 25.53 | 1.85 | 27.38 | 0.00 | 0.00 | 0.00 |

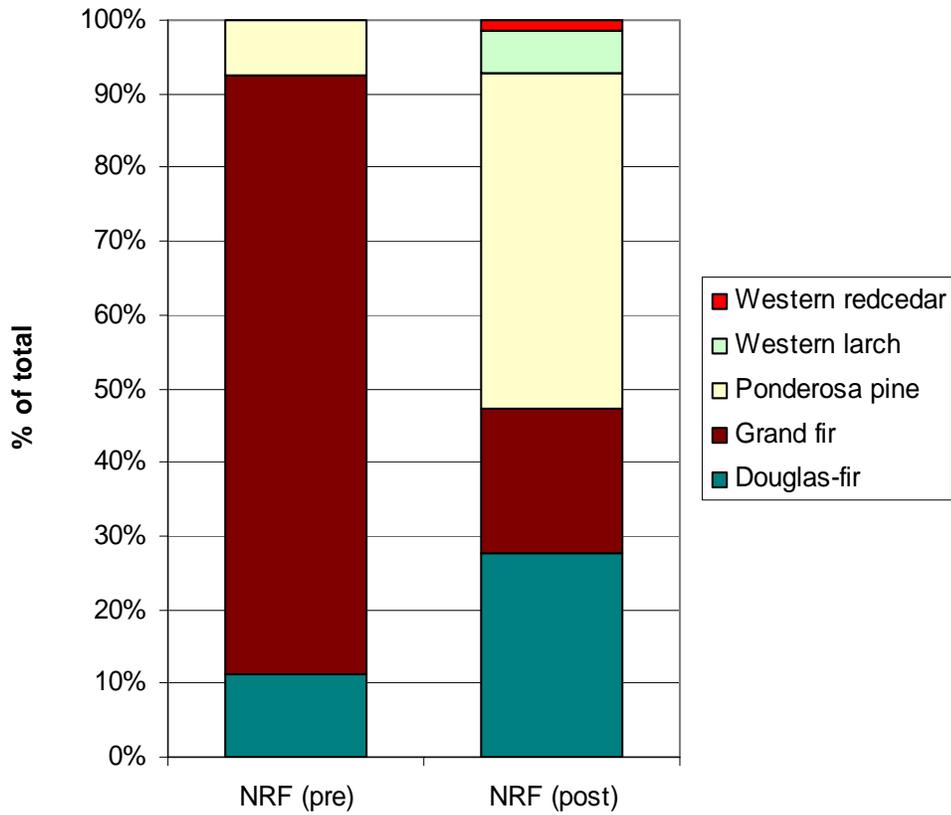
| King Mountain U5 GFFC Cumulative TPA | | | | | | |
|---|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| dbh (inches) | Pre- Harvest Live | Pre- Harvest Dead | Pre- Harvest Total | Post- Harvest Live | Post- Harvest Dead | Post- Harvest Total |
| 40+ | 1.17 | 0.23 | 1.40 | 0.00 | 1.22 | 1.22 |
| 39 | 1.33 | 0.23 | 1.56 | 1.22 | 1.22 | 2.44 |
| 38 | 1.65 | 0.23 | 1.88 | 1.22 | 1.22 | 2.44 |
| 37 | 1.83 | 0.27 | 2.10 | 1.22 | 1.22 | 2.44 |
| 36 | 2.38 | 0.59 | 2.97 | 1.22 | 1.22 | 2.44 |
| 35 | 2.58 | 0.64 | 3.22 | 1.22 | 1.22 | 2.44 |
| 34 | 2.58 | 0.64 | 3.22 | 1.22 | 1.22 | 2.44 |
| 33 | 2.79 | 0.69 | 3.48 | 1.22 | 1.22 | 2.44 |
| 32 | 3.26 | 1.04 | 4.30 | 1.22 | 1.22 | 2.44 |
| 31 | 3.75 | 1.04 | 4.79 | 1.22 | 1.22 | 2.44 |
| 30 | 4.81 | 1.44 | 6.25 | 1.22 | 1.22 | 2.44 |
| 29 | 5.10 | 1.51 | 6.61 | 1.22 | 1.22 | 2.44 |
| 28 | 6.31 | 1.51 | 7.82 | 1.22 | 1.22 | 2.44 |
| 27 | 7.30 | 1.67 | 8.97 | 1.22 | 1.22 | 2.44 |
| 26 | 9.77 | 1.76 | 11.53 | 1.22 | 1.22 | 2.44 |
| 25 | 11.71 | 1.95 | 13.66 | 1.22 | 1.22 | 2.44 |
| 24 | 13.80 | 2.56 | 16.36 | 1.22 | 1.22 | 2.44 |
| 23 | 14.72 | 2.90 | 17.62 | 1.22 | 3.66 | 4.88 |
| 22 | 17.64 | 3.27 | 20.91 | 1.22 | 4.88 | 6.10 |
| 21 | 20.91 | 3.67 | 24.58 | 1.22 | 4.88 | 6.10 |
| 20 | 28.06 | 5.31 | 33.37 | 1.22 | 4.88 | 6.10 |
| 19 | 30.67 | 6.13 | 36.80 | 2.44 | 4.88 | 7.32 |
| 18 | 34.37 | 7.23 | 41.60 | 2.44 | 4.88 | 7.32 |
| 17 | 39.27 | 8.05 | 47.32 | 2.44 | 4.88 | 7.32 |
| 16 | 46.56 | 9.20 | 55.76 | 2.44 | 4.88 | 7.32 |
| 15 | 46.56 | 9.73 | 56.29 | 2.44 | 4.88 | 7.32 |
| 14 | 53.95 | 11.26 | 65.21 | 2.44 | 4.88 | 7.32 |
| 13 | 69.47 | 11.61 | 81.08 | 2.44 | 4.88 | 7.32 |
| 12 | 77.57 | 13.25 | 90.82 | 2.44 | 6.10 | 8.54 |
| 11 | 95.71 | 14.28 | 109.99 | 3.66 | 6.10 | 9.76 |
| 10 | 102.83 | 15.59 | 118.42 | 3.66 | 6.10 | 9.76 |
| 9 | 123.23 | 16.32 | 139.55 | 6.10 | 7.32 | 13.41 |
| 8 | 148.76 | 18.17 | 166.93 | 6.10 | 7.32 | 13.41 |

Appendix 3D. Stand Composition Graphs

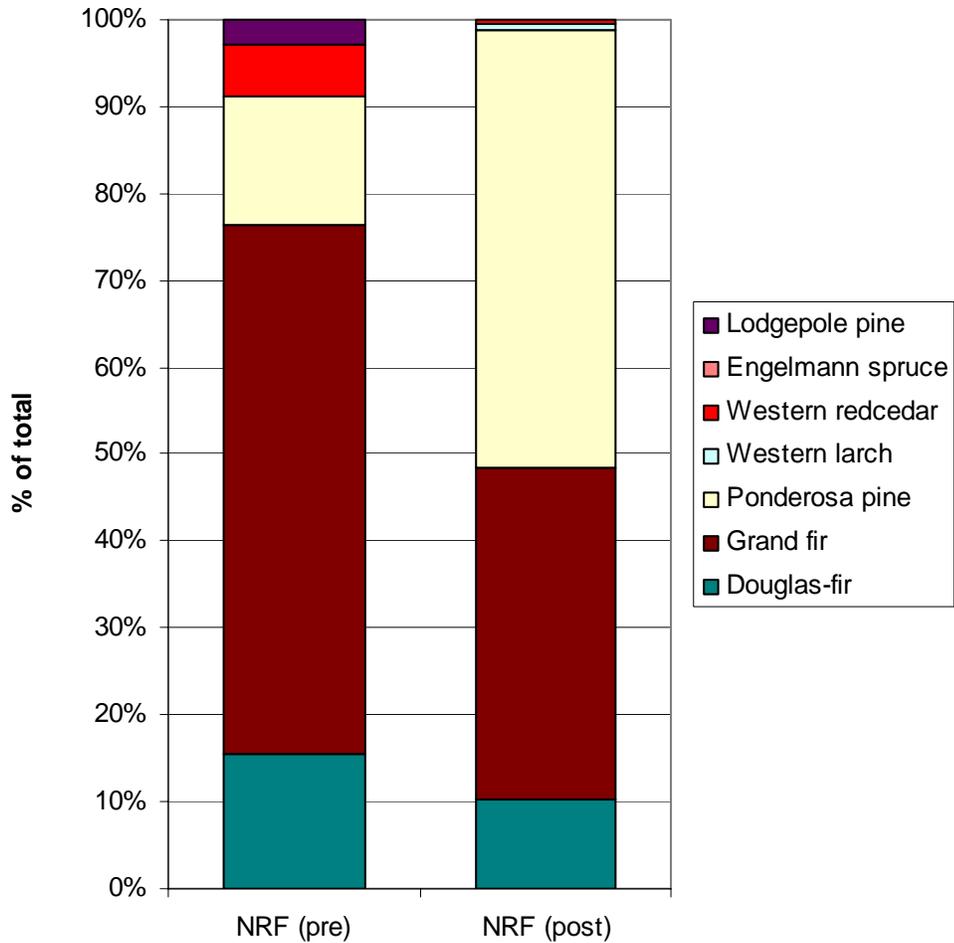


*Due to a data collection error, no distinction was made between the two DFC vegetation series when gathering post-harvest data for this unit.

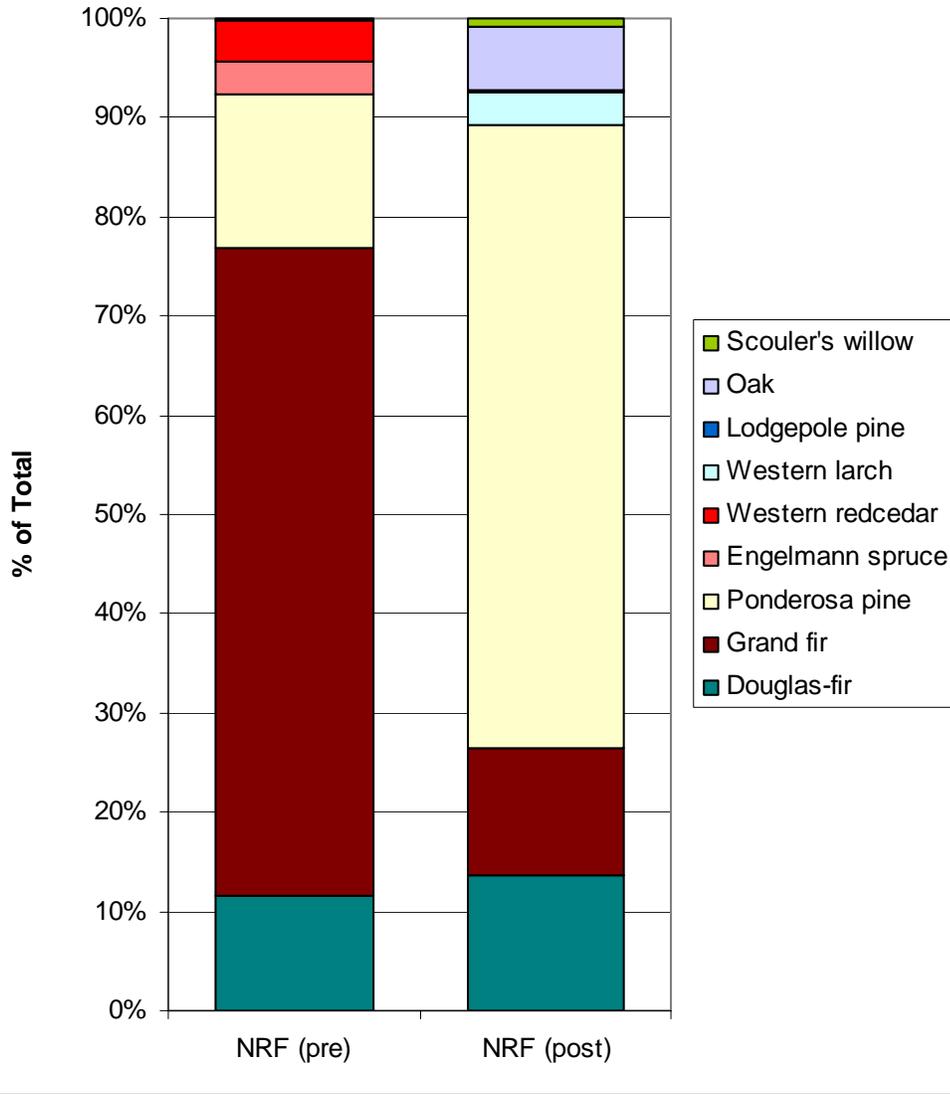
B&B West Unit 3B Live Trees ≥ 8 " dbh: Stand Composition



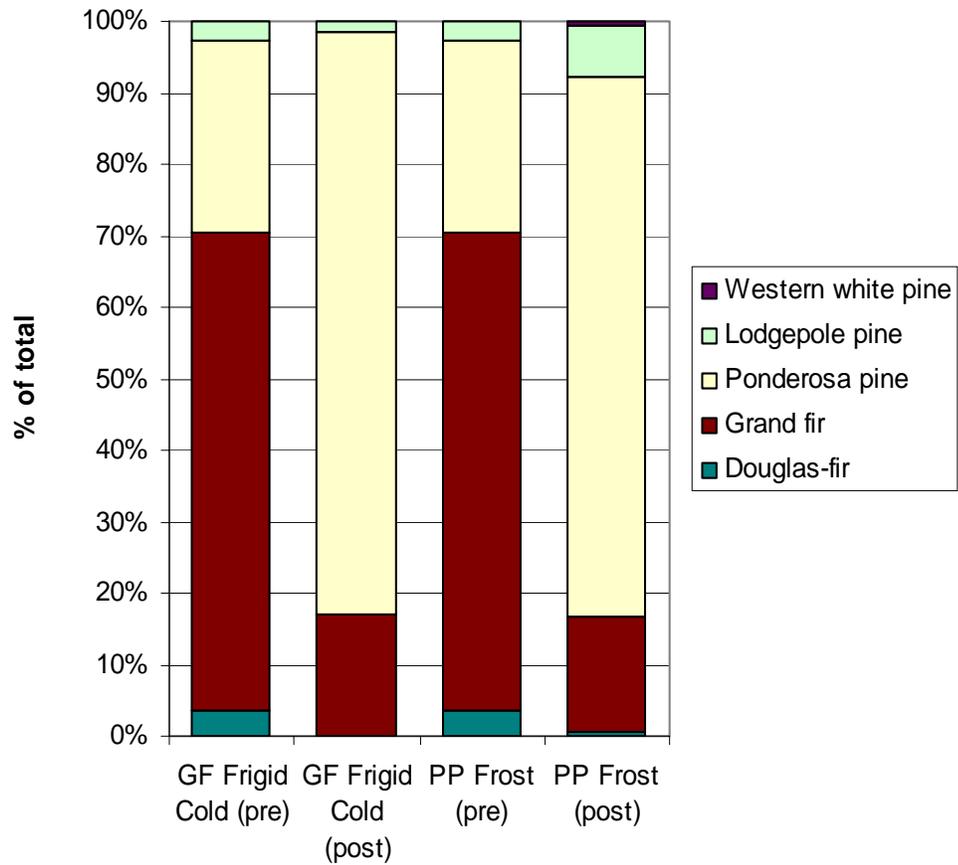
B&B East Unit 4B Live Trees \geq 8" dbh: Stand Composition



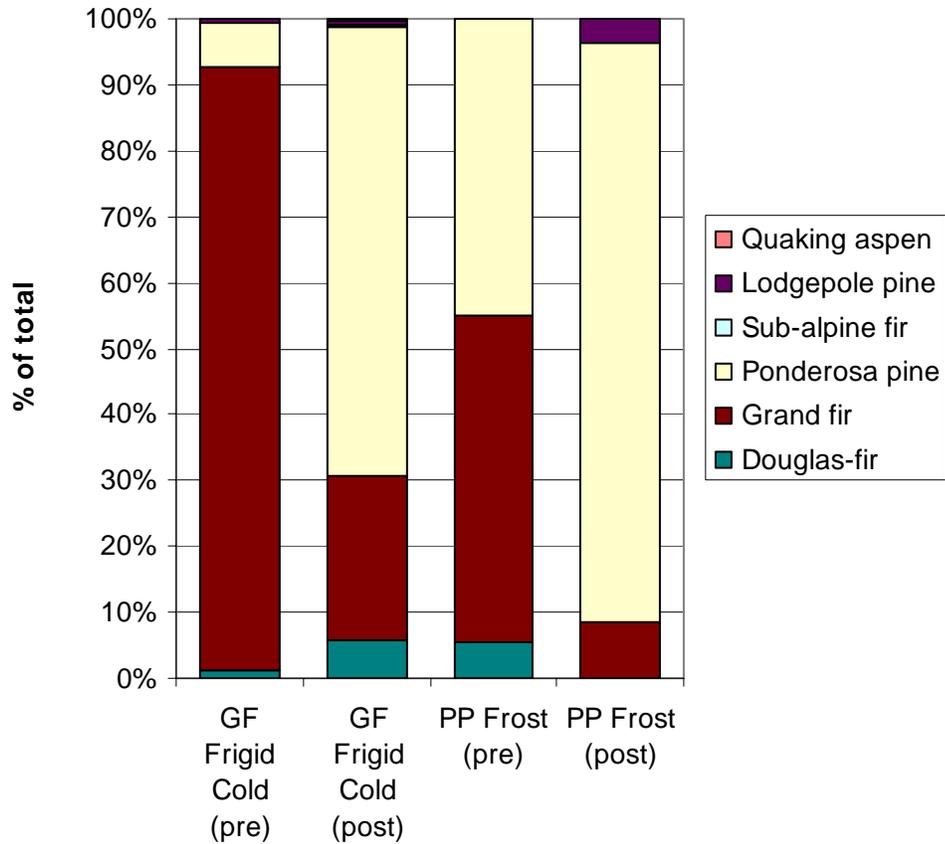
B&B East Unit 8 Live Trees >= 8" dbh: Stand Composition



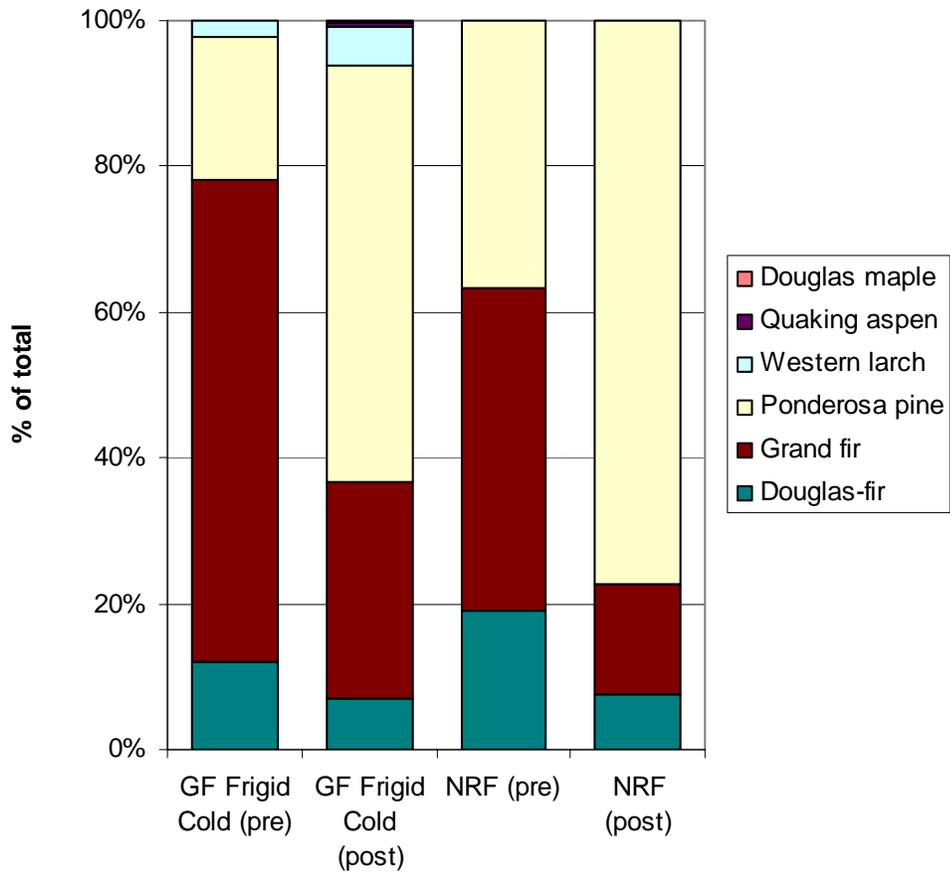
Waterline 2 Unit 3 Live Trees >=8" dbh: Stand Composition



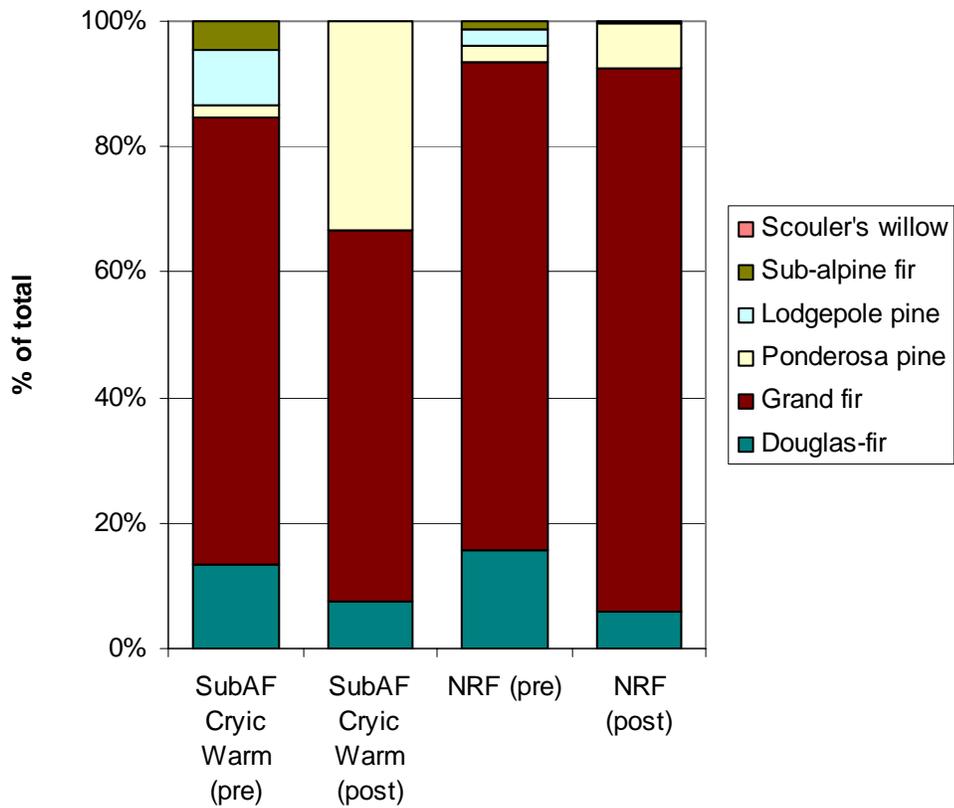
Waterline 2 Unit 5 Live Trees ≥ 8 " dbh: Stand Composition



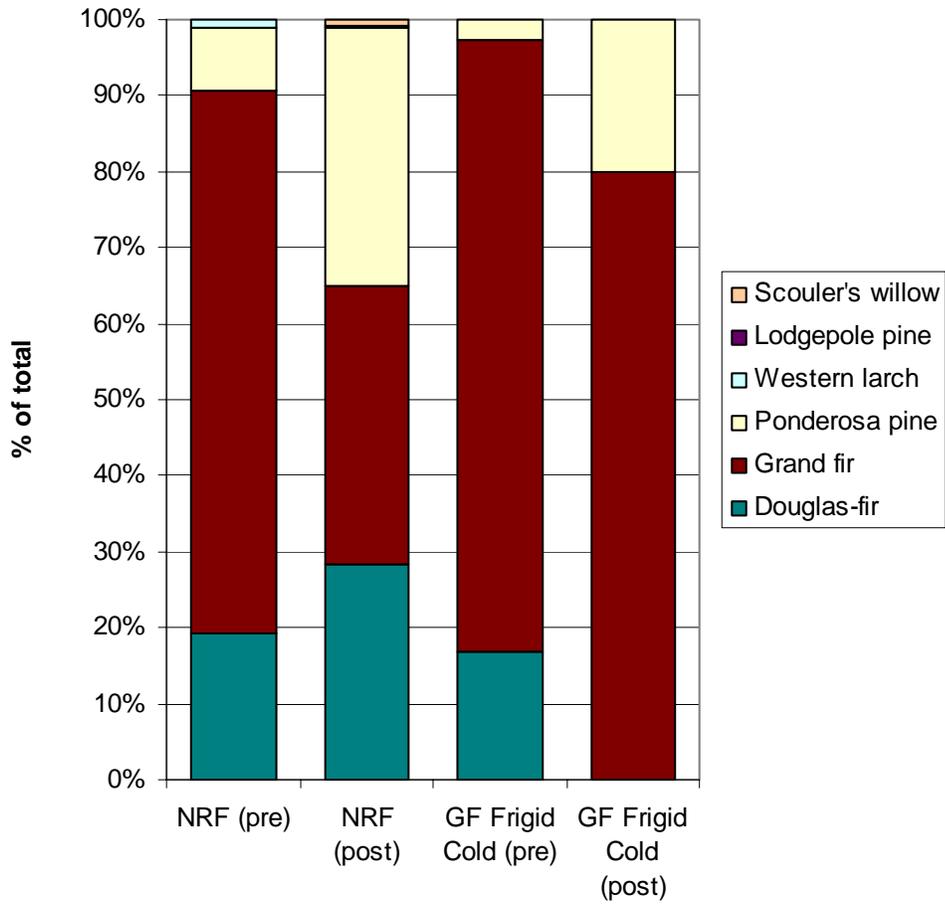
Waterline 2 Unit 7 Live Tree ≥ 8 " dbh: Stand Composition

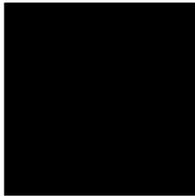


King Mountain Unit 4 Live Trees ≥ 8 " dbh: Stand Composition



King Mountain Unit 5 Live Trees >= 8" dbh: Stand Composition





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