

DYNAMIC ASPEN DENSITY EXPERIMENT

ANNUAL REPORT

December 31, 2010



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1.0 DADE Project Background

The current Regeneration Standards of Alberta (RSA) mandate that the same forest type, same RSA stratum, should be created after harvest on the forested landbase. One approach to regenerating aspen and white spruce mixedwoods (CD or DC broad cover groups) was to promote pure white spruce plantations on some portions of the harvested areas while the remaining portions of the cutblocks were allowed to regenerate to pure aspen with the hopes that the resulting stands would grow sufficient timber to support annual allowable cuts. The continuation of this approach to mixedwood regeneration will result in a highly aggregated (patchy) distribution of tree species across the managed forest landscape with unknown effects on timber production, habitat quality, and biodiversity values. The resulting stands are usually two story stands with the overstory aspen overtopping the understory white spruce.

Research in the boreal mixedwoods suggests that the effects of the overstory aspen (beneficial and competitive) on the shade tolerant white spruce will vary throughout the life of a stand. One major factor that affects the understory white spruce is the density of the overstory aspen. A set of Dynamic Density trials is required, where density management treatments are applied at different stand ages, to assess the role of aspen density related effects on understory white spruce at different stages of development in juvenile mixedwood stands.

1.1 DADE Project Initiation

In 2007, the Mixedwood Management Association of Alberta (MWMA), a co-operative of 10 Alberta forest companies, in collaboration with the University of Alberta and Alberta Sustainable Resource Development (SRD), initiated a 5-year project for the development of a Dynamic Aspen Density Experiment (DADE).

The objectives of the experiment are to:

- Identify the thresholds in aspen density that determine Stand Condition (Symbiotic, Commensal, Competitive) during each of two Stand Development Stages (17 and 22 years of age).
- Determine the survival and growth of white spruce and aspen in different Stand Conditions during each of two Stand Development Stages.
- Determine the opportunity cost to aspen production of optimizing spruce survival and growth.
- Provide credible data with which to evaluate and further improve the Reforestation Standards of Alberta for mixtures of spruce and aspen.

1.2 DADE Project Design

The original intent of the DADE project was to establish five installations in each combination of 17 and 22 year old stands in the Central Mixedwood, and Lower Foothills Ecoregions. This would result in a total of 20 Installations.

Table 1. DADE Project Design Table

		STAND AGE	
		17 Years	22 Years
ECOREGION	Central Mixedwood	1.	1.
		2.	2.
		3.	3.
		4.	4.
		5.	5.
	Lower Foothills	1.	1.
		2.	2.
		3.	3.
		4.	4.
		5.	5.

In 2007, four plots were established according to Table 2.

Table 2. DADE Project Design Table at end of 2007 Field Season

		STAND AGE	
		17 Years	22 Years
ECOREGION	Central Mixedwood	1. CM 17-1	1. CM 22-1
		2. CM 17-2	2. CM 22-2
		3.	3.
		4.	4.
		5.	5.
	Lower Foothills	1.	1.
		2.	2.
		3.	3.
		4.	4.
		5.	5.

Following the 2008 Season, five Installations in the Central Mixedwood Ecoregion that were 22 years old were added to the Matrix.

Table 3. DADE Project Design at end of 2008 Field Season

		STAND AGE	
		17 Years	22 Years
ECOREGION	Central Mixedwood	1. CM 17-1	1. CM 22-1
		2. CM 17-2	2. CM 22-2
		3.	3. CM 22-3
		4.	4. CM 22-4
		5.	5. CM 22-5
		6.	6. CM 22-6
		7.	7. CM 22-7
	Lower Foothills	1.	1.
		2.	2.
		3.	3.
		4.	4.
		5.	5.

Following the 2009 Season, the MWMA members decided to drop the Lower Foothills Ecoregion from the project Matrix and to balance the Central Mixedwood Ecoregion part of the Matrix. As a result five new installations were added in the 17 years old blocks in the Central Mixedwood Ecoregion. Table 4 presents the Matrix at the end of the 2009 Season, while the 2009 DADE Annual Report presents the steps taken in selecting these 5 installations.

Table 4. Project Design Table at End of 2009 Field Season

		STAND AGE	
		17 Years	22 Years
ECOREGION	Central Mixedwood	1. CM 17-1	1. CM 22-1
		2. CM 17-2	2. CM 22-2
		3. CM 17-3	3. CM 22-3
		4. CM 17-4	4. CM 22-4
		5. CM 17-5	5. CM 22-5
		6. CM 17-6	6. CM 22-6
		7. CM 17-7	7. CM 22-7

2.0 2010 DADE Project Activities

This DADE Annual Report documents the activities that occurred during 2010. For information on 2007, 2008, and 2009 activities and measurement protocol, please refer to the corresponding DADE Annual Report or DADE Project Manual.

2.1. Revision of DADE Project Manual

There were no revisions to the DADE Project Manual in 2010. The 2009 DADE Project Manual was used for all the 2010 re-measurements.

2.2. Personnel

- Willi Fast, The Forestry Corp.

As Science Director Willi Fast was the lead in project design and implementation for the Dynamic Aspen Density Experiment. As well, Willi was responsible for the daily project administration and management and was the contact for any questions by the field staff. He spent time in the field reviewing block selections, plot establishment and measurement/re-measurement procedures. Willi was also responsible for overseeing all reporting and data analysis following the field season.

- Gitte Grover, Alberta-Pacific Forest Industries Ltd.

Gitte Grover provided direction in block selection and design implementation and analysis. She accompanied Willi Fast during project review in the field.

- Vic Lieffers, University of Alberta.

Vic Lieffers provided technical direction in project design, block selection and field protocol. Vic aided in development of the Spruce Thinning Protocol.

- Ken Stadt, University of Alberta.

Ken Stadt also provided scientific direction throughout the Spruce Thinning Protocol during field visits and phone meetings.

- Stacy Bergheim, University of Alberta

Stacy Bergheim was responsible for the daily office administration and accounting of the project. Stacy also assisted in the double-entry keypunching of the 2010 field data.

- Murray Fowler, The Forestry Corp

Murray Fowler's responsibilities included field duties associated with training the field cruise and the quality checks for the project.

- Benchmark Environmental

Benchmark Environmental were hired to do all the field work including thinning and remeasuring 4 installations established in 2007 (CM-17-1, CM-17-2, CM-22-1, CM-22-2).

- Yanguo Qin, The Forestry Corp.

Yanguo Qin was responsible for updating the 2010 DADE database. Yanguo also did all the analysis using the DADE database (GYPSY version 1.0 and MGM 2009A4 projections).

- Cosmin Tansanu, The Forestry Corp.

Cosmin Tansanu was responsible for preparing the field tally sheets for the field crews, training, and writing the 2010 Annual Report.

2.3 Acquisition of Equipment

Supplies from the previous year were used in the 2010 field season (paint, tags, wire).

A four wheel drive truck was leased through Driving Force Vehicle Rentals for the field training session (September).

2.4 Changes to Procedures in 2010

The 2010 protocol remained the same as the 2009 protocol.

2.4.1 Plot Installation

No changes were made in the plot installation protocol in 2010. No new installations were completed in 2010.

2.4.2 Plot Re-Measurement

No changes were made in plot measurement/re-measurement procedures in 2010. Four installations were re-measured in September 2010: CM-17-01, CM-17-02, CM-22-1, CM-22-2.

2.4.3. Deciduous Thinning

No changes were made to deciduous maintenance protocols in 2010.

2.4.4. Installation Maintenance Documentation.

There were no changes to the Installation Maintenance Form in 2010.

2.4.6. Database Record Keeping Protocol

Following the 2010 field season (4 installations re-measured), new data were added to the database (first re-measurements) as well as corrections were made to address some procedural changes as well as mistakes made mainly during the first year of plot establishment. The cleaned 2010 database includes measurements at establishment for all the installations as well as first re-measurements for 4 installations. A record of the changes is located in the Database History Table.

The re-measurement data for installation CM-22-01, destroyed by herbicide (see Section 2.5), were also included in the database.

2.5. Herbicide Damage to Three DADE Installations (CM-22-01, CM-22-03, CM-22-04)

During the September 2010 field re-measurement season a large number of aspen trees were found dead. The unusual number of dead trees was firstly identified by Murray Fowler during the Quality Control checks. Initial investigation by Gitte Grover (Chair, MWMA) and Willi Fast (Scientific Director, MWMA) lead to discussion with Dave Flynn from Bushmen Enterprises, who suspected that he may have undertaken a triclopyr basal bark herbicide project in the area of the Calling Lake DADE trials. When provided with DADE installation details, he confirmed that his herbicide project did occur in the Maintaining our Forests (MOF) block within which three DADE installations were located.

Dave indicated that he had undertaken the herbicide project under contract with FRIAA, and had in turn sub-contracted the actual herbicide application to Spectrum Resource Group Inc. (Spectrum). Kyle Robillard from Spectrum confirmed that Spectrum had indeed applied triclopyr through the MOF block where the DADE installations were established.

Alberta Sustainable Resource Development (ASRD), Lac La Biche, received a herbicide project application from Bushmen Enterprises on March 19th, 2010, and approved the application on March 24th, 2010. Dave Flynn has stated that he followed all steps required of him, as per the Alberta Forest Management Herbicide Reference Manual and Checklist, for securing a herbicide project approval.

In all, three DADE installations have been destroyed: one established in 2007 (and scheduled for re-measurement in 2010 and 2012, CM-22-01), and two established in 2008 (and scheduled for re-measurement in 2011 and 2013, CM-22-03 and CM-22-04). Prescribed aspen density is the critical dimension of interest in the DADE. Since all treatment units in the affected installations had previously been manually thinned to prescribed aspen densities as specified in the project design, the additional herbicide

killing of remaining aspen has rendered the affected installations useless. Three years of response in one installation, and two years of response in each of two further installations have been lost, and all future responses which would have flowed from these three installations will now be unavailable.

As a consequence of destroying three DADE installations, the project became underrepresented in one of its age classes (22 years). A proposal was submitted and accepted by FRIAA to ensure funding for establishing three new installations and thus rebalance the DADE project. All work required for establishing the three new installations: identifying and screening candidate blocks, pre-location, establishment, pre-measurement, thinning, post-thinning measurement, data entry, database management, plot maintenance, and annual reporting will be performed as per the DADE 2011 Workplan and Budget (see Section 5.5).

3.0 Installation Summaries

3.1 Installation Re-Measurement Reports

3.1.1. CM 17-1 Touchwood Lake Road

Installation Number/Local Name: CM-17-1 Touchwood Lake Road

Dates established: September 7-26, 2007

Dates thinned: September 10-20, 2007

Measurement Dates: September 7-20, 2007

First Re-Measurement Dates: September 20-23, 2010

RE-MEASUREMENT PROTOCOL TABLE – September 2010					
Thinning Treatment (stems/ha)					
	0	1000	2500	5000	Control
Post Treatment Completed					
20 X 20 Main Plot					
Deciduous ≥ 5.1	yes	yes	yes	yes	yes
Conifer $\geq 1.3m$	yes	yes	yes	yes	yes
10 X 10 Deciduous Subplot					
Deciduous 1.3m - 5.1cm	yes	yes	yes	yes	yes
Spruce Thinning/Spacing	yes	yes	yes	yes	yes
Cut deciduous post-thinning regeneration	yes	yes	yes	yes	n/a

Re-Measurement Comments:

Work Remaining: None

Comments:

Data Storage Location: Re-measurement data were appended to the DADE database

3.1.2. CM 17-2 Calling Lake 'C' Road

Installation Number/Local Name: CM-17-2 'C' Road Martini

Dates established: October 25 – November 14, 2007

Dates thinned: October 26 – November 14, 2007

Measurement Dates: October 25 – November 15, 2007

First Re-Measurement Dates: September 4 – September 7, 2010

RE-MEASUREMENT PROTOCOL TABLE – September 2010					
	Thinning Treatment (stems/ha)				
	0	1000	2500	5000	Control
Post Treatment Completed					
20 X 20 Main Plot					
Deciduous ≥5.1	yes	yes	yes	yes	yes
Conifer ≥ 1.3m	yes	yes	yes	yes	yes
10 X 10 Deciduous Subplot					
Deciduous 1.3m - 5.1cm	yes	yes	yes	yes	yes
Spruce Thinning/Spacing	yes	yes	yes	yes	yes
Cut deciduous post-thinning regeneration	yes	yes	yes	yes	n/a

Re-Measurement Comments:

Work Remaining: None

Comments:

Data Storage Location: Re-measurement data were appended to the DADE database

3.1.3. CM 22-1 Calling Lake 1000 Road

Installation Number/Local Name: CM-22-1 Calling Lake 1000 Road

Dates established: September 24 – October 11, 2007

Dates thinned: September 30 – October 11, 2007

Measurement Dates: September 24 – October 11, 2007

Re-Measurement Dates: September 8 – September 12, 2010

RE-MEASUREMENT PROTOCOL TABLE – September 2010					
Measurement Plots	Thinning Treatment (stems/ha)				
	0	1000	2500	5000	Control
Post Treatment Completed					
20 X 20 Main Plot					
Deciduous ≥5.1	yes	yes	yes	yes	yes
Conifer ≥ 1.3m	yes	yes	yes	yes	yes
10 X 10 Deciduous Subplot					
Deciduous 1.3m - 5.1cm	yes	yes	yes	yes	yes
Spruce Thinning/Spacing	yes	yes	yes	yes	yes
Cut deciduous post-thinning regeneration	yes	yes	yes	yes	n/a

Re-Measurement Comments: In 2010 the entire Maintaining our Forests (MOF) area where CM-22-1 and two other installations, CM-22-3 and CM-22-4, are located was treated with triclopyr basal bark herbicide. As a result of killing a large number of aspen within the treatment units and altering the aspen densities, the entire installation is considered to be destroyed (see Section 2.5). However, the entire installation has been re-measured in September 2010.

Work Remaining: None

Comments:

Data Storage Location: Re-measurement data were appended to the DADE database

3.1.4. CM 22-2 Calling Lake 1000 Road

Installation Number/Local Name: CM-22-2 Calling Lake 1000 Road

Dates established: October 15 – October 30, 2007

Dates thinned: October 15 – October 30, 2007

Measurement Dates: October 15 – October 30, 2007

Re-Measurement Dates: September 14 – September 18, 2010

RE-MEASUREMENT PROTOCOL TABLE – September 2010					
Measurement Plots	Thinning Treatment (stems/ha)				
	0	1000	2500	5000	Control
Post Treatment Completed					
20 X 20 Main Plot					
Deciduous ≥ 5.1	yes	yes	yes	yes	yes
Conifer $\geq 1.3m$	yes	yes	yes	yes	yes
10 X 10 Deciduous Subplot					
Deciduous 1.3m - 5.1cm	yes	yes	yes	yes	yes
Spruce Thinning/Spacing	yes	yes	yes	yes	yes
Cut deciduous post-thinning regeneration	yes	yes	yes	yes	n/a

Re-Measurement Comments:

Work Remaining: None

Comments:

Data Storage Location: Re-measurement data were appended to the database

3.2. Installation Maintenance Reports

In 2010 the four Installations that were established in 2007 (CM 17-01, CM 17-02, CM 22-01, and CM 22-02) were re-measured. In addition, installations' tending and white spruce thinning were done to align the plots with the 2009 updated protocol.

The installations were tended to remove the re-sprouting aspen (deciduous maintenance) as described in sections 3.2.1 through to 3.2.4.

In all four installations, where found, tags were removed from white spruce trees smaller than 1.3 m that were missed in 2009. Where tagged white spruce (> 1.3 m) were thinned as per the 2009 updated protocol, tags were collected. Tags from trees that were dead and down or tags that were found on the ground were also collected.

A list of the tags removed and collected in each of the four installations is presented in Appendix 7.2.

In all four installations posts were checked to establish borderline trees, buffers were repainted, where missing, orange dots were painted on trees to indicate the direction of height measurement. Pictures were taken at each treatment unit within the four re-measured installations.

3.2.1 CM-17-01 Touchwood Lake Road

Tag removal on Spruce < 1.3m and thinned white spruce.

Date: September 20 – 23, 2010.

Any additional tags on white spruce < 1.3 m were removed as well as all the tags from additionally thinned white spruce. Tags found on the ground as well as tags from dead and down trees were also collected.

Tag/Wire Maintenance

Date: September 20 – 23, 2010

Wires were made larger on the deciduous trees and tags were moved onto a branch for the white spruce in each of the treatment units. Flagging tape was removed from the trees to avoid girdling.

Deciduous Maintenance

Date: September 20 – 23, 2010

Deciduous sprouts growing post-thinning were cut using a hand ax in the treatment units as well as in the buffer area.

3.2.2 CM-17-02 Calling Lake (Al-Pac 'C' Road)

Tag removal on Spruce < 1.3m.

Date: September 4 – 7, 2010

Any tags missed during the 2009 maintenance and found on white spruce trees < 1.3 m were removed. All tags from the additionally thinned white spruce were also removed.

Tag/Wire Maintenance

Date: September 4 – 7, 2010

Wires were made larger on the deciduous trees and tags were moved onto a branch for the white spruce in each of the treatment units. Flagging tape was removed from the trees to avoid girdling.

Maintenance

Date: September 4 – 7, 2010

Deciduous sprouts growing post-thinning were cut using a hand ax in all treatment units and adjacent buffer.

3.2.3 CM-22-01 Calling Lake MOF

The activities in CM-22-01 took place at the end of the 2010 growing season. The installation was mistakenly treated with triclopyr herbicide in 2010 and the initial aspen density was altered rendering the installation useless. However, plot maintenance and plot measurement were still done in September 2010.

Tag removal on Spruce < 1.3m.

Date: September 8 – 12, 2010

Any tags missed during the 2009 maintenance and found on white spruce trees < 1.3 m were removed. All tags from the additionally thinned white spruce were also removed. Tags from dead and down trees as well as tags found on the ground with trees missing were also collected.

Tag/Wire Maintenance

Date: September 8 – 12, 2010

Wires were made larger on the deciduous trees and tags were moved onto a branch for the white spruce in each of the treatment units. Flagging tape was removed from the trees to avoid girdling.

Deciduous Maintenance

Date: September 8 – 12, 2010

Deciduous sprouts growing post-thinning were cut using a hand ax in all treatment units and adjacent buffer.

3.2.4. CM 22-2 Calling Lake (AIPac 1000 Road)

Tag removal on Spruce < 1.3m.

Date: September 14 – 15, 2010

Any tags missed during the 2009 maintenance and found on white spruce trees < 1.3 m were removed. All tags from the additionally thinned white spruce were also removed.

Tag/Wire Maintenance

Date: September 14 – 15, 2010

Wires were made larger on the deciduous trees and tags were moved onto a branch for the white spruce in each of the treatment units. Flagging tape was removed from the trees to avoid girdling.

Deciduous Maintenance

Date: September 14 – 15, 2010

Deciduous sprouts growing post-thinning were cut using a hand ax in all treatment units and adjacent buffer.

3.4. Summaries of 2010 Measurement Data

The data collected in the 2010 field season represented first re-measurements for four installations. The data were appended to the existing DADE database, with several additions. Attribute names were standardized and a series of attributes were added (i.e. Measurement, Standage, Plot_Size, Dec_SubPlot_Size, Con_SubPlot_Size). A separate document was created to describe the Access database that was built.

Due to the changes in protocol during the experiment establishment, a unique variable was defined to identify the trees that were initially measured but were no longer in the plot (i.e. thinned spruce trees, spruce < 1.3 m). The variable's name is 'Final_Flag' and it is located in the 'Post_Plot_Tree_Data' table of the Access database. All trees with Final_Flag = 'YES' represent trees that were no longer part of the project (i.e. <1.3 m, dead trees, thinned trees).

Appendix 1 presents the top height, basal area, DBH, and height graphs for the 4 installations re-measured in 2010.

4.0 Reservation Notations

The reservation notations have not changed in 2010 and there were no new installations added to the 14 existing ones.

Appendix 7.4. presents a complete list of Reservation numbers.

5.0 DADE Project Budget and Cost Information.

5.1 2009 Budget Forwarded.

2009 Total Budget including surplus	\$ 264,698.46
2009 Total Project Costs	\$ 197,690.00
2009 Budget Surplus	\$ 67,008.46

5.2 2010 Proposed Budget

The following funds were provided to this project in 2010 and made up the total budget for the year.

FRIAA Sponsorship	\$ 95,000.00
MWMA Sponsorship	\$ 24,000.00
2009 Surplus	\$ 67,008.46
Yearly total	\$ 186,008.46

5.3 2010 Actual Project Cost Information

The following table summarizes the actual amounts charged to the project in 2010. The project was under budget for 2010. This was due to no new installations. Only plot remeasurements and maintenance was done this year and these costs were much lower than expected. Due to damage to some of our plots, there will be increased costs for 2011 and 2012. The budget surplus from 2010 will be used for during the next 2 years.

Table 6 2010 Actual Project Costs

Forester wages	\$ 51,252.65
Remeasurement Contracts	\$ 23,582.80
Food and Accommodation	\$ 457.32
Vehicle and Fuel	\$ 3,324.94
Data entry, analysis and management	\$ 16,302.45
U of A overhead	\$ 2,766.99
Total Project Cost (2010)	\$ 97,687.15

5.4 2010 Budget Surplus

The budget surplus for the 2010 year is:

Total Budget	\$ 186,008.46
Total Project Costs	\$ 97,687.15
Budget Surplus	\$ 88,321.31

5.5 2011 DADE Proposed Budget

The following funds will be provided to this project in 2011:

FRIAA Sponsorship	\$ 85,500.00
MWMA Sponsorship* see section 5.6	\$ 24,000.00
2010 Surplus	\$ 88,321.31
FRIAA Payment for Damaged Plots	\$ 115,000.00
Yearly total	\$ 312,821.31

The 2011 budget will be divided into the following general categories:

Remeasurement and Maintenance	\$ 57,000.00
Includes travel, accommodations and QC	
Re-establishment of damaged plots	\$ 115,000.00
Includes travel, accommodations and QC	
Report Writing	\$ 35,000.00
Data entry, analysis	\$ 67,500.00
Project Management	\$ 10,000.00
U of A overhead	\$ 5,900.00
Total	\$ 290,400.00

5.6 MWMA Funding to DADE for 2010 and 2011

Due to budget constraints within the entire forestry sector, the MWMA has had to look at ways to reduce costs. Since the Lower Foothills Ecoregion was removed from the DADE project, the MWMA contribution budget for 2010 and 2011 will be reduced. The original schedule showed MWMA contributions of \$65,500 per year for both years. This has been reduced to \$24,000 per year for both years. This change reduces the total MWMA funding by \$83,000. The total MWMA funding was originally \$480,500. This number includes the “start up” money of \$10,000 from 2006 (which was part of the original surplus). The total MWMA funding is now \$397,500. The reduction in MWMA funding does not drastically change any of the original deliverables. The changes are: the total number of installations has been reduced to 14 instead of 20. The remeasurements will occur in years 3 and 5 instead of each year.

6.0 Miscellaneous

6.3 Annual General Meeting

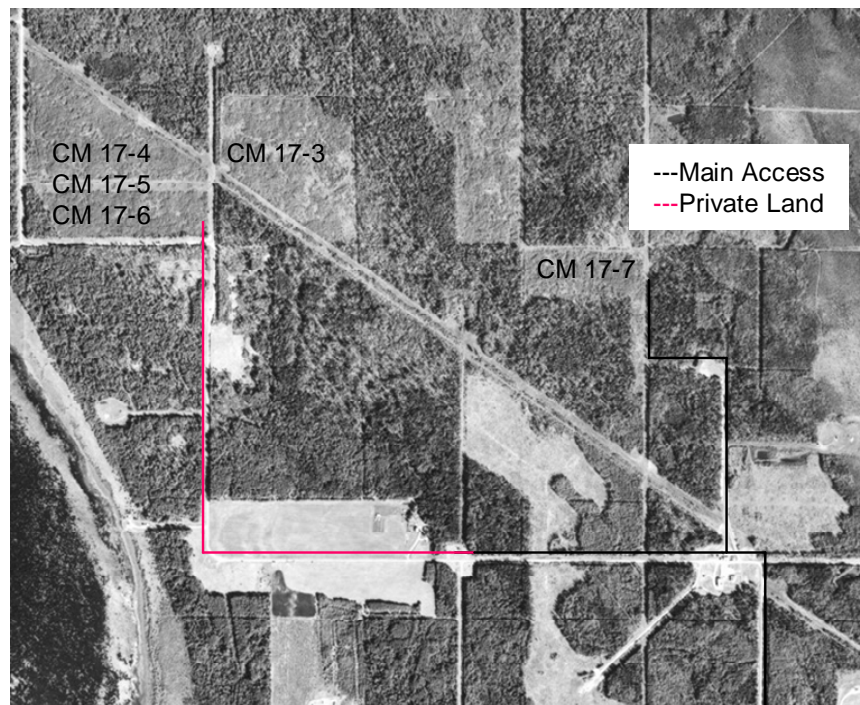
The 2010 Annual General Meeting was held in Edmonton. There was no field component to the AGM this year.

6.4 Road Use Agreement

Access to the installations located at Sinkhole Lake cutblocks, was on a Landowner's private road (see Figure 1.). A Road Use Agreement was in place for 2009 and 2010 (see Appendix 3). The portions of road under this Road Use Agreement are in section 21-50-9-W5 and affect access to four of the five 2009 established DADE Installations in the Sinkhole Lake area.

A new road agreement will have to be negotiated with Mr. Watson, the Landowner, for access after 2010. Indications through discussions with Mr. Watson are that it will likely remain the same in the future but it is very important to ensure that a road use agreement is in place prior to using Mr. Watson's road for access.

Figure 1. Diagram Illustrating Section of Private Road Under Road Use Agreement



6.5 Database Updating

The database was updated to include the data re-measured in 2010. See Appendix 7 for explanations of changes that were made to the database.

7.0 List of Appendices

7.1 Appendix 1. Plot Summaries/Compilations

7.2 Appendix 2 List of Tags Removed During The 2010 Field Season.

7.3 Appendix 3. Road Use Agreement

7.4 Appendix 4. Reservation Notations.

7.5 Appendix 5. Competition Fieldnotes from Peace River.

7.7 Appendix 7. Database Updating.

7.8 Appendix 8. 2010 DADE Project Manual.

7.1 Appendix 1. Plot Summaries/Compilations

All graphs included in this selection are made using the following criteria:

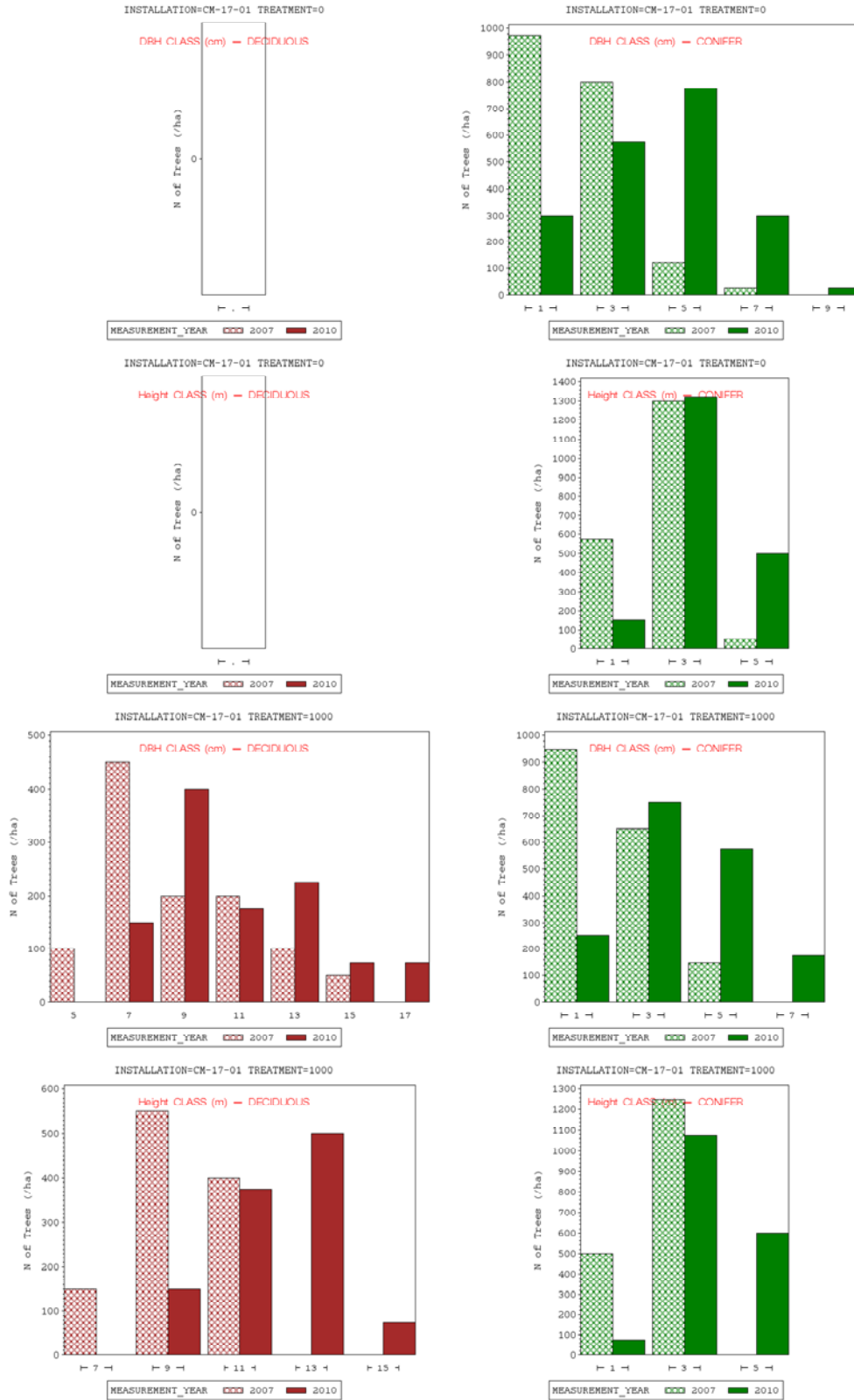
- Pre-harvest stems include all stems $\geq 1.3\text{m}$ in height.
- No dead trees are included in this data unless specified in the title.

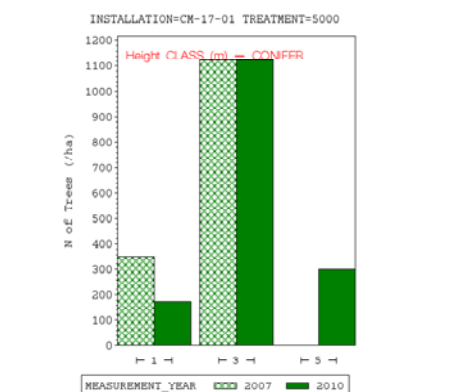
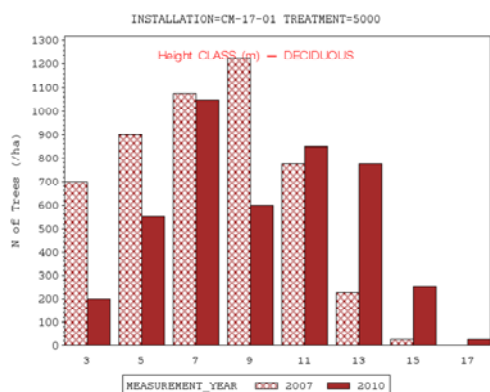
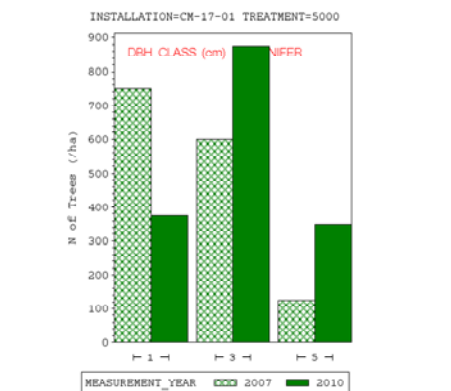
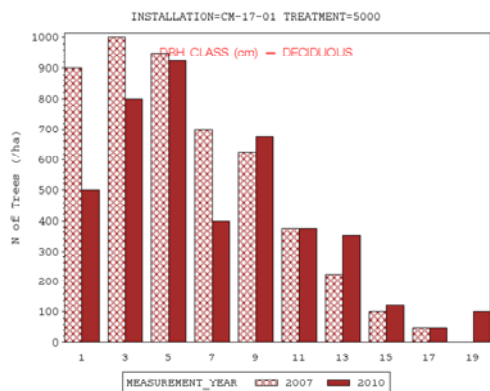
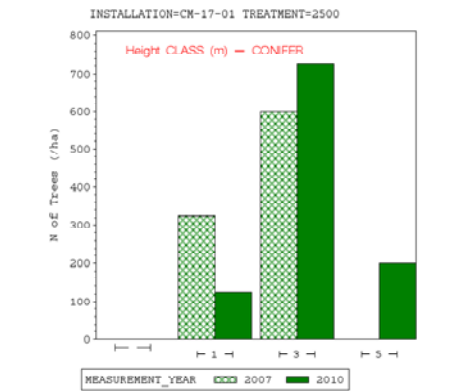
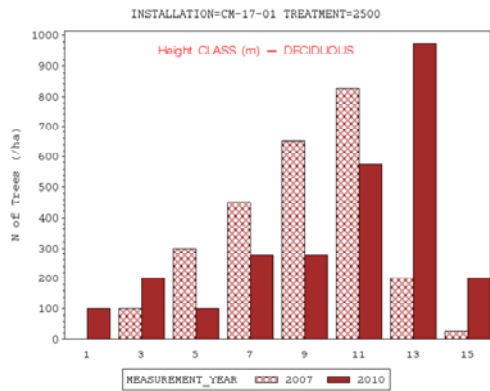
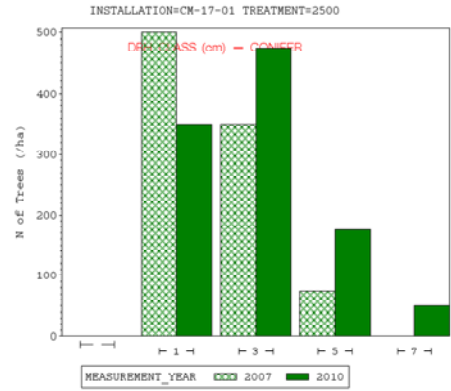
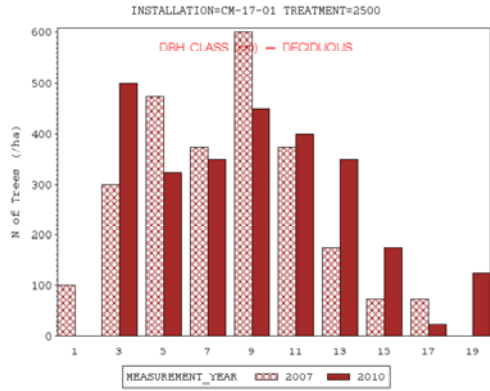
The first set of graphs shows the height and DBH frequency distributions in all the plots within the 4 installations. On the left hand side there are the deciduous graphs (in brown), while on the right hand side there are the coniferous graphs (in green). Each plot within the installation has four graphs, two deciduous (DBH and Height) and two coniferous (DBH and Height).

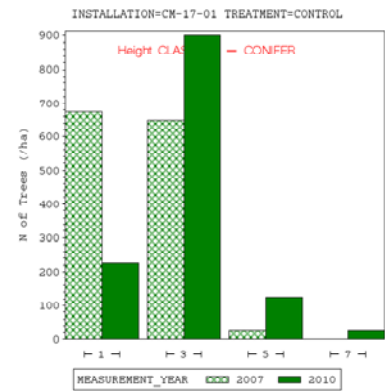
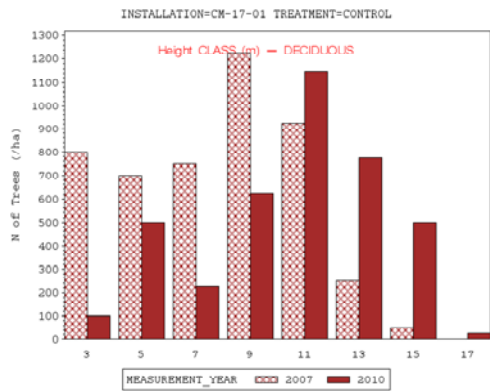
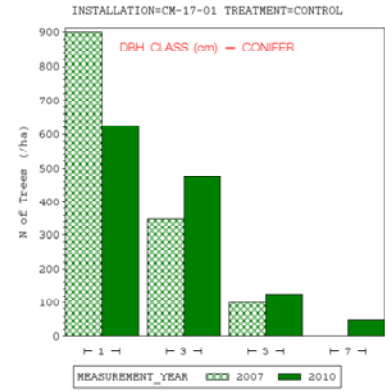
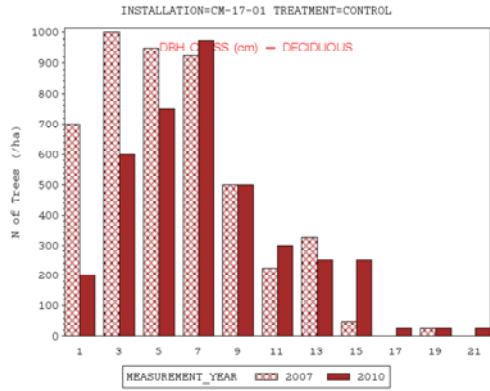
The second set of graphs shows the DBH and Height trajectories in each plot of the 4 installations. The deciduous with DBH on top and Height at the bottom are located on the left hand side (in brown), while the coniferous graphs are located on the right hand side (in green).

The third set of graphs shows the basal area trajectories for the plots within the installations, deciduous on the left hand side and coniferous on the right hand side, while the fourth set of graphs shows the top height trajectories for all plots, deciduous on the left hand side and coniferous on the right hand side.

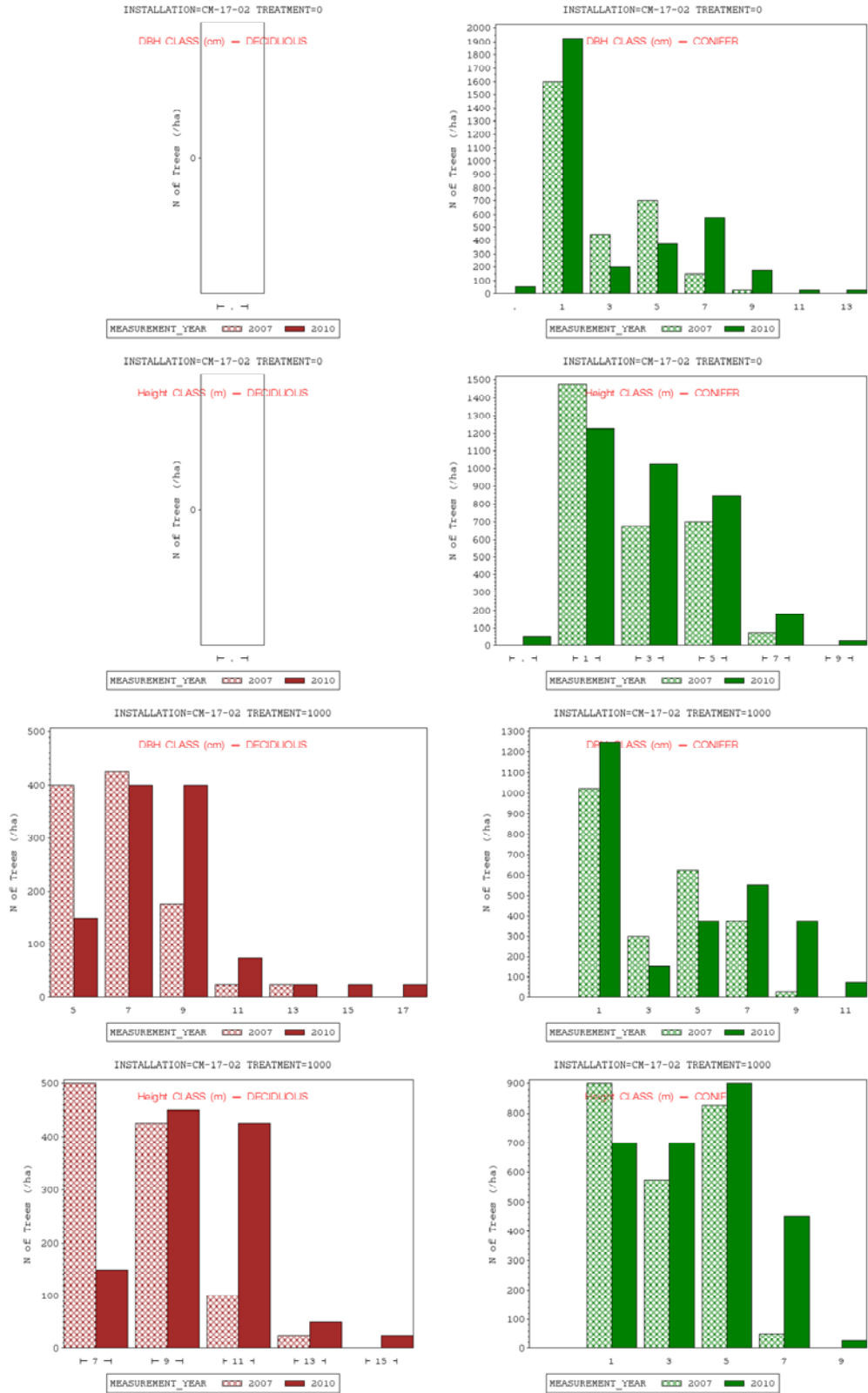
Frequency Distribution of DBH and Height for CM-17-01: 2007 vs. 2010

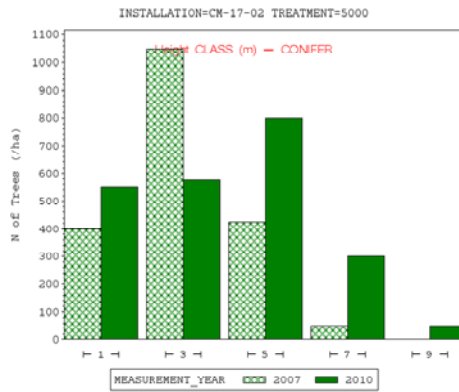
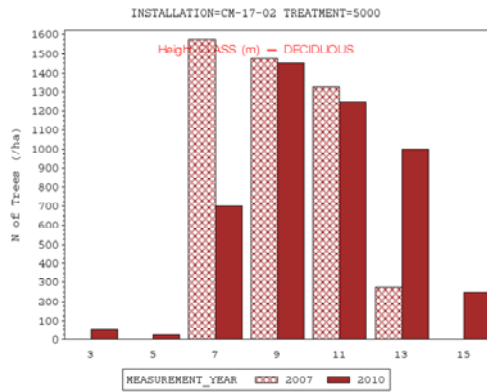
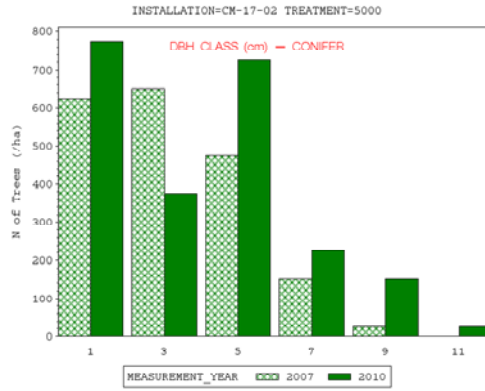
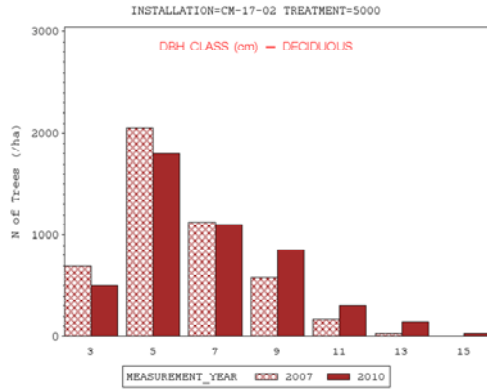
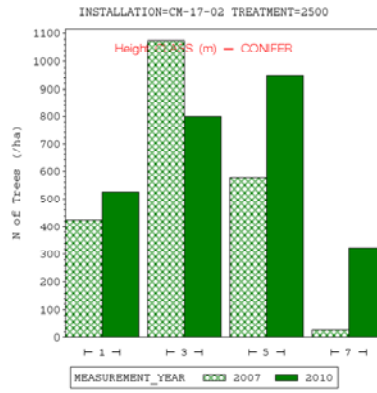
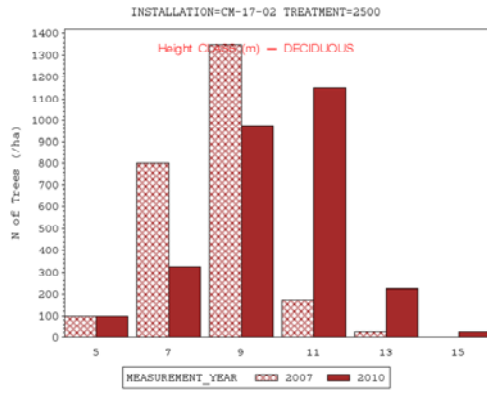
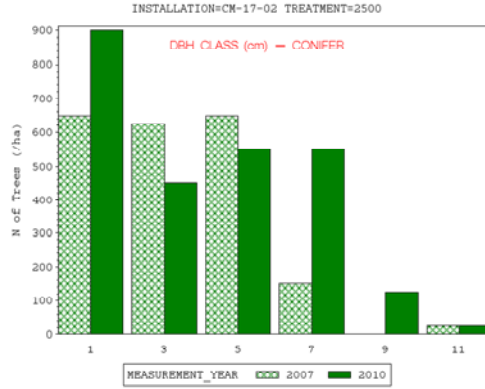
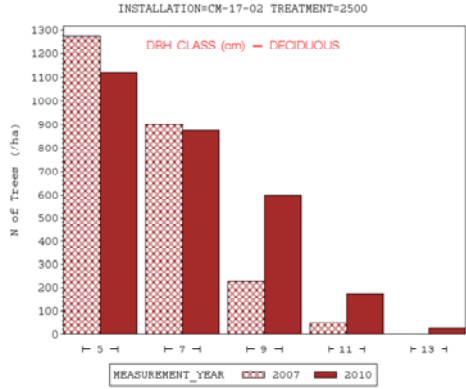


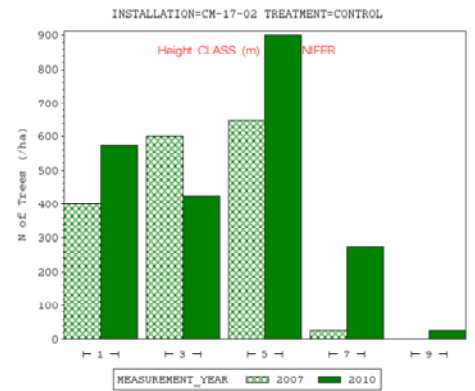
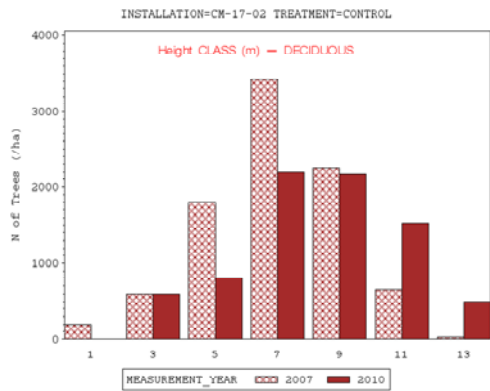
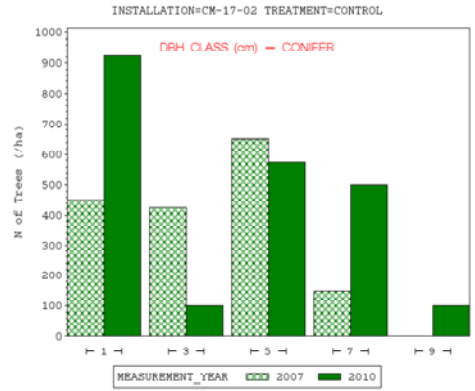
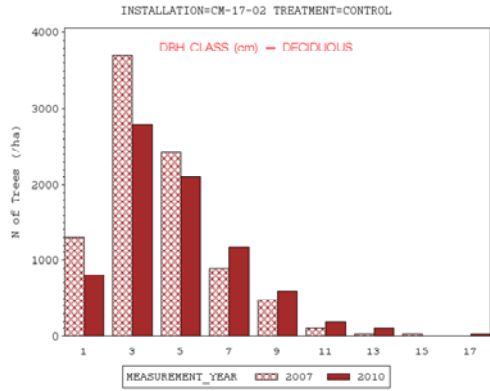




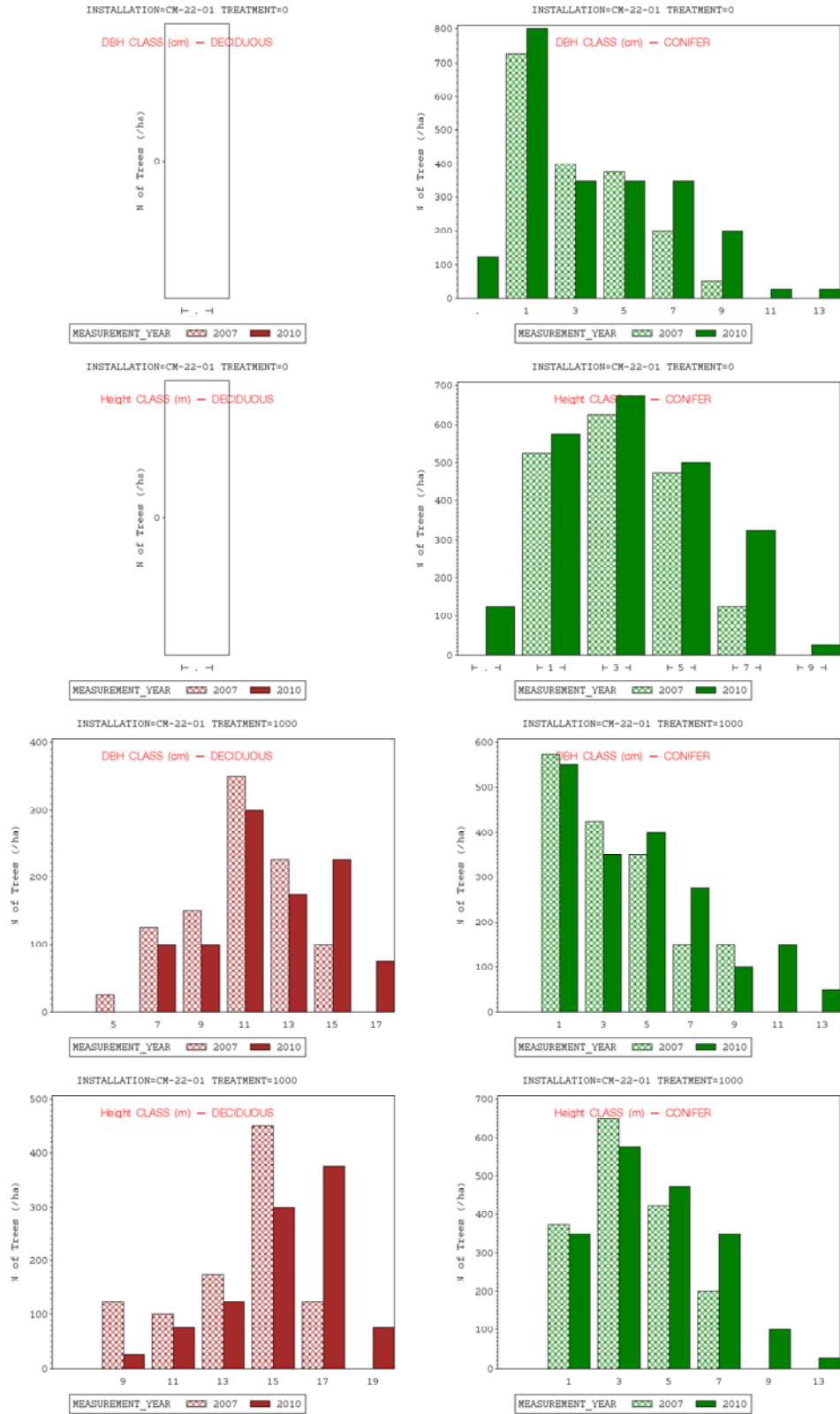
Frequency Distribution of DBH and Height for Installation CM-17-02: 2007 vs. 2010

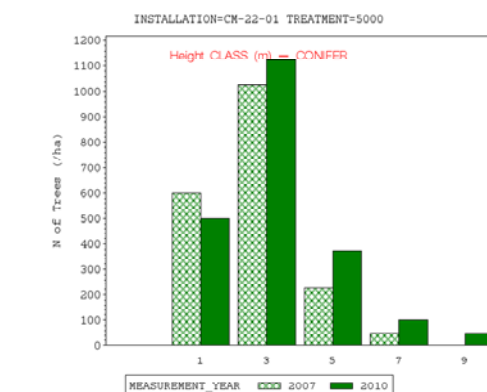
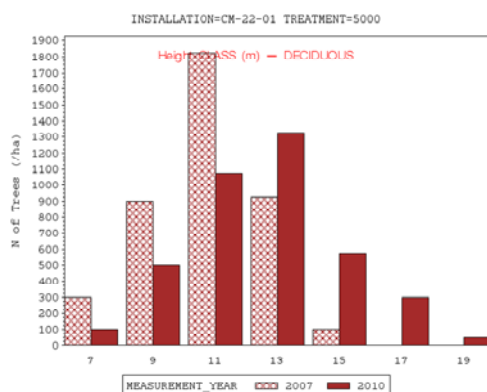
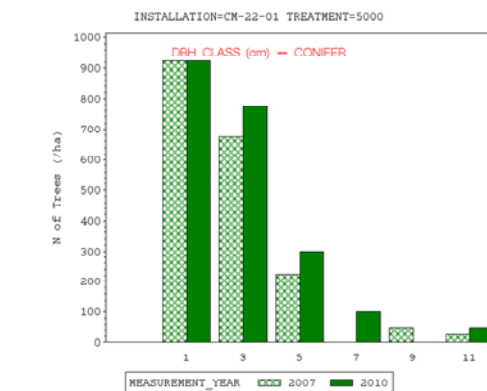
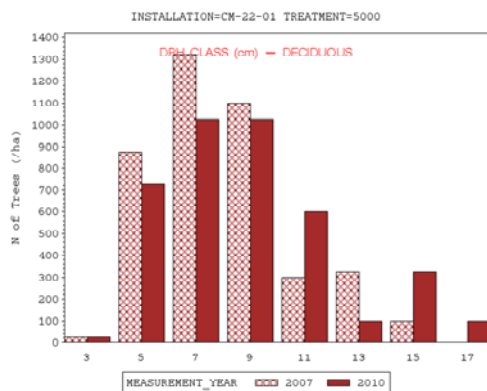
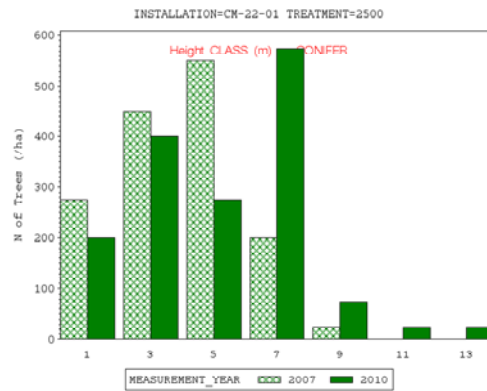
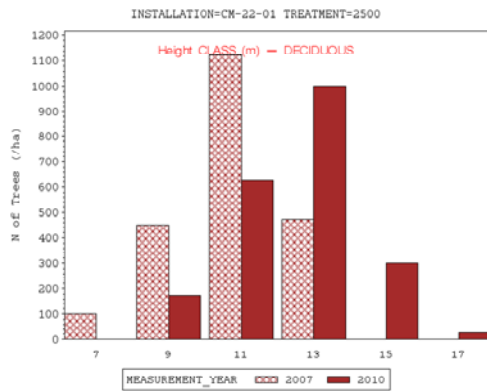
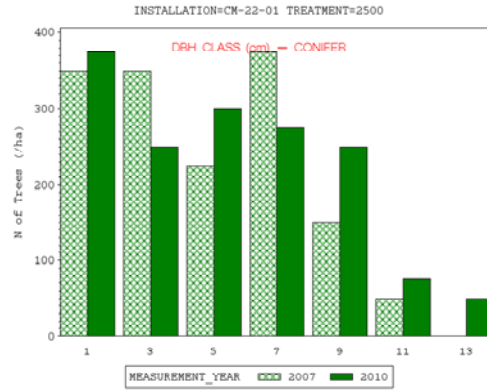
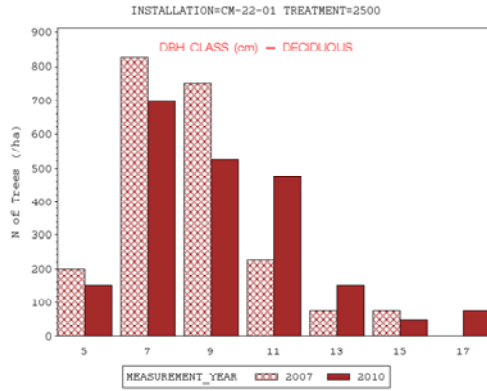


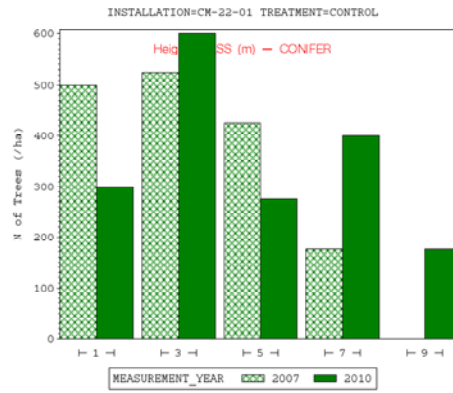
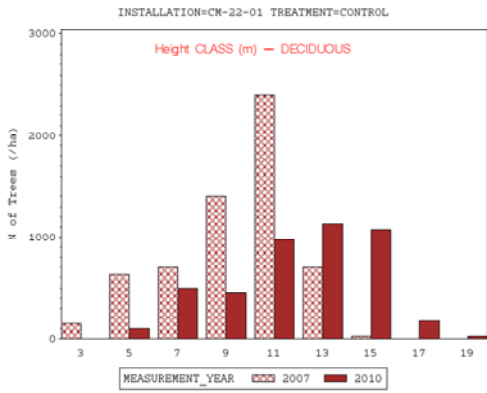
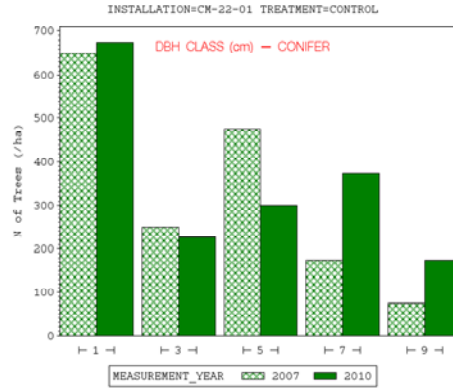
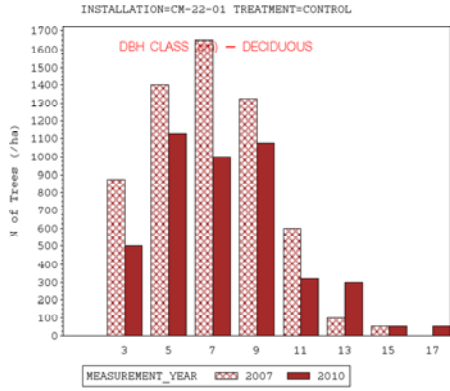




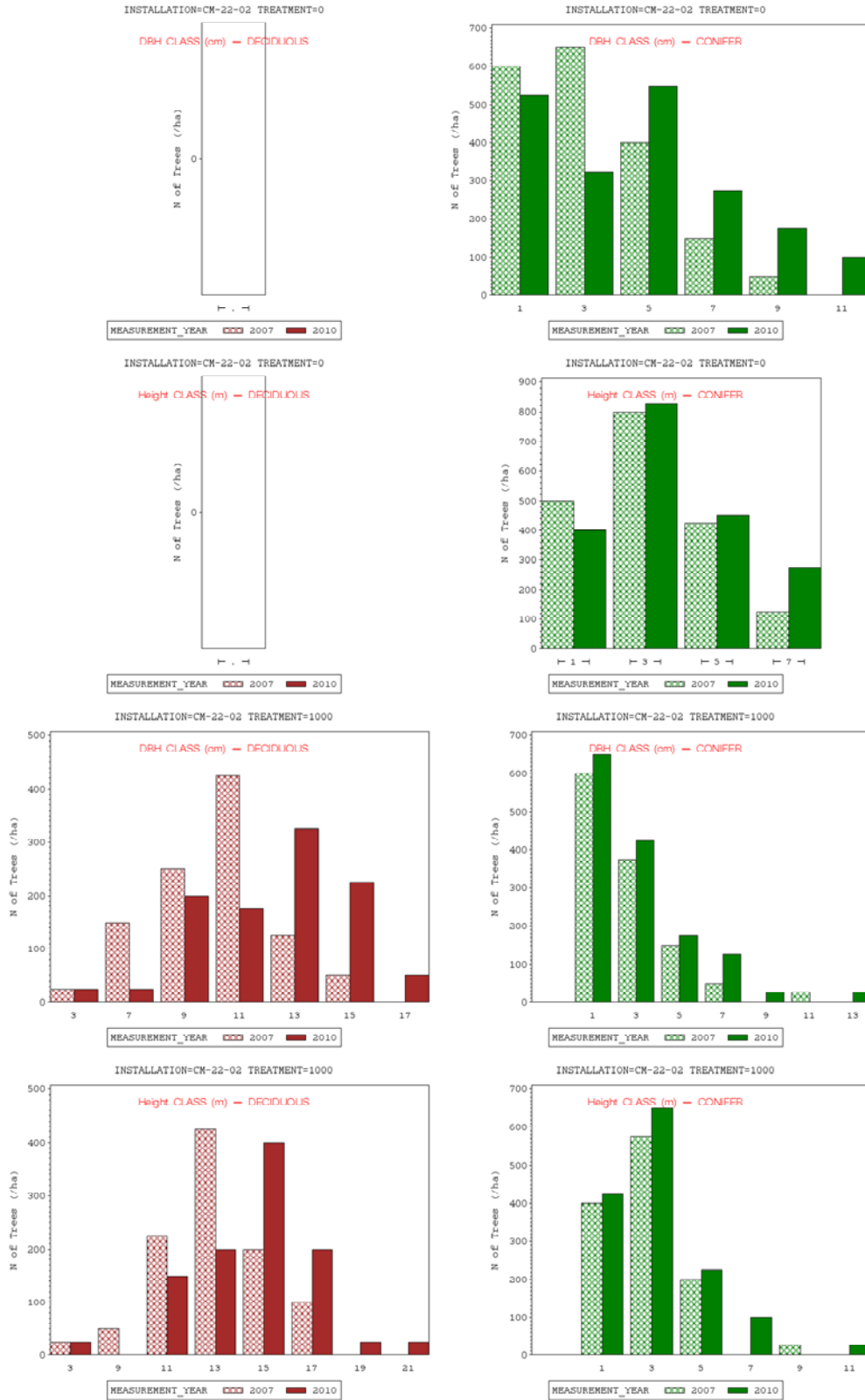
Frequency Distribution of DBH and Height for CM-22-01: 2007 vs. 2010

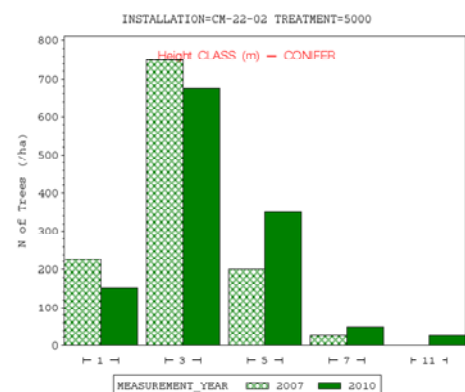
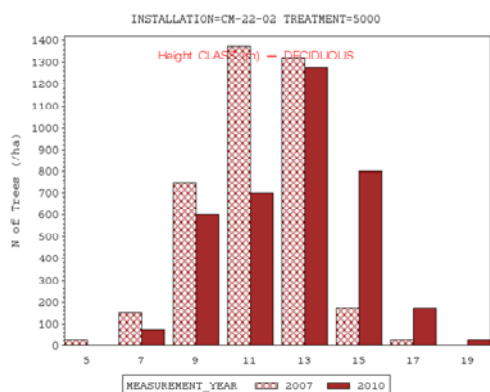
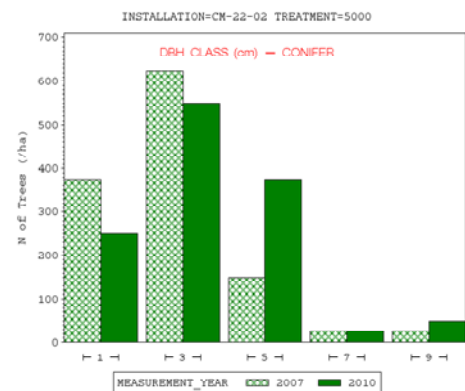
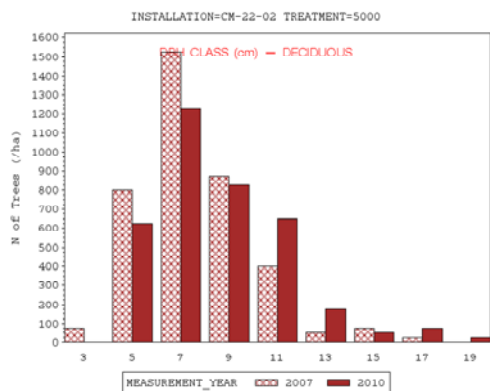
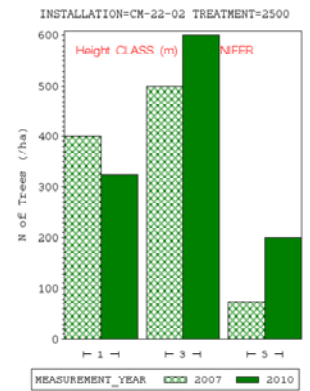
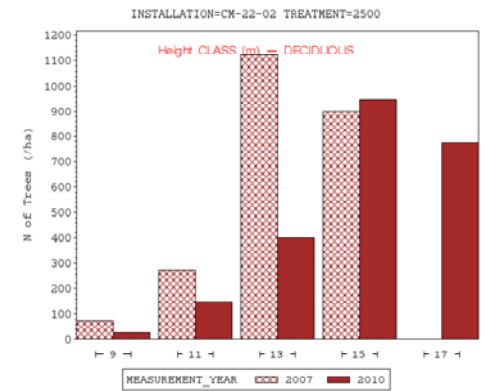
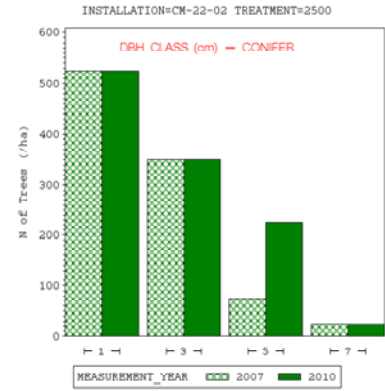
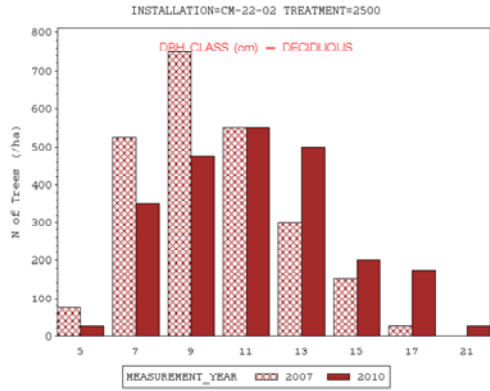


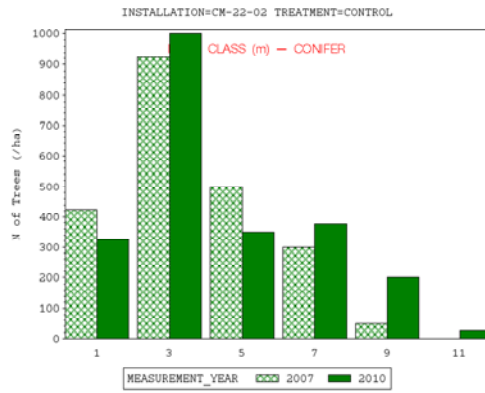
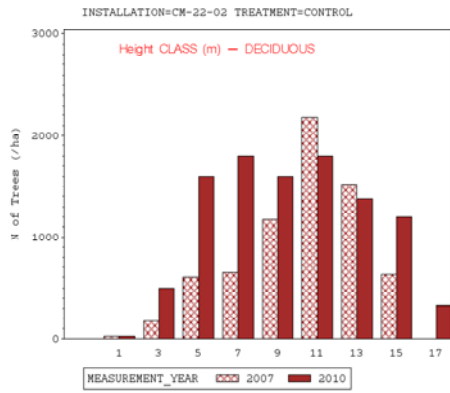
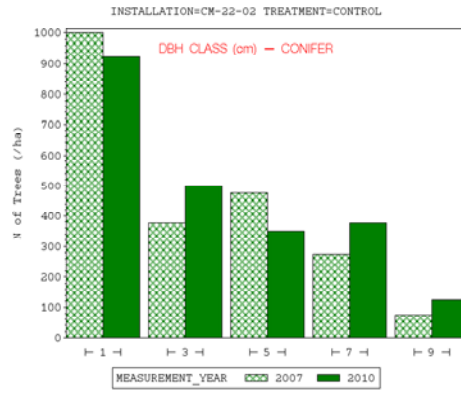
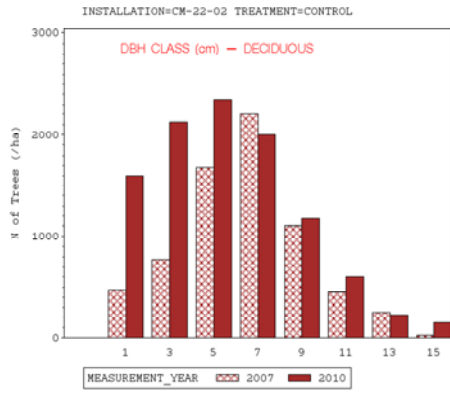




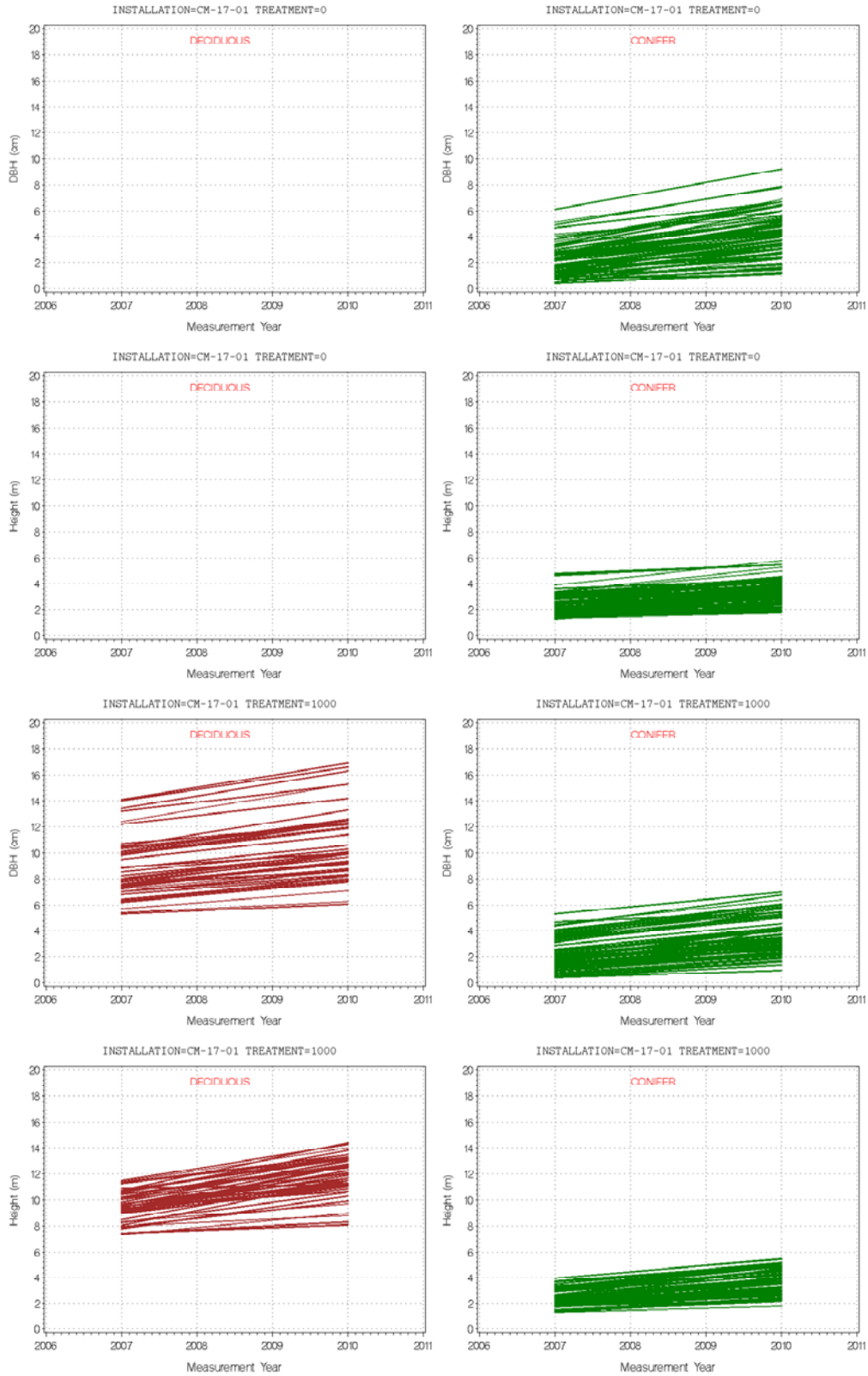
Frequency Distribution of DBH and Height for CM-22-02: 2007 vs. 2010

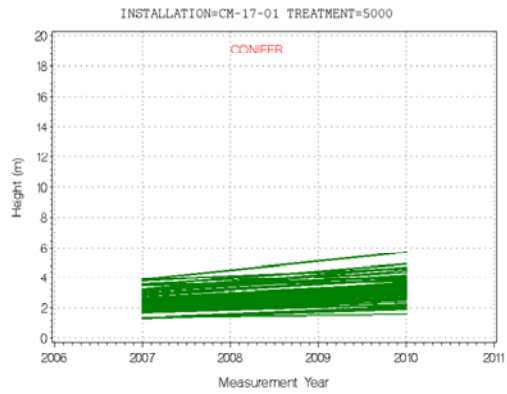
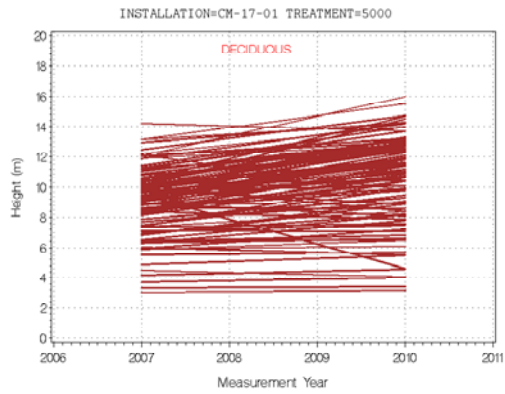
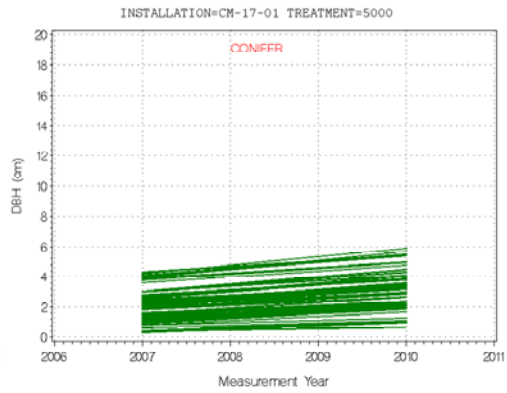
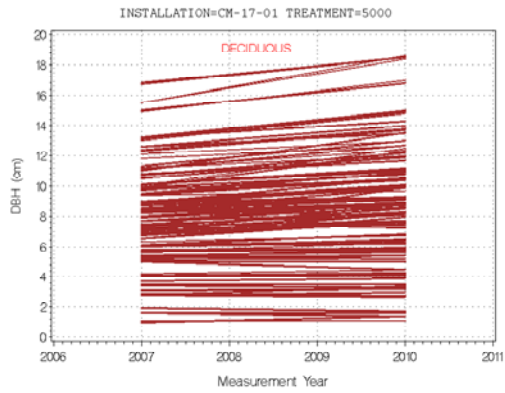
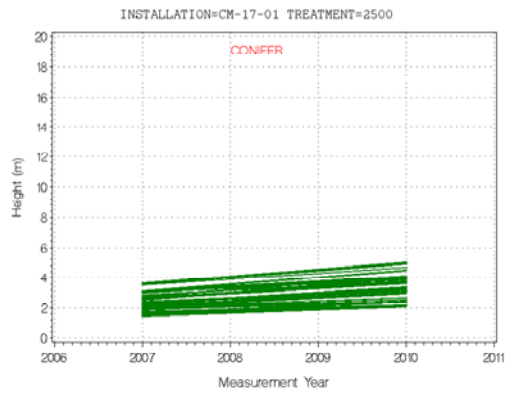
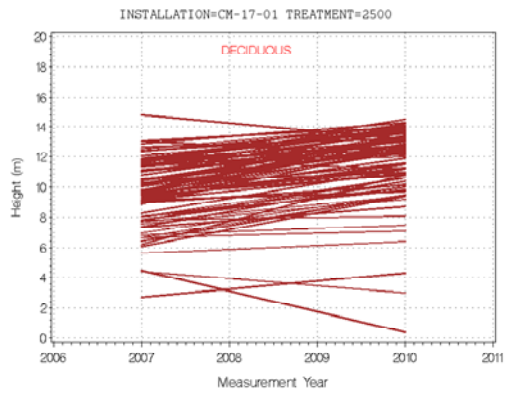
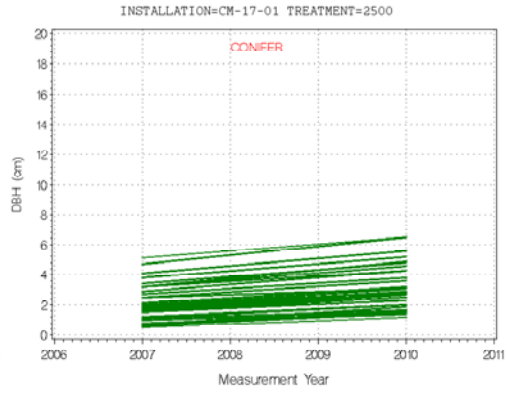
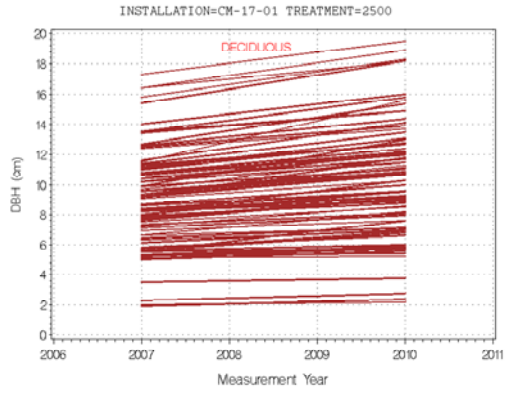


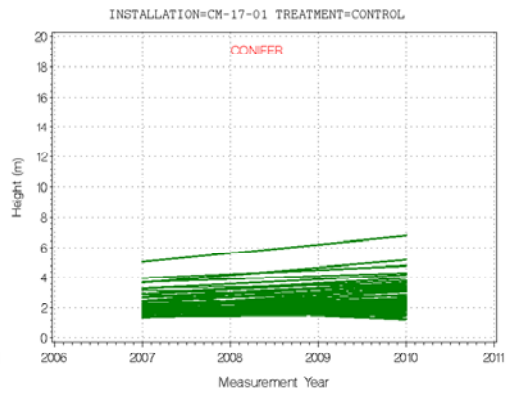
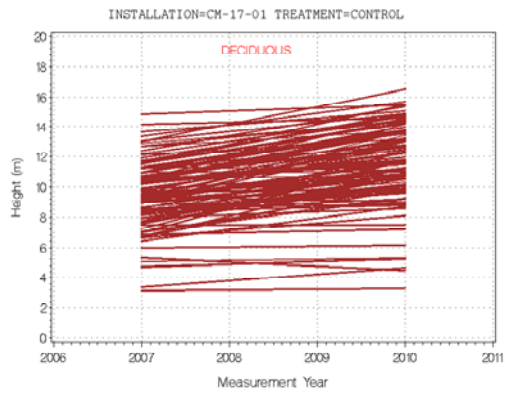
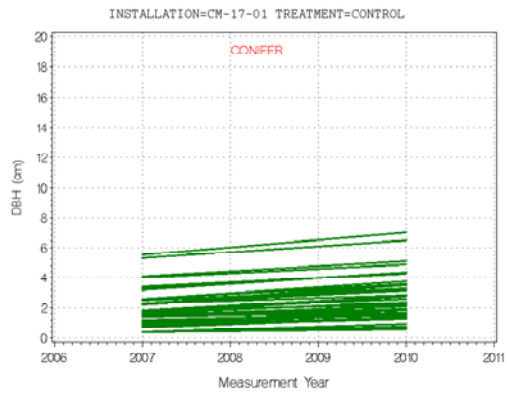
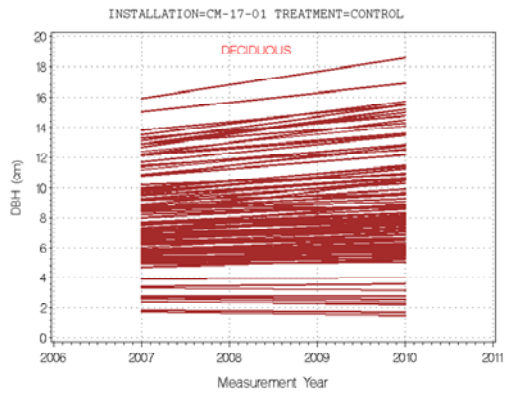




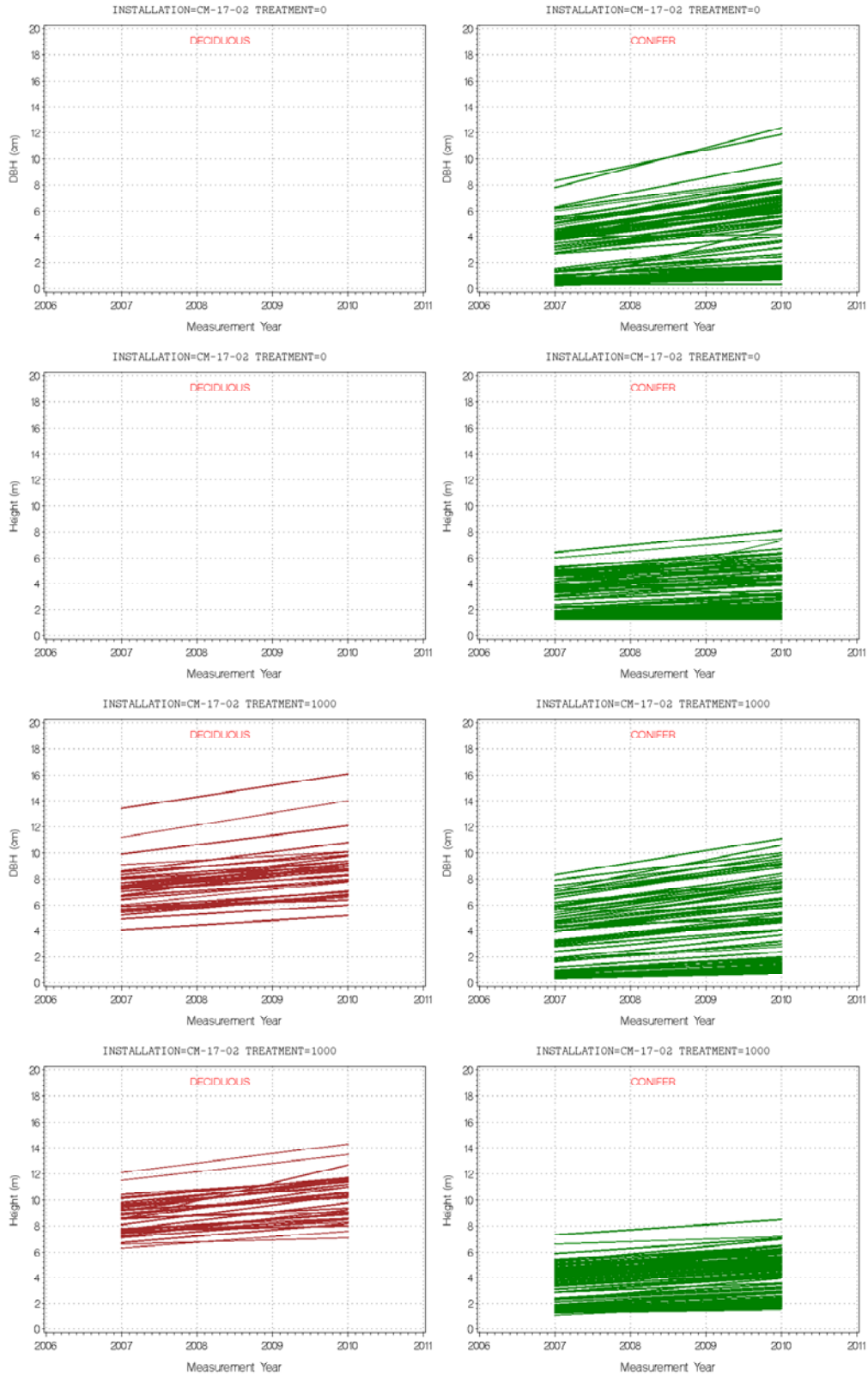
DBH and Height Trajectories for CM-17-01: 2007 vs. 2010

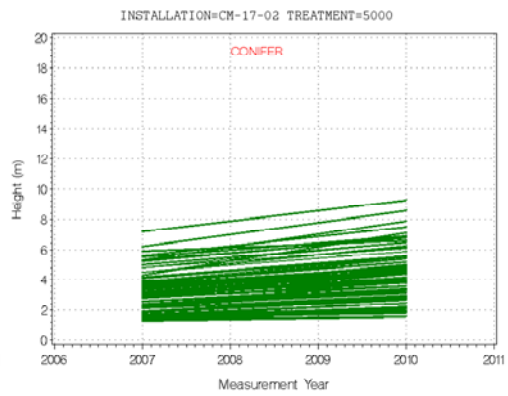
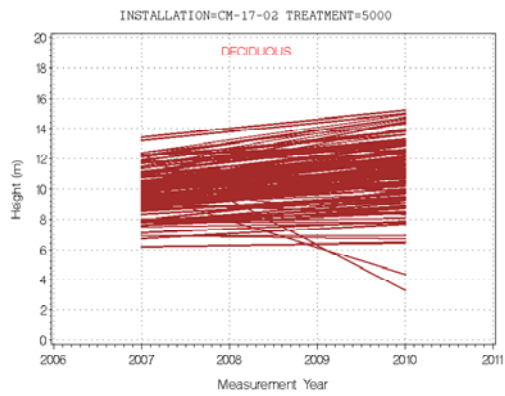
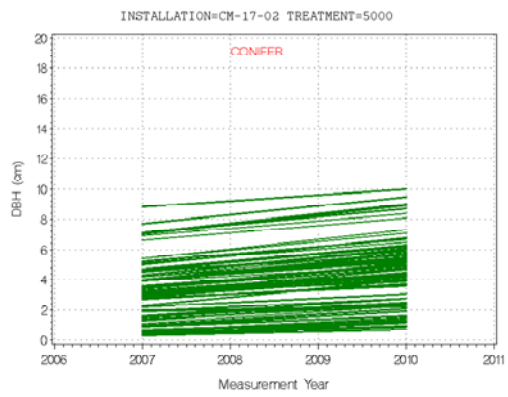
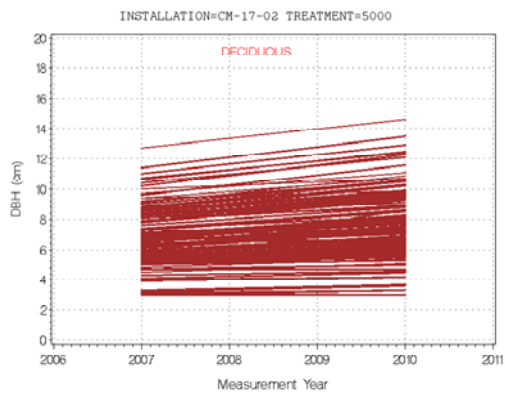
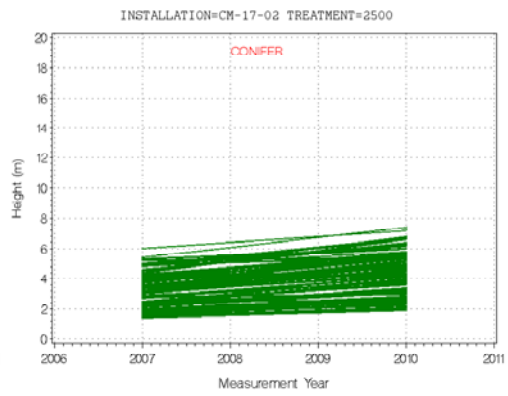
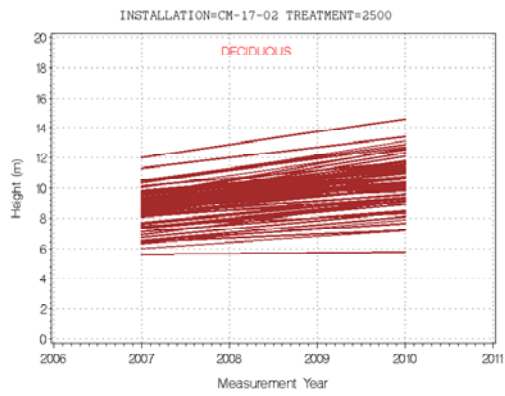
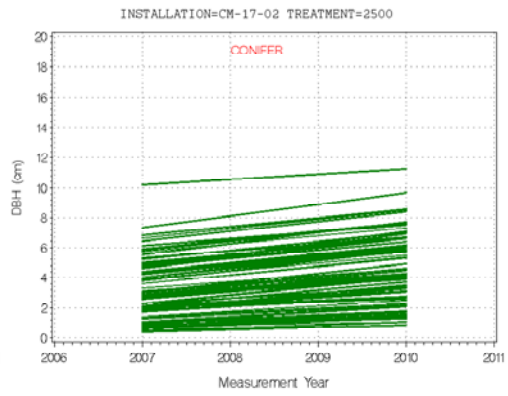
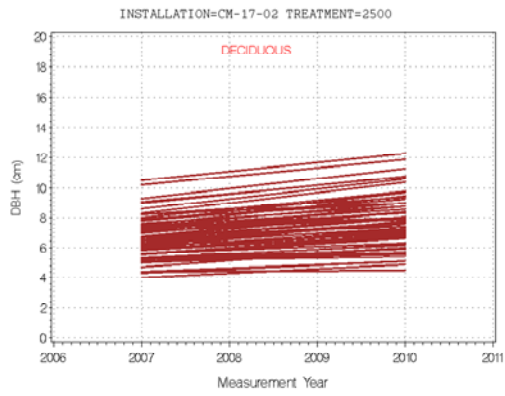


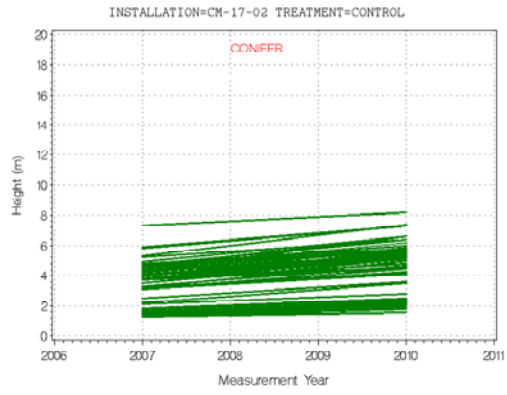
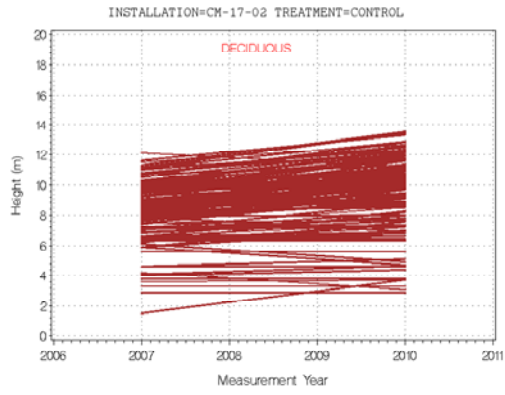
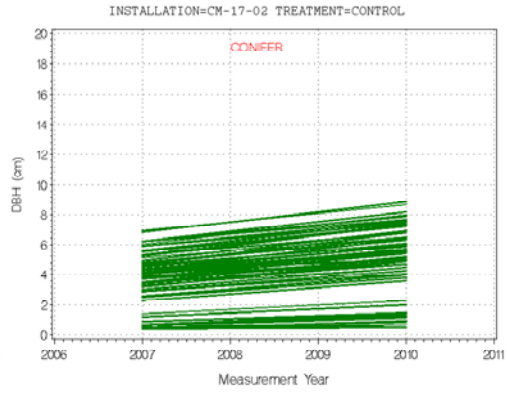
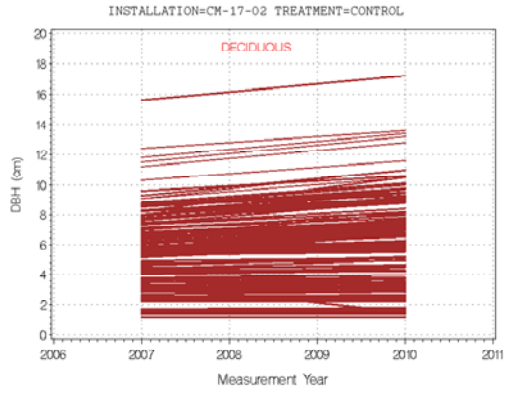




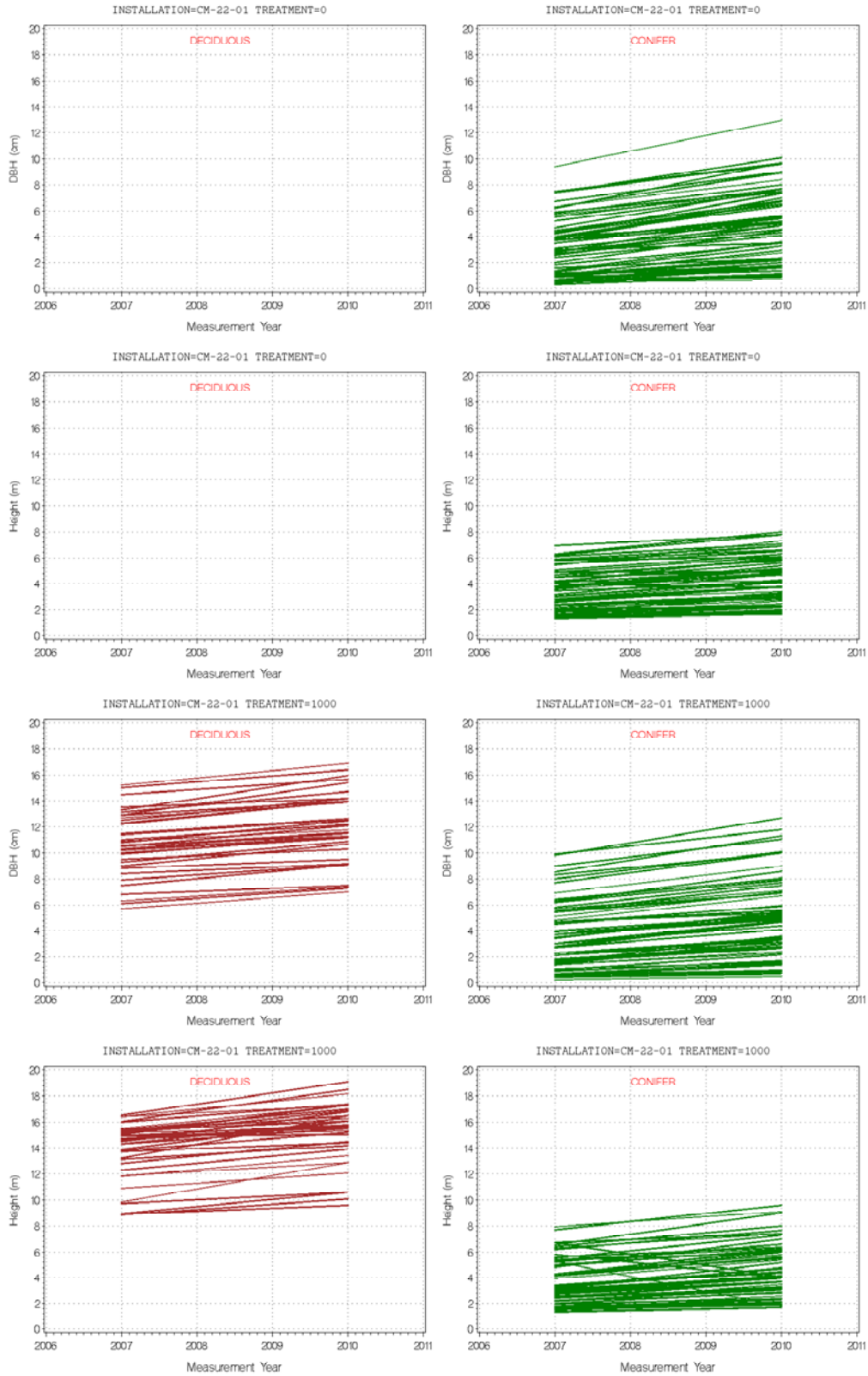
DBH and Height Trajectories for CM-17-02: 2007 vs. 2010

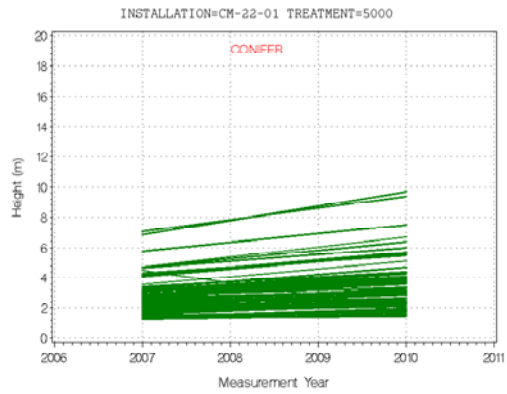
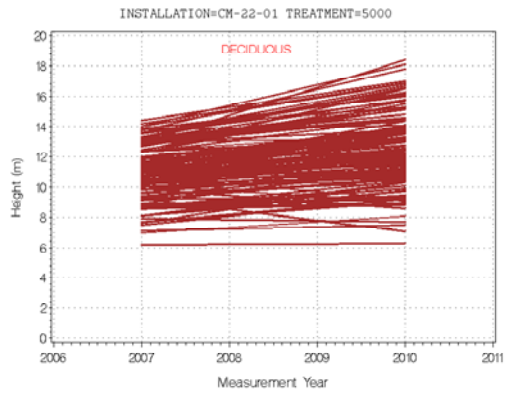
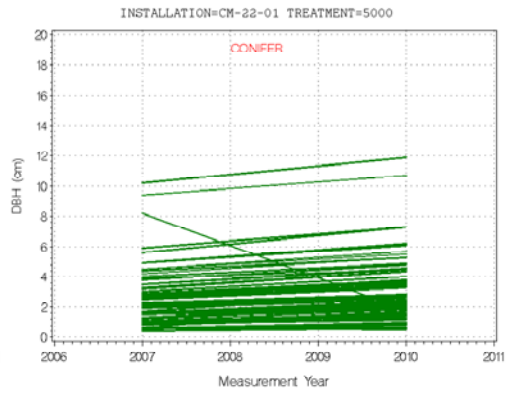
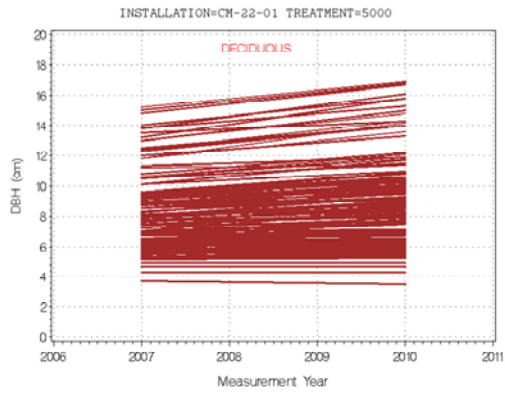
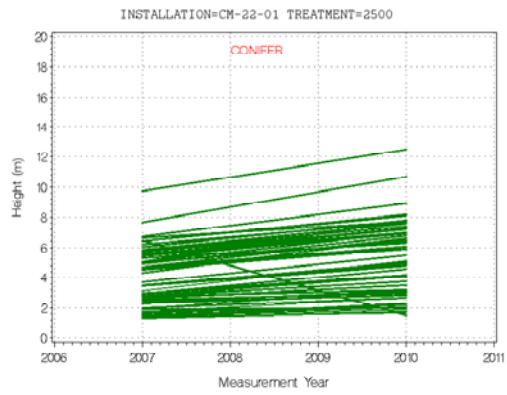
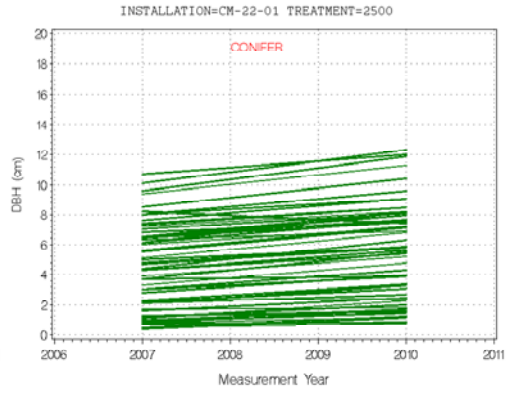
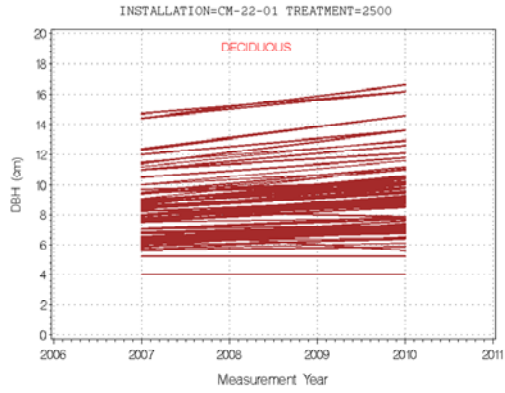


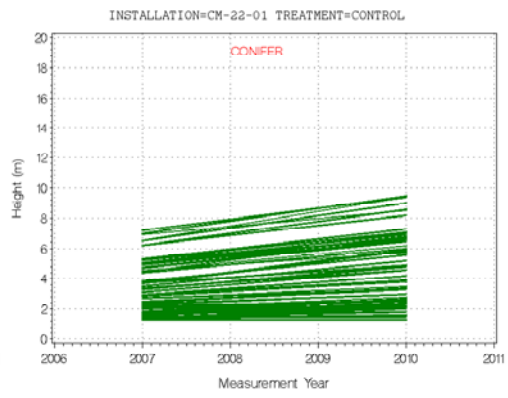
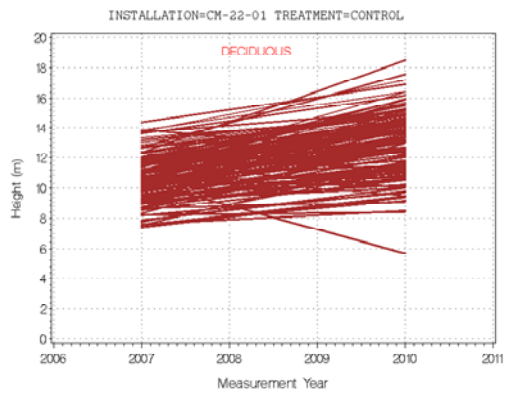
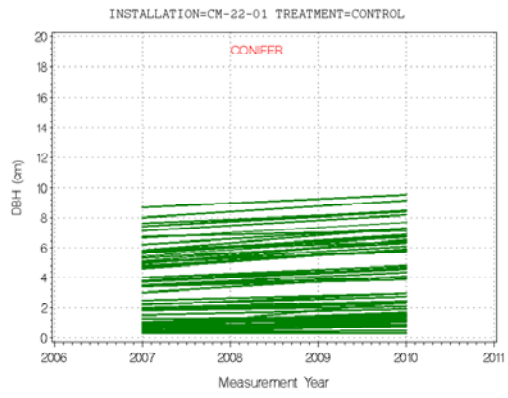
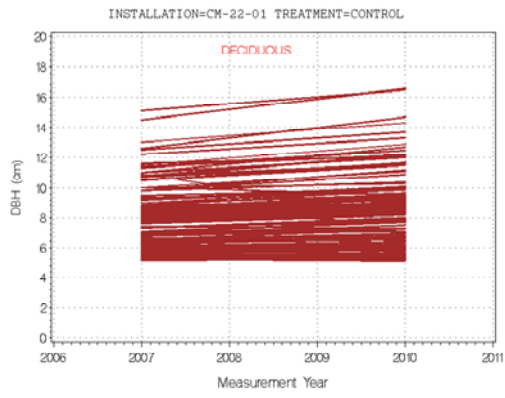




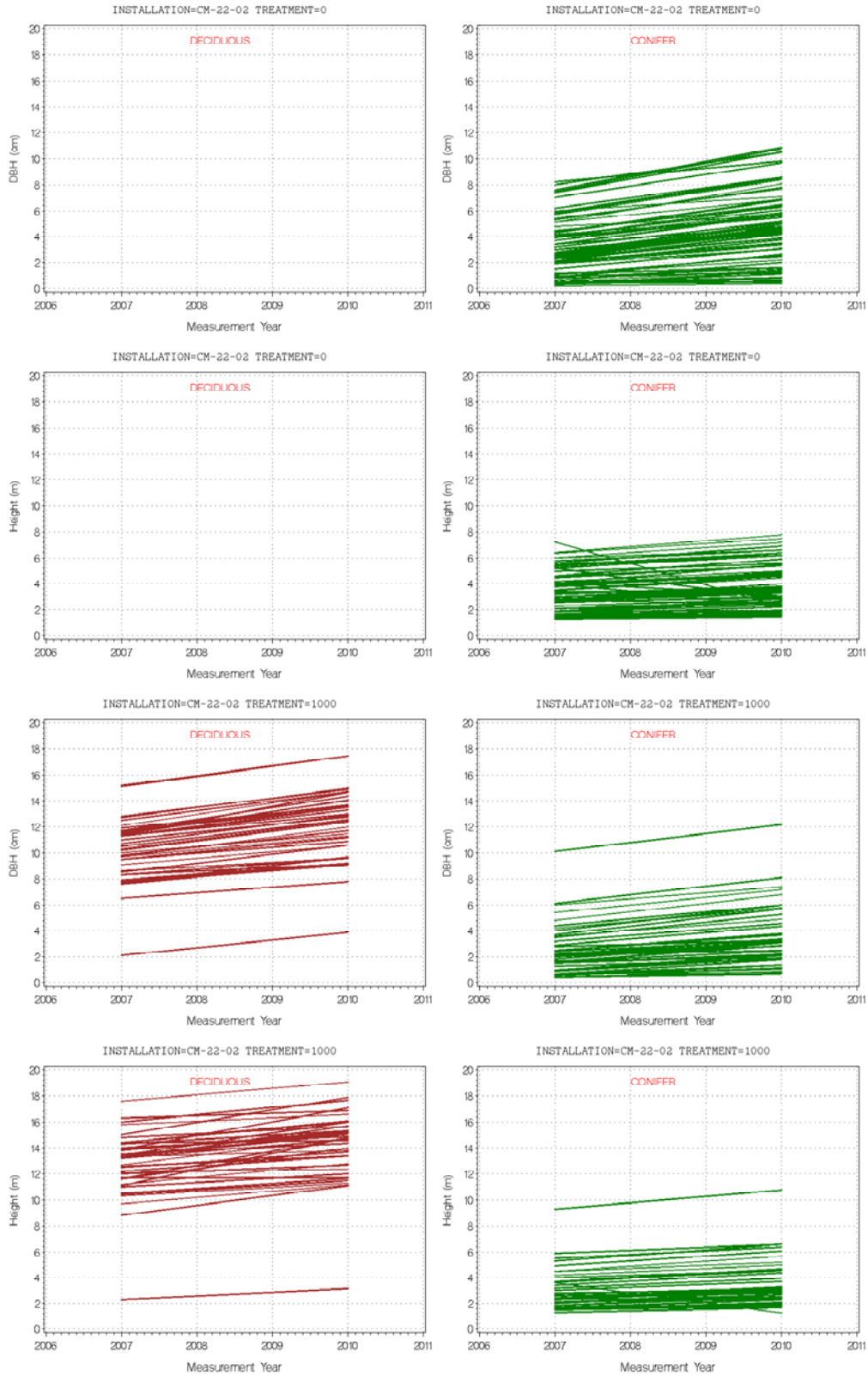
DBH and Height Trajectories for CM-22-01: 2007 vs. 2010

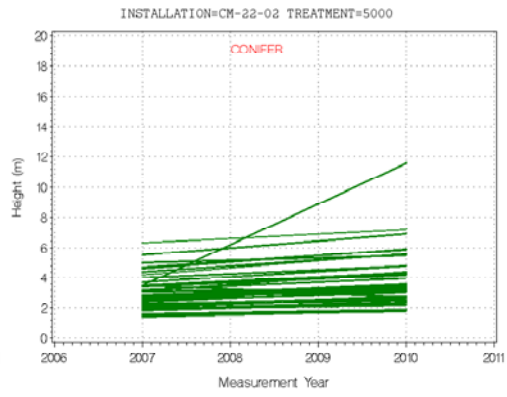
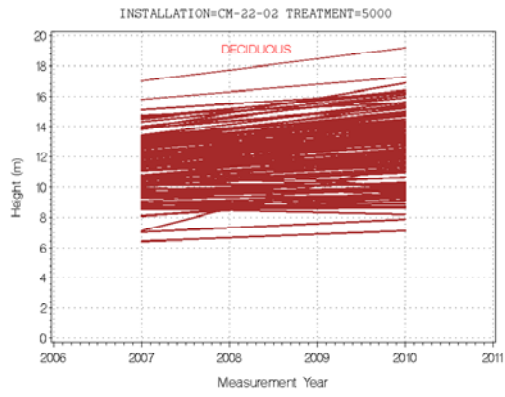
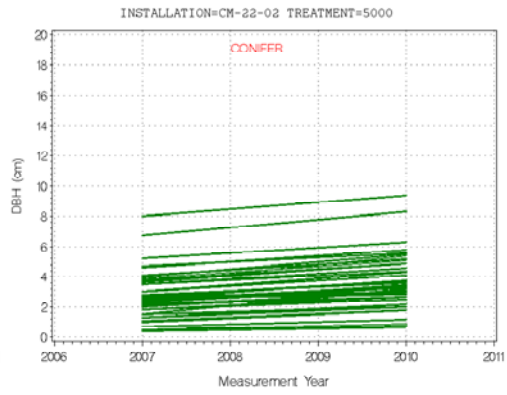
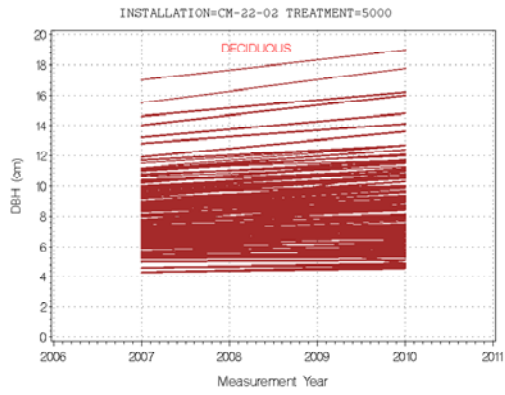
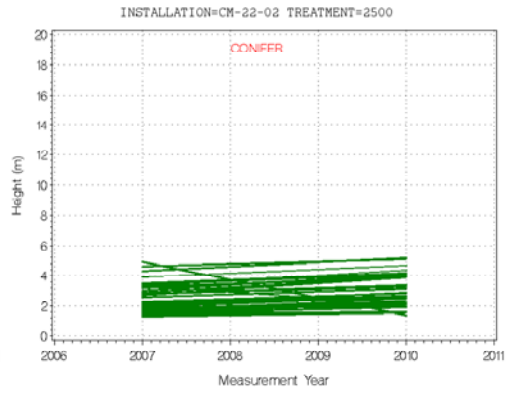
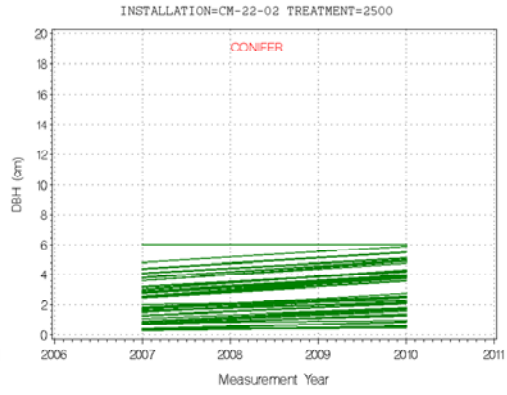
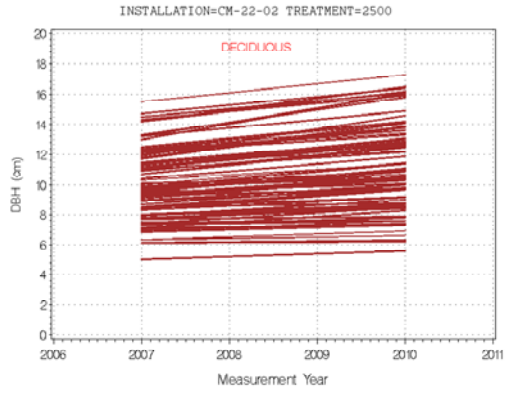


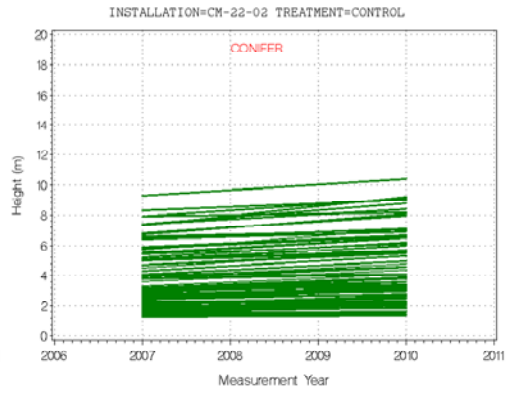
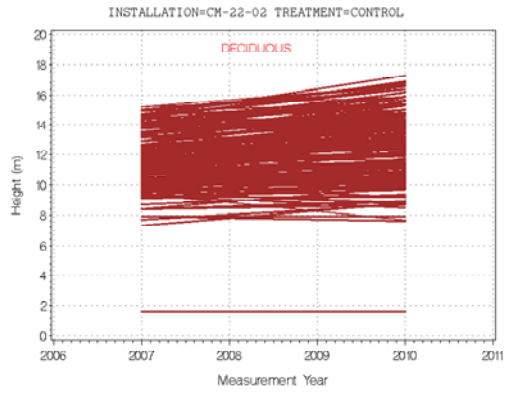
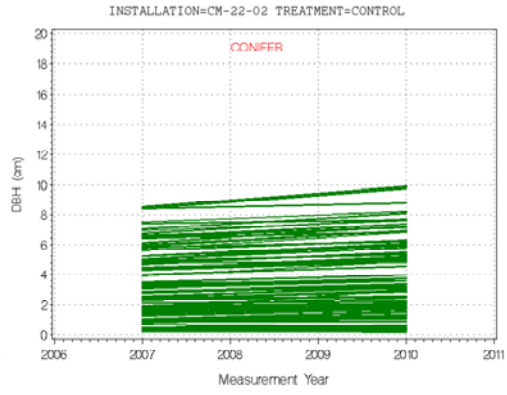
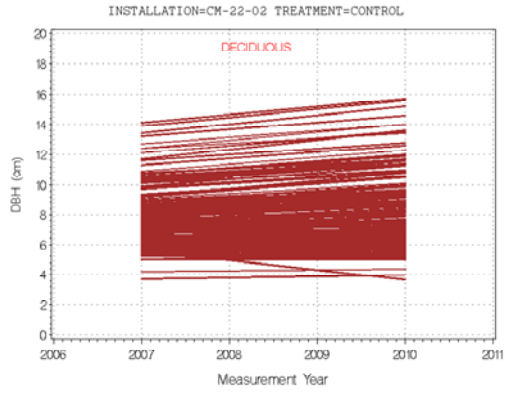




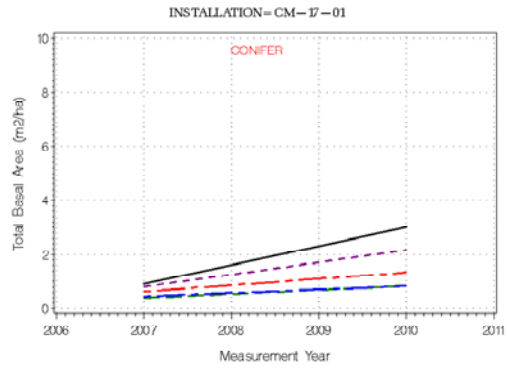
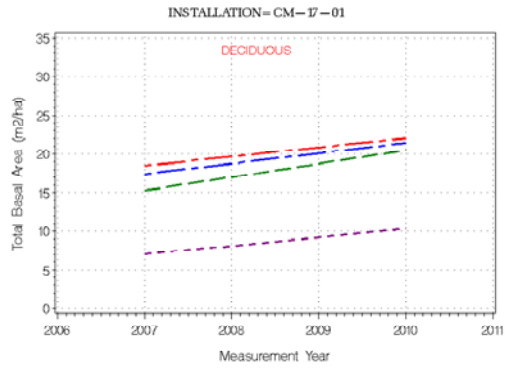
DBH and Height Trajectories for CM-22-02: 2007 vs. 2010





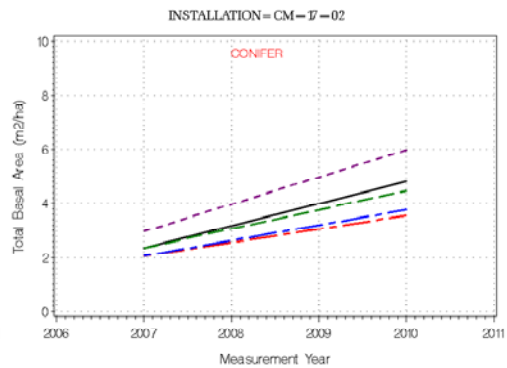
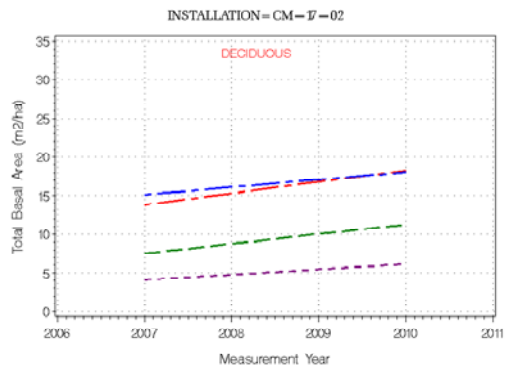


Basal Area Trajectories for All Four Installations 2007-2010



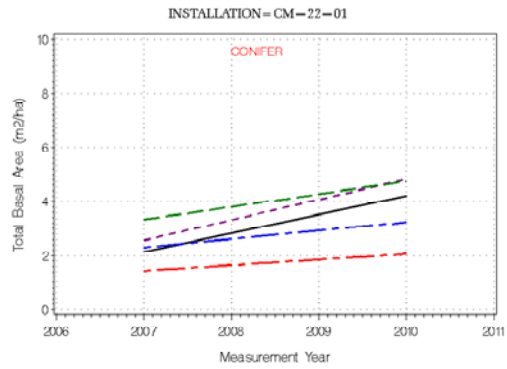
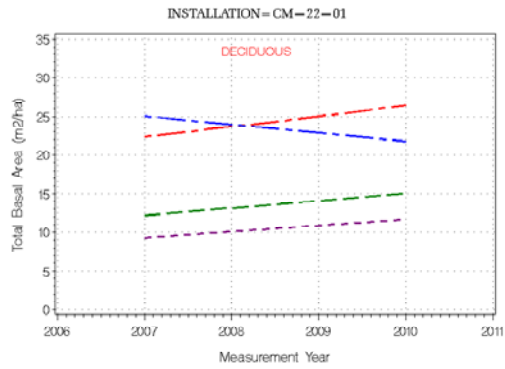
TREATMENT: BLACK=0, PURPLE=1000, GREEN=2500, RED=5000, BLUE=CONTROL

TREATMENT: BLACK=0, PURPLE=1000, GREEN=2500, RED=5000, BLUE=CONTROL



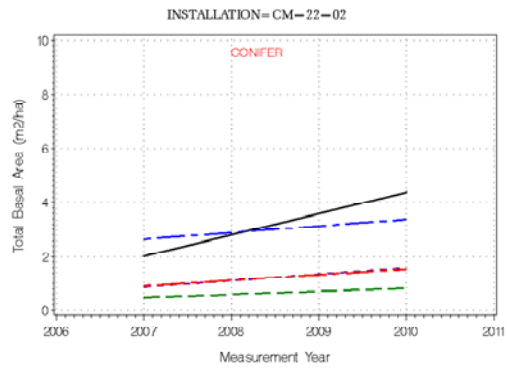
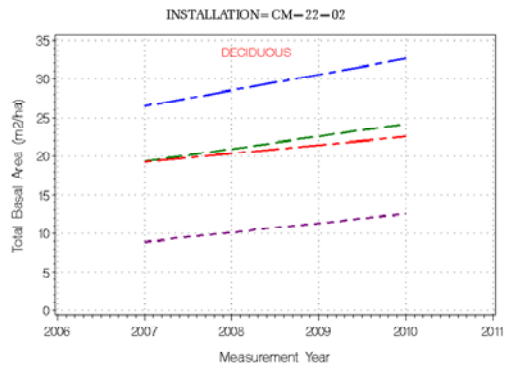
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TREATMENT: BLACK=0, PURPLE=1000, GREEN=2500, RED=5000, BLUE=CONTROL



TREATMENT: BLACK=0, PURPLE=1000, GREEN=2500, RED=5000, BLUE=CONTROL

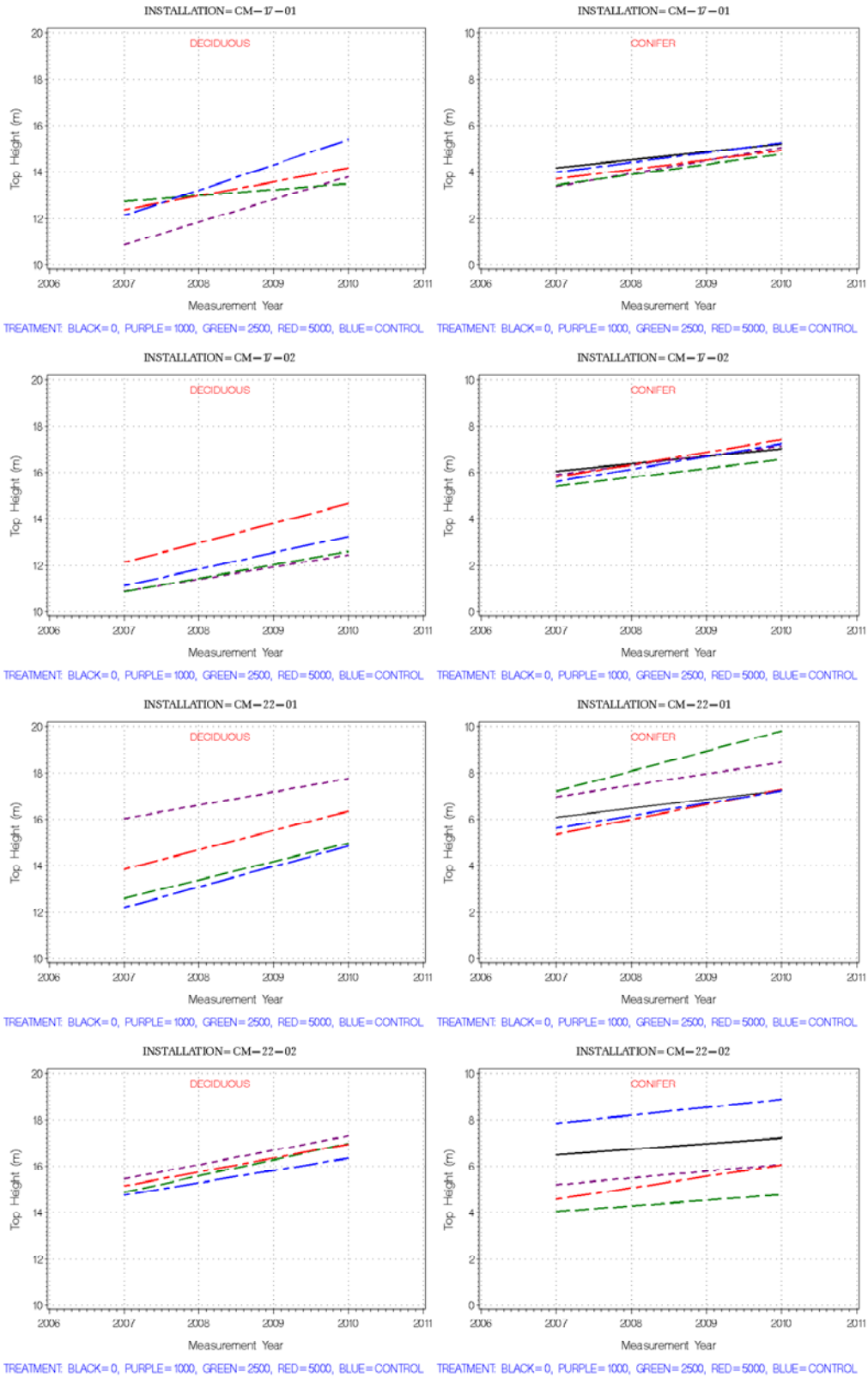
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TREATMENT: BLACK=0, PURPLE=1000, GREEN=2500, RED=5000, BLUE=CONTROL

TREATMENT: BLACK=0, PURPLE=1000, GREEN=2500, RED=5000, BLUE=CONTROL

Top Height Trajectories for All Four Installations 2007-2010



7.2 Appendix 2 List of Tags Removed During The 2010 Field Season.

7.2.1. CM 17-01 Touchwood Lake Road

7.2.1.1. Tag Removal on Spruce < 1.3m.

Date: September 20-23, 2010.

When CM 17-01 was established, spruce less than 1.3m were tagged and measured. Current protocol is to measure only spruce ≥ 1.3 m. To make all installations the same, tags on spruce < 1.3m were removed in October 2009. There were no additional tags removed from this installation in 2010.

7.2.2. CM 17-02 Calling Lake (AIPac‘C’ Road)

7.2.2.1. Tag Removal on Spruce < 1.3 m and missing trees.

Date: September 4 – 7, 2010

This installation originally had four conifer subplots installed to measure spruce < 1.3 m. The subplot posts were removed in 2009 and all spruce < 1.3 m had the tags removed. In September 2010 some additional tags were removed from the plots. The tags are presented in the table below. Most of the tags come from missing trees rather than spruce < 1.3 m.

CM-17-2	0	5026	SW	Dead and down
CM-17-2	0	5437	SW	Missing tree
CM-17-2	1000	5758	SW	Missing tree
CM-17-2	1000	5783	SW	Missing tree
CM-17-2	5000	6461	AW	Cut down
CM-17-2	CONTROL	5255	PB	Dead and down

7.2.3. CM 22-1 Calling Lake MOF

7.2.3.1. Tag Removal – dead trees.

Date: September 8 – 12, 2010

The tags in the table below were removed from dead trees in September 2010.

CM-22-01	0	1396	SW	Dead and down
CM-22-01	0	1500	SW	Dead and down
CM-22-01	0	1501	SW	Dead and down
CM-22-01	1000	2272	SW	Windthrow
CM-22-01	CONTROL	1598	AW	Dead and down
CM-22-01	CONTROL	1609	WL	No information
CM-22-01	CONTROL	1816	AW	Dead tree standing

CM-22-01	CONTROL	1929	AW	Dead and down
CM-22-01	CONTROL	1951	AL	No information
CM-22-01	CONTROL	2105	No information	

7.2.4. CM 22-2 Calling Lake (AIPac 1000 Road)

7.2.4.1. Tag removal on Spruce < 1.3m and on dead/missing trees.

Date: September 14 – 18, 2010

All treatment units had all of the tags removed on spruce < 1.3 m. Tags were also removed from dead trees. All tags for which the trees could not be found (missing trees) were also collected.

CM-22-02	0	3185	SW	Missing
CM-22-02	2500	4604	SW	Spruce < 1.3 m
CM-22-02	5000	4733	SW	Spruce < 1.3 m
CM-22-02	CONTROL	3309		No information
CM-22-02	CONTROL	3446	AW	Dead and down
CM-22-02	CONTROL	3589	WI	Dead and down
CM-22-02	CONTROL	3603	WI	Dead and down
CM-22-02	CONTROL	3635	AL	Dead and down
CM-22-02	CONTROL	3729	WI	No information
CM-22-02	CONTROL	3763	BW	Dead and down
CM-22-02	CONTROL	3914		No information
CM-22-02	CONTROL	3956	SW	Spruce < 1.3 m

7.3 Appendix 3 Copy of Road Use Agreement

This agreement is for employee's of The Forestry Corp. of Edmonton and their sub contractor's to have road access across our property's to undergo their work of thinning trees on crown land in Weyerhaeuser's FMA for the University of Alberta's project. This is for pickup truck traffic only.

Our property includes SE-21-50-9-W5.

SW-21-50-9-W5.

NW-21-50-9-W5.

Our conditions are that all parties follow road signs especially when driving through our S.E. $\frac{1}{4}$ past the house and that you are driving on this road at your own risk. You must also have contacted Penn West and obtained their conditions and approval as they are the principle owners of the road system.

There is a cost to use the main road as understood by all parties. We will leave it up to you to provide us with your monthly usage and payments as discussed. This agreement also covers your past access of which a separate cheque will be forth coming as discussed.

As owners of this property we hold the right to cancel this agreement at any time if we feel The Forestry Corp or its contractors are not abiding with this agreement. Also as land owners you (The Forestry Corp) will not hold us responsible for any issues, accidents or other problems that might arise, either human or animal related while you are using this portion of the said road.

Signed

Henry & Bonnie Watson

7.4. Appendix 4. Reservation Notations.

- CM 17-1 ISP 080201
- CM 17-2 ISP 080200
- CM 17-3 ISP 090393
- CM 17-4 ISP 090394
- CM 17-5 ISP 090394
- CM 17-6 ISP 090394
- CM 17-7 ISP 090395
- CM 22-1 ISP 080202
- CM 22-2 ISP 080203
- CM 22-3 ISP 080336
- CM 22-4 ISP 080337
- CM 22-5 ISP 080338
- CM 22-6 PNT 090007
- CM 22-7 ISP 080340

7.7 Appendix 7. Database Updating

7.7.1. Tags Removed Table Updated

To account for all the tags that had to be removed to standardize the protocol, a database table was created with all of the tag numbers and reasons that tags were removed.

In order to standardize all the installations and correct some establishment errors, two tables were created in 2009: “Tags to be Removed” and “Removed Tags”. Tags to be Removed table included all the tags that should have been removed in the field in order to standardize the installations. Table Removed Tags indicates the tags that were actually removed in the field in 2008 and 2009. Some tags from the “Tags to be Removed” table were not found in the field.

Table “Removed Tags” was updated in 2010 to include the tags collected at the first re-measurement (2010). The tags removed in 2010 represent a mix of tags collected from trees found dead when the installations were re-measured and previously not found tags from the “Tags to be Removed” existing table.

A single variable (Final_Flag) was used in the tree table to indicate if a tree was still in the database (Final_Flag = ‘’) or if it was removed (Final_Flag = ‘YES’). This variable was compiled based on all the existing information and it represents the 2010 updated status of trees in the installations.

7.7.2. General Database Updates

The Database was updated and is current to the end of December, 2010. The following additional tasks were completed:

- 2010 Re-measurement data from CM-17-1, CM-17-2, CM-22-1, CM-22-2 were appended to the database.
- The tags removed in 2010 were appended to the Removed Tags table.
- Modifications were made to some of the database tables to accommodate the measurement number and measurement date.

A separate document describing the process to create the 2010 DADE database as well as the database itself was produced and accompanies the 2010 version of the database.

7.8 Appendix 8. 2009 DADE Project Manual

2009 DADE Project Manual – the manual was not changed in 2010.