

**REGION E (G259C) WHITE SPRUCE CLONAL SEED ORCHARD
2010 MANAGEMENT, OPERATIONS AND
SEED PRODUCTION RESEARCH**

Technical Report

EXAMPLE ONLY

**Alberta Tree Improvement & Seed Centre
Alberta Sustainable Resource Development
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1.0 INTRODUCTION

The Region E seed orchard is located at the Alberta Tree Improvement and Seed Centre (ATISC) site and is managed and maintained by ATISC. It occupies an area of approximately 2.5 hectares and is designed for 1200 grafts. The orchard was established in 2 phases: planting of Phase I (G259A), designed for 700 grafts, commenced in 1989; Phase II (G259B), with a capacity of 500 grafts, was initially planted in 1995. Since 2003, the orchard has been considered a single production facility with the project number G259C. This is a rolling front orchard in which clones are replaced on a more or less continuous basis as higher breeding value material is identified; the number of clones finally represented will reflect a balance between gain and effective population size. The first genetic roguing of the orchard was done in 2005 based on progeny test results for 11 year height.

The Controlled Parentage Plan (CPP) related to this orchard is the Region E White Spruce Tree Improvement Project in the Northeast Boreal Lowland Region in Alberta.

The base population for this CPP is considered to be wild stands of white spruce occurring within Region E. The current breeding population consists of 119 wild stand selections, 3 plantation selections from the G103 white spruce provenance trials and 5 forward selections from the Region E progeny trial at the Wandering River site (G156B). As of September 2010, 1142 grafts representing 97 of these parents are established in the orchard.

The progeny trials for this CPP, assigned project number G156, were established in 1994 at Kinosis Lake (G156A), Wandering River (G156B) and Calling Lake (G156C). These trials were 19 years old at the end of the 2010 growing season.

The orchard manager is Mike Storp (ATISC) with scientific support from Jill Makim (ATISC).

This report provides highlights of the management and operations of the seed orchard in 2010. A point form summary of activities in 2010 is provided in Appendix A.

2.0 CULTURAL ACTIVITIES

2.1 Irrigation

The irrigation system was activated on May 19. All lines were flushed and emitters to all grafts were checked to ensure free water flow.

The orchard is normally irrigated every week for 8 to 16 hours depending upon rainfall. Throughout the summer, the system was inspected periodically to ensure that all trees were being sufficiently irrigated. Repairs were made as required.

On October 13, the orchard was given a final deep watering to at least eight inches below the soil surface.

2.2 Fertilization

Based on soil sample analyses completed on October 5, 2009, a fertilizer prescription specific to the Region E orchard was developed for the 2010 growing season. A blend of 21-0-0, 46-0-0, 0-45-0 and 0-0-51 was used. The prescribed amount of fertilizer was applied over three applications completed in October (2009), June (2010) and July (2010). Fertilizer is applied with a band fertilizer that places a 50 cm band on both sides of the graft. The fertilization workplan for 2010 is in Appendix B.

On September 27, 2010, soil and tissue samples were taken to assess the macro- and micro- nutrient levels of the soil and the current year's growth of the grafts. The fertilizer prescription for the 2011 growing season is based on these assessments. Soil sampling was conducted throughout the orchard, at a depth of six inches and within one foot of planted grafts. Both samples were submitted to an accredited laboratory for detailed nutrient analysis.

2.3 Vegetation Management and Control

Mowing was done three times during the growing season on June 4, 7-8, July 5-6 and 21.

2.4 Flower Induction

No flower induction activities were undertaken in 2010.

2.5 Supplemental Pollination

No supplemental pollination was undertaken in 2010.

2.6 Graft Maintenance

No major graft maintenance was completed in 2010 in the orchard.

Throughout the growing season, active northern pocket gophers (*Thomomys talpoides*) were trapped using a box trap. The gophers are tunnelling under established grafts, loosening the soil and damaging roots causing the grafts to fall over.

3.0 INSECT AND DISEASE INCIDENCE

Inspections for insect and disease problems were carried out in conjunction with regular maintenance activities.

On June 21, a moderate infestation of yellow headed spruce sawfly (*Pikonema alaskensis*) was noted and Entrust[®] 80W Naturalyte (Spinosyn) was applied at a rate of 15 gms/1000 L (1.5% solution) using a tractor turbo mist sprayer. Throughout the summer, periodic checks were made to ensure outbreaks of this insect did not reoccur.

In a sample of 300 mature cones the spruce cone maggot (*Strobilomyia neanthracina*) and the spruce cone axis midge (*Kaltenbachiola rachiphaga*) were identified. Especially damaging was the cone maggot which was detected in 18% of the cones; seed loss due to the maggot was estimated at about 12%. The cone axis midge was found in one cone only.

4.0 ORCHARD MONITORING AND RESEARCH

4.1 Permanent Sample Trees

As a requirement of the Forest Genetic Resource Management and Conservation Standards (FGRMS), permanent sample trees (PST) are assigned in the seed orchard to provide orchard specific data about orchard development, flowering, cone and seed production, and seed quality. They also provide an estimate of reproductive gender balance and data for cone crop forecasting. A minimum of 10% of orchard trees are designated as PSTs and they represent each clone and planting year (see Appendix 33 FGRMS). Data recorded on PSTs include total height, crown width, diameter at breast height (dbh), flower and cone production, seed yield and germination. In 2010, 137 PSTs were assessed and the data are summarized in Appendix C.

4.2 Phenology Monitoring

Phenology monitoring permits the identification of clones that are receptive either later or earlier than the bulk of the orchard population. It also allows the period of orchard receptivity to be related to patterns of within orchard pollen flight. Clones that may not be successfully pollinated can then be identified.

Assessments of female and male bud development begin when most reproductive buds are identifiable and are continued until all sample trees are post-receptive and pollen has flown. Data are collected approximately every 2 days. Orchard phenology is monitored with the PSTs.

In 2010, female phenological development was assessed on 108 PSTs representing 54 clones and male phenological development was assessed on 124 PSTs representing 62 clones. The first assessment was done on May 10 when growing degree days (GDD) had reached 73; the last assessment was on May 19 at 160 GDD. Based on the phenology data, the period of orchard receptivity (when at least 20% of the clones are receptive) was estimated to be May 14 to 18 corresponding to accumulated GDD of 95-147. Pollen trap data show that pollen flight in the orchard peaked May 17-18 (129-147 GDD). On average, clones were receptive for 4.5 days and shedding pollen for 2.1 days.

The phenology data suggest that most clones reach receptivity 2-3 days in advance of general pollen flight in the orchard. On the contrary, the pollen trap data indicate that the beginning of pollen flight and female receptivity are essentially concurrent. In either case, all clones in the PST sample remained receptive throughout the orchard pollen flight period and, since pollen flight both within and outside the orchard is essentially concurrent, there should be no increased risk of pollen contamination resulting from incomplete synchrony between receptivity and pollen flight in the orchard.

Data and summaries appear in Appendix E.

4.3 Pollen Monitoring

Wind vane type pollen monitors are used to determine the period of pollen flight and pollen cloud density. The data are used to estimate the level of pollen contamination in the seed orchard.

Three monitors are installed in the orchard and four regional monitors are located north (D1), south (E sector), northeast (culverts) and southeast (burn pit) of the orchard (Appendix D). Because a jack pine stand occurs to the west of the orchard, no suitable openings are available for establishing a pollen monitor within a reasonable distance of the orchard in this direction.

A microscope slide coated with Vaseline[®] is mounted on each monitor to trap pollen. The monitors are installed in early May, before the start of pollen release, and the slides are changed every 1-2 days.

Pollen cloud density is determined by examining the slides using a compound microscope fitted with a 10x eye piece lens and a 10x objective lens giving a total magnification of 100x. A 1 cm² micrometer grid is inserted into the eyepiece and the number of pollen grains falling within the grid is counted. Pollen grains are magnified 100x; the micrometer grid in the eyepiece is 1 cm² magnified 10x which is equivalent to 1 mm² magnified 100x, therefore, counts are in grains/mm². Counts are done on 10 systematically selected fields on the microscope slide and averaged over all orchard or regional monitors to give average pollen density for a given day.

Pollen was trapped from May 14 to June 1. From May 14 to 18, the period of orchard receptivity, an average of 20.9 spruce pollen grains/mm² were trapped on the orchard monitors and 6.4 spruce pollen grains/mm² were trapped on the regional monitors. Pollen contamination was estimated at 10%. A summary of the data and the pollen contamination calculations are provided in Appendix F.

5.0 CONE AND SEED PRODUCTION

Cone collection commenced on August 18 and was completed by August 24. Tripod ladders and two 40-foot manlifts were used in cone picking operations. Trees 5-6m in height were topped to facilitate cone collection. Cones were picked directly into a 1 or 2 gallon pail equipped with a quick release clip and chain to allow easy placement on the ladder or the tree.

Non-PST Trees (Bulk collection):

Cones from non-PST trees were bulked into burlap sacks and brought to the Smoky Lake Forest Nursery (SLFN) seed cold storage bays for volume measurement and curing.

PST collection:

Cones from PSTs were collected and bagged separately in order to estimate the effective population size of the 2010 orchard seedlot (see FGRMS Appendix 37). ATISC staff measured the cone volume of each individual tree collection unless the number of cones was very small (i.e. <15). For collections less than 2 litres, all the cones were counted; for collections greater than 2 litres, the number of cones in 1 litre was counted and the total number of cones estimated by multiplying total volume by cones per litre. Cones were then bulked and spread on screen-lined pallets to cure. On October 13, the cones were released to SLFN for extraction and testing.

In 2010, the orchard produced 3160 litres of cones and 26.21 kilograms of clean seed with a germination of 92%. Annual information on orchard development, cone and seed production, seed testing and effective

population size is summarized in Table 1. Beginning in 2010, N_e is estimated from PST data instead of from the entire cone crop. The genetic worth of the 2010 seed crop is estimated at 2.5% without adjusting for pollen contamination; after adjusting for 10% pollen contamination the genetic worth is 2.3%.

Table 1. Region E white spruce clonal seed orchard (G259C) – cone and seed production.

Variable	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
# of trees	1142	1137	1114	1103	1006	1162	1159	1161	1162	1142	1145
Average tree age (yrs from grafting)	18	17	16	16	16	15	14	13	12	11	10
Trees producing cones	942 (82%) ¹	777 (68%)	25 (2%)	1052 (95%)	594 (59%)	896 (77%)	3 (0.3%)	1089 (94%)	510 (44%)	180 (16%)	184 (16%)
# of clones	97	97	97	97	92	94	94	94	94	91	91
Clones producing cones	79 (81%) ¹	86 (89%)	16 (16%)	90 (93%)	78 (85%)	91 (97%)	3 (3%)	91 (97%)	72 (77%)	48 (53%)	51 (56%)
Cone production (l)	3160	769	0.75	9869	150	361	0.025	7840	118	14.7	6.5
Cones per tree	454	90	0.2	1319	38	49	-	1378	20	3	2
Cones per litre	164	133	295	147	251	159	-	204	199	205	277
Total # of cones	517,948	102,645	221	1,455,178	37,767	57,455	9	1,599,360	23,439	3,015	1,798
Clean seed (g)	26,210	7,490	0.02	103,043	42	1,494	0	110,900	825	70.7	18.0
Seeds per cone	20.3	29.4	0.05	30.5	0.4	10	-	35	16	8.8	4.7
Seeds/kg	401,123	403,063	450,045	430,662	344,135	382,701	-	504,032	456,412	378,788	429,184
Seed yield (g/hl)	829.4	973.9	2.96	1044.1	27.9	413.6	-	1414.5	699	480.9	277.2
1000 seed weight	2.49	2.48	2.22	2.32	2.90	2.61	-	1.98	2.191	2.64	2.33
Germination %	92.0	84.5	70.0	94.0	98.0	93.0	-	93.0	78.5	92.8	89.0
Effective Population size	17 ¹	14	6.9	25.2 ^{**}	18.5	24.4	2.4	29.9	18.6	14.3	6.1

¹estimated from psts

^{**} N_e includes polycross collections from 14 clones which were extracted and stored separately from the bulk collection for use in progeny testing
 N_e excluding these clones is 25.1; this is the N_e of the bulk seedlot in operational cold storage

6.0 SUBSEQUENT YEARS' PLANNING

Based on 15-year analysis results, the orchard will be rogued and redesigned to increase representation of top performing parents.

Appendix A. Operations Completed for 2010 – Brief Summary

April 1	Pollen slides preparation for 2010 pollen flight
April 28	Graft assessment and check 2009 planting
April 30	Graft maintenance
May 3	Install pollen traps
May 10	Phenology survey
May 12	Phenology survey
May 14	Phenology survey
May 17	Phenology survey
May 19	Phenology survey
May 19	Charge up irrigation system
May 20	PST flower counts
May 21	PST flower counts
May 21	Change pollen slides
May 24	Change pollen slides
May 25	PST flower counts
May 26	Change pollen slides
May 26	Irrigation
May 28	Change pollen slides
May 31	Change pollen slides
May 31	Mow grass along roadway
June 2	Change pollen slides
June 4	Mowing
June 7-8	Mowing
June 15	Irrigation
June 16	Check for Yellow headed sawfly
June 16	Apply fertilizer with band fertilizer
June 21	Spray for yellow headed sawfly
June 23	Irrigation
July 5	Irrigation
July 5-6	Mowing
July 6	Apply fertilizer with band fertilizer
July 7	Check for Yellow headed sawfly
July 12	Planting of 5 grafts
July 12	Irrigation
July 21	Mowing
July 28	Spray painting PST grafts
July 28	Irrigation
August 4	Irrigation
August 5	Move ladders to F&G
August 9	Irrigation
August 17	Irrigation
August 18	Cone picking (7 pickers and 17 heli-attack from Lac La Biche)
August 19	Cone picking (9 pickers and 17 heli-attack from Lac La Biche)
August 20	Cone picking (11 pickers and 12 heli-attack from Lac La Biche)
August 21	Cone picking (4 pickers and 12 heli-attack from Lac La Biche)
August 22	Cone picking (4 pickers and 12 heli-attack from Lac La Biche)
August 23	Cone picking (9 pickers and 15 heli-attack from Lac La Biche)

August 24	Cone picking (11 pickers and 10 heli-attack from Lac La Biche)
September 2	Irrigation
September 14	Irrigation
September 22	Irrigation
September 27	Collect soil and tissue samples
September 29	Irrigation
October 8	Irrigation
October 13	Deep water and winterize system
November 10	Apply fertilizer with band fertilizer

Appendix B. 2010 Fertilization Workplan

October 2009, June 2010 and July 2010 Application Region E (G259) Seed Orchard

Project No.	Target (kg/Ha)			Available (kg/Ha)			Required (kg/Ha)			Application per band (kg)			# of Trees	Total Amount / Application (kg)			Total Area Fertilized	kg/Ha		
	N	P	K	N	P	K	N	P	K	21-0-0	46-0-0	0-45-0		0-0-51	21-0-0	46-0-0			0-45-0	0-0-51
G259	100	50	280	4.40	50.00	180.40	95.60	0.00	99.60	27.31	12.42	0.00	28.23	1142	27.31	12.42	0.00	28.23	0.3600	188.78
Total amount required (kg)																				
27.31 12.42 0.00 28.23																				
Total X 10% (kg)																				
2.73 1.24 0.00 2.82																				
Total amount required for seed orchard (kg)																				
30.05 13.66 0.00 31.05																				

Appendix C. Permanent Sample Trees

Table C-1. Summary of Seed Production & Monitoring Information for Region E White Spruce Clonal Seed Orchard (G259C) – 2010.

ORCHARD CHARACTERISTICS		RESULT
1.	Orchard design capacity	1200
2.	Total no. of seed trees established	1142
3.	Total no. of clones/families established	97
4.	Average age	18
5.	Age range	4-25
6.	Average height (cm ± SE)	.
7.	Height range	.
8.	Average crown width (cm ± SE)	.
9.	Crown width range	.
10.	Average DBH (cm ± SE)	.
11.	DBH range	.
12.	Total no. of PSTs	137
REPRODUCTIVE BALANCE		
13.	No. of PSTs flowering	127
Male Flowering		
14.	No. PSTs with male flowers	125
15.	Mean no. male flowers/PST	1288
16.	Standard error of (15.)	133
17.	Range male flowers/PST	0-9500
Female Flowering		
18.	No. PSTs with female flowers	116
19.	Mean no. female flowers/PST	265
20.	Standard error of (19.)	31
21.	Range female flowers/PST	0-1800
22.	Mean male:female flower production ratio	23
IMMATURE CONE PRODUCTION		
23.	Date assessed	na
24.	No. PSTs producing cones	na
25.	Mean no. cones/PST	na
26.	Standard error of (25.)	na
27.	Range of cones/PST	na
28.	Cone crop estimate (number of cones)*	302630
29.	Cone crop estimate (hectolitres)**	20.2
CONE PRODUCTION		
30.	No. of PSTs producing cones	113
31.	Mean no. cones/PST	361
32.	Range of cones/PST	0-3889
33.	Total no. of cones collected from PSTs (max 5/tree; developing orchards only)	49511 (all cones)
34.	Mean no. of cones/litre***	164
SEED PRODUCTION ***		
35.	Seed production (kg)	26.2
36.	No. of seeds/cone	20.3
37.	1000 seed weight	2.49
38.	Germination %	92

*For all species except pine (2.) x (19.)

*For pine species (2.) x (25.)

**To estimate hectolitres divide (28.)

by the appropriate factor

For white spruce - 15000 cones/hl

For black spruce - 24000 cones/hl

For lodgepole pine - 3800 cones/hl

***For producing orchards, lines 34-38 may be completed from operational crop data

Appendix C. cont'd . . .

Table C-2. Annual mean summary of PST data for Region E white spruce clonal seed orchard (G259C).

YEAR	HEIGHT (cm)	CROWN WIDTH (cm)	DBH (mm)	MALE FLOWERS	FEMALE FLOWERS	NO. of CONES
1992	84	42	-	2	2	0
1993	102	53	-	2	1	1
1994	-	-	-	0	0	0
1995	151	87	-	8	8	5
1996	-	-	-	135	40	40
1997	212	109	-	48	4	4
1998	-	-	-	76	20	16
1999	269	127	-	502	360	261
2000*	-	-	-	26	2	1
2001	310	134	41	19	3	4
2002	355	160	49	96	8	14
2003	341	166	57	7176	1463	1340
2004	384	190	66	0	0	0
2005	-	-	-	256	27	53
2006	479	226	82	922	29	52
2007	422	246	89	2082	591	1289
2008	-	-	-	5	0	0
2009	510	252	108	1970	45	89
2010	-	-	-	1288	265	361

*data from G259A and B combined beginning in this year

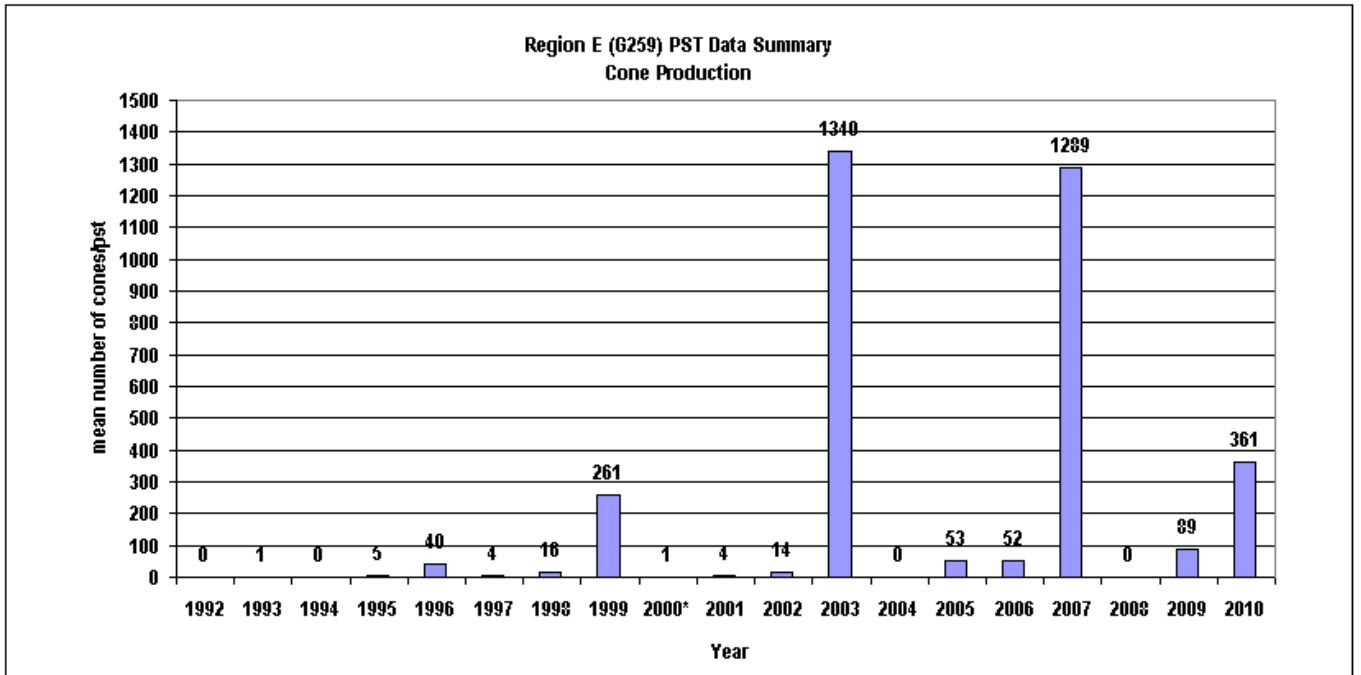


Fig. C-1

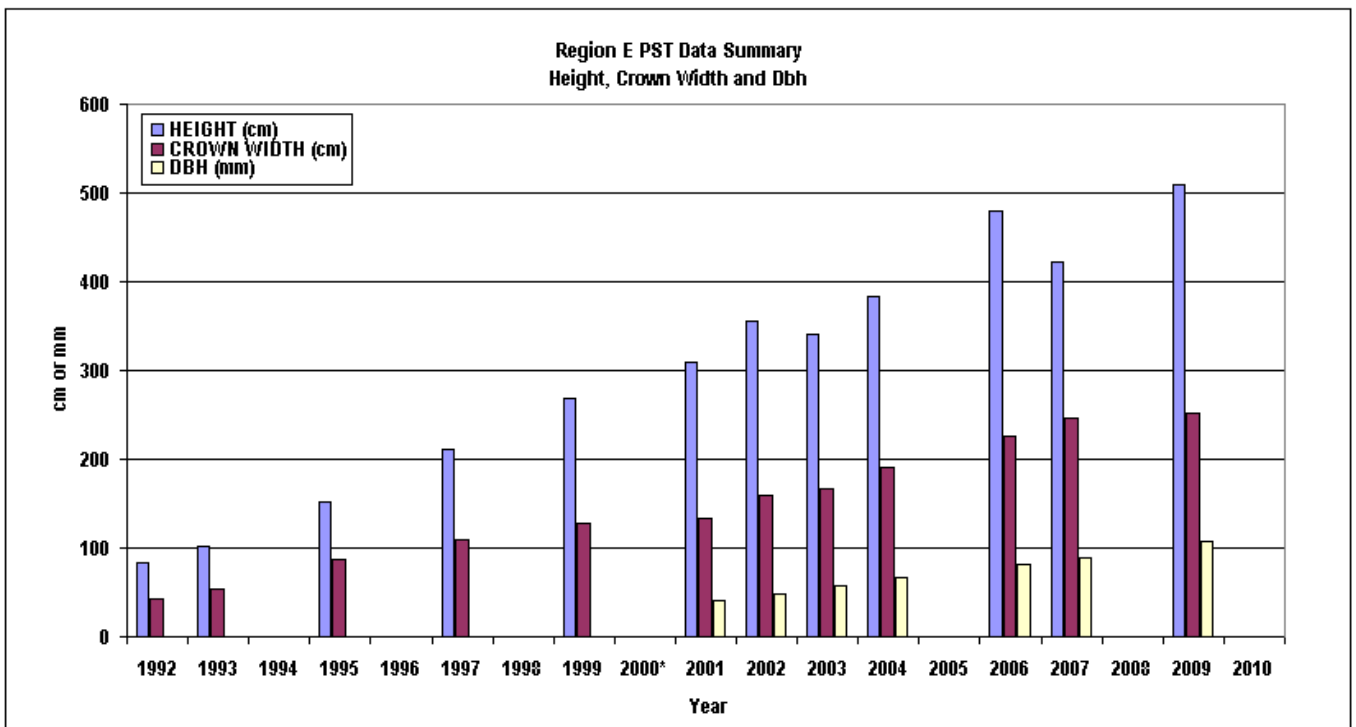


Fig. C-2

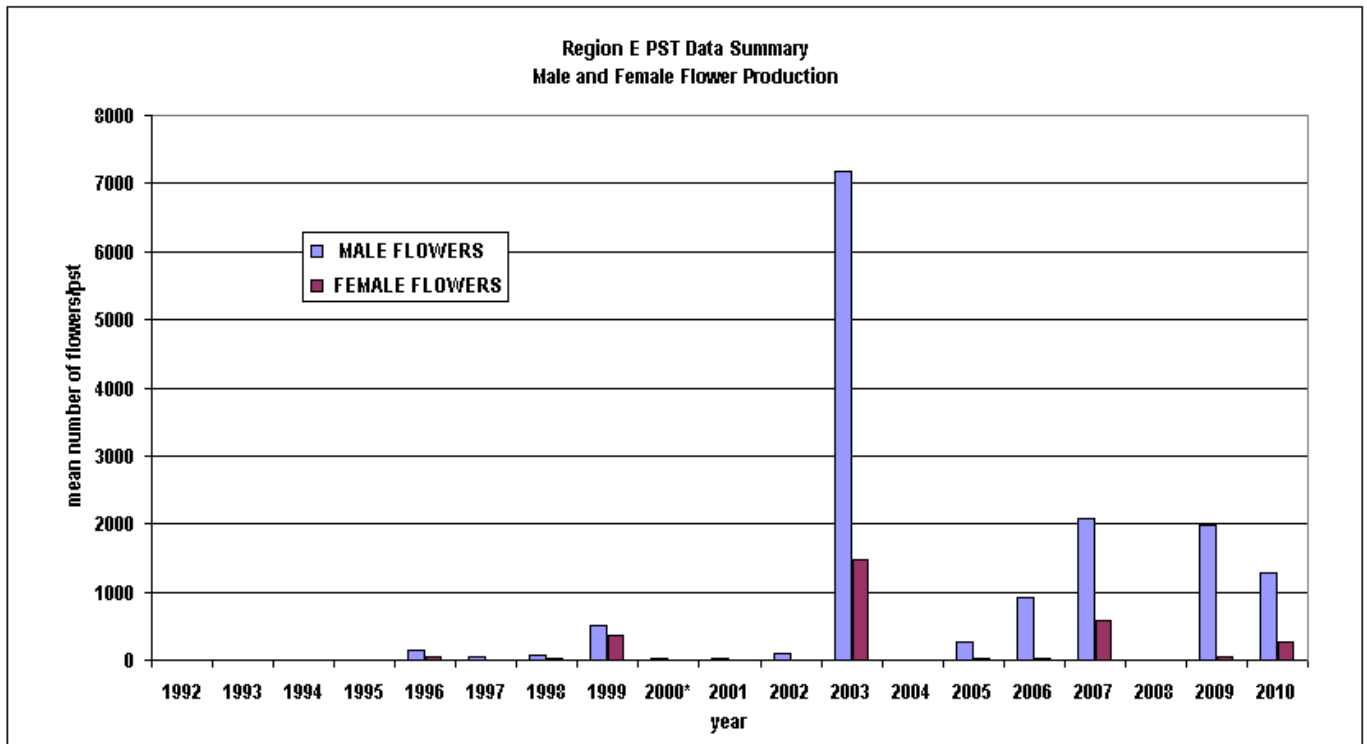
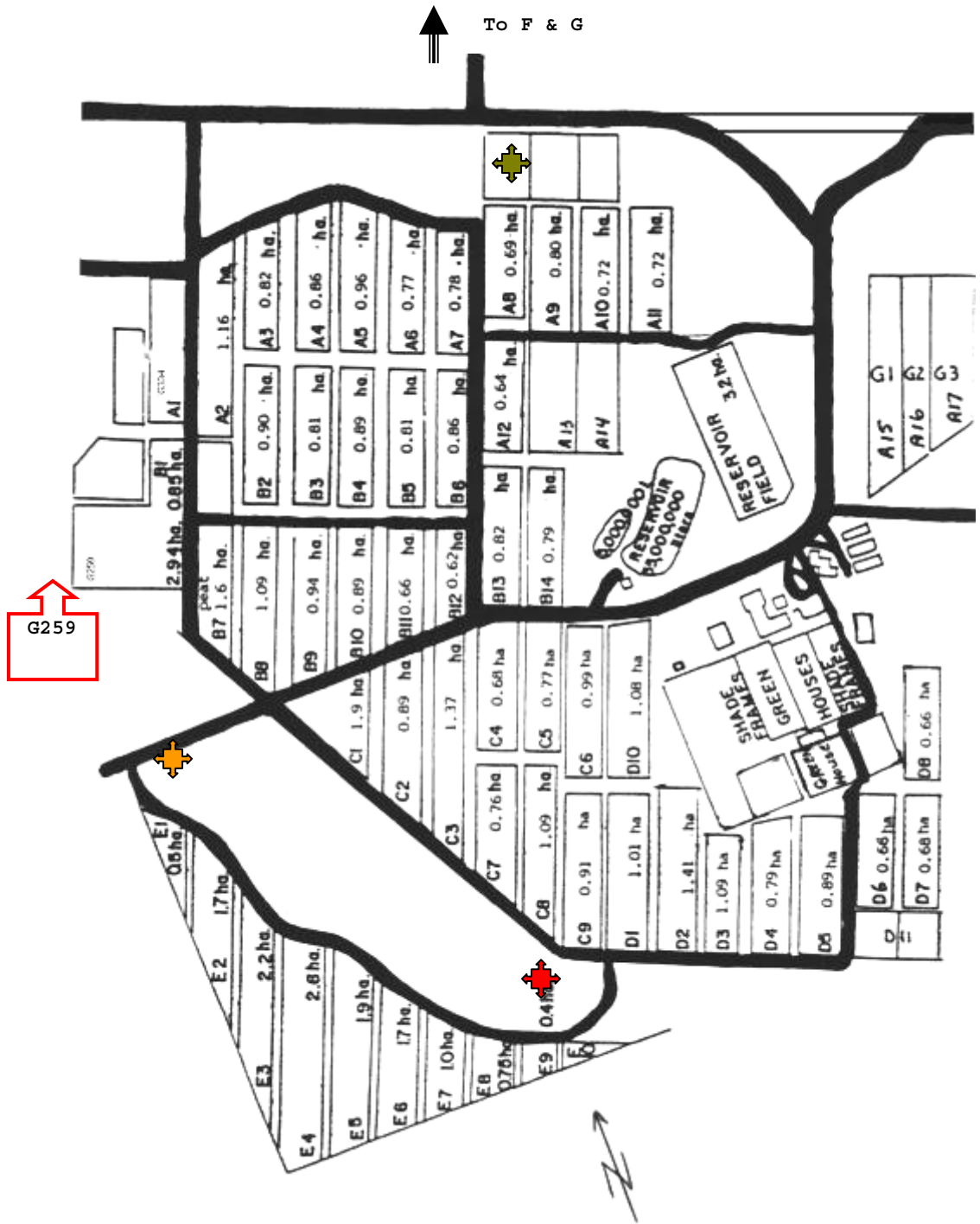






Fig. C-3

Appendix D: Location of Regional Pollen Monitors



-  E3 pollen monitor
-  Burn Pit monitor
-  Culverts monitor
-  D1 monitor (see next page)

 **D1 pollen monitor**



Appendix E. Phenology Monitoring

Table E1. Region E average number of receptive days and pollen flight days per clone – 2010.

Female				Male			
Number of days	Receptive Period	Number of clones	Weighted # of days	Number of days	Anthesis Period	Number of clones	Weighted # of days
5	14/19	27	135	2	17/19	56	112
4	15/19	25	100	3	17/20	6	18
5	15/20	2	10			62	130
		54	245			avg. no. of anth days	2.1
		avg. no of rec days	4.5				

Table E-2. Region E clonal receptivity and pollen flow – 2010.

date	female			male			Pollen Flow (grains/mm ²)	Cumulative Pollen Flow	Percent Pollen Flow	Cumulative % Pollen Flow	Pollen Flow (grains/mm ²)	Cumulative Pollen Flow	Percent Pollen Flow	Cumulative % Pollen Flow
	# receptive	# post-rec	% receptive	# anthesis	# post-anth	% anthesis	(orchard)	(orchard)	(orchard)	(orchard)	(regional)	(regional)	(regional)	(regional)
13	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	27	0	50	0	0	0	7.5	7.5	33.5	33.5	1.4	1.4	18.2	18.2
15	54	0	100	0	0	0	7.5	7.5	33.5	33.5	1.4	1.4	18.2	18.2
16	54	0	100	0	0	0	7.5	7.5	33.5	33.5	1.4	1.4	18.2	18.2
17	54	0	100	62	0	100	13.4	20.9	59.8	93.3	5.0	6.4	64.9	83.1
18	54	0	100	62	0	100	13.4	20.9	59.8	93.3	5.0	6.4	64.9	83.1
19	2	52	4	6	56	10	1.0	21.9	4.5	97.8	0.7	7.1	9.1	92.2
20	0	54	0	0	62	0	1.0	21.9	4.5	97.8	0.7	7.1	9.1	92.2
21	0	54	0	0	62	0	0.5	22.4	2.2	100.0	0.6	7.7	7.8	100.0
							22.4		100.0		7.7		100.0	

orchard receptive period

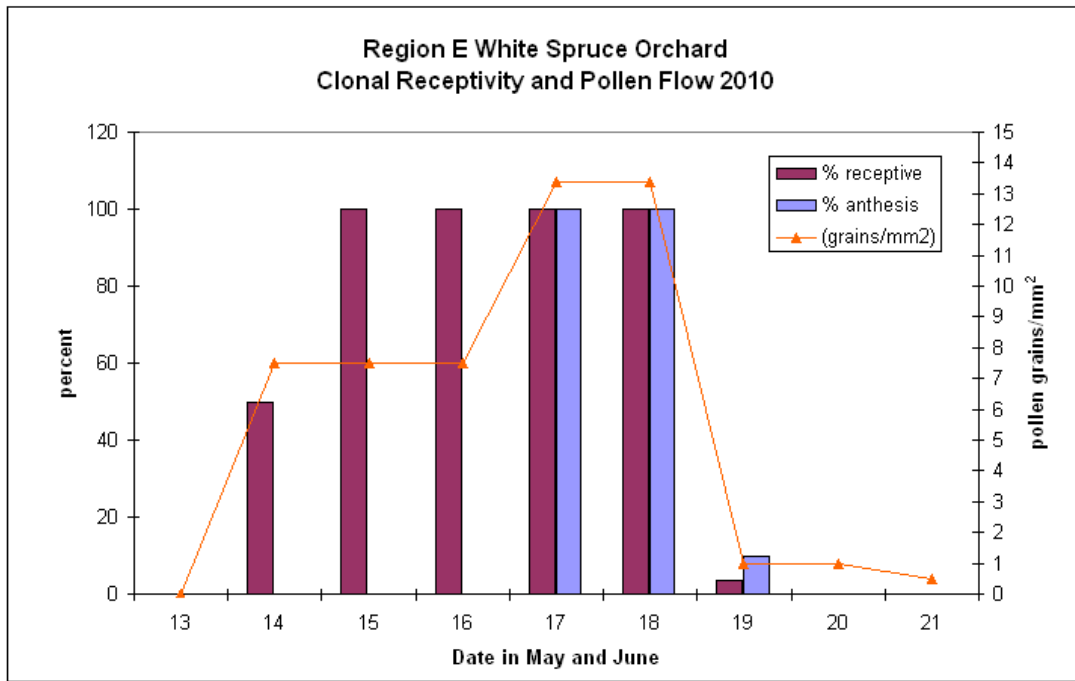


Fig. E-1

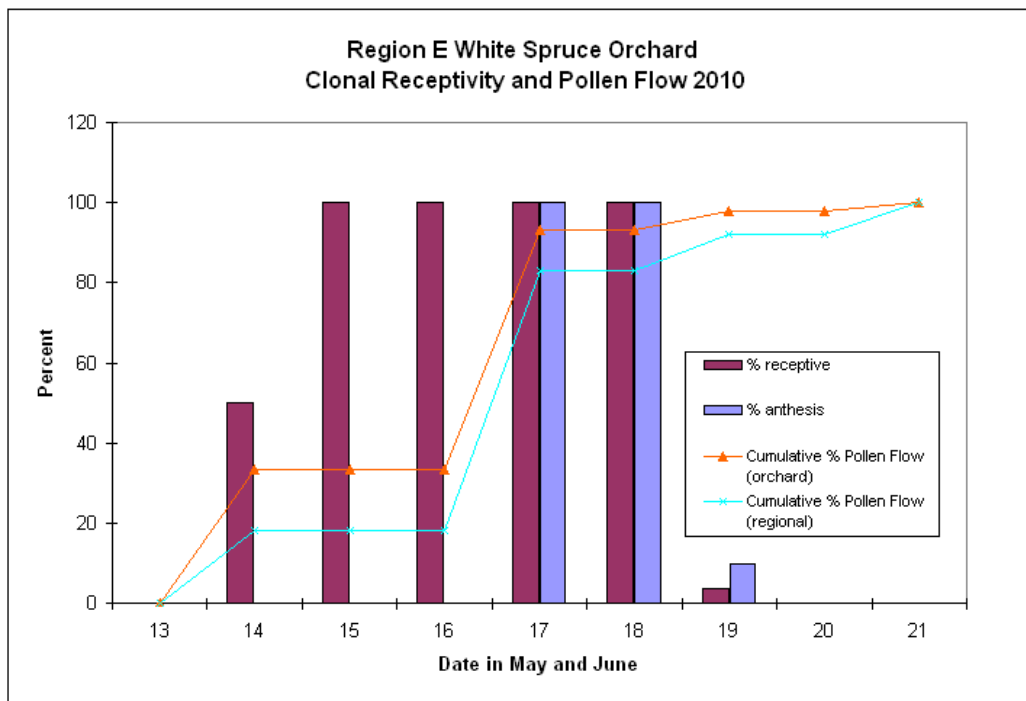


Fig. E-2

Appendix F. Pollen Monitoring

Table F-1. Region E pollen contamination calculations – 2010.

DATE (May/June)	REGIONAL MONITORS (pollen grains/mm ²)								AVERAGE REGIONAL		ORCHARD MONITORS (pollen grains/mm ²)						AVERAGE ORCHARD	
	E SECTOR		BURN PIT		CULVERTS		D1		SPRUCE	PIINE	EAST		CENTRE		WEST		SPRUCE	PIINE
	SPRUCE	PIINE	SPRUCE	PIINE	SPRUCE	PIINE	SPRUCE	PIINE			SPRUCE	PIINE	SPRUCE	PIINE	SPRUCE	PIINE		
14-16	1.5	0.0	1.2	0.0	1.2	0.0	1.8	0.0	1.4	0.0	6.0	0.0	9.3	0.0	7.1	0.0	7.5	0.0
17-18	3.0	0.0	1.5	0.0	2.7	0.0	12.7	0.0	5.0	0.0	12.1	0.0	11.2	0.0	17.0	0.0	13.4	0.0
19-20	0.0	0.0	0.1	0.0	0.0	0.0	2.5	0.0	0.7	0.0	0.8	0.0	0.4	0.0	1.7	0.0	1.0	0.0
21-23	0.5	1.1	1.0	1.6	0.3	1.7	0.4	1.3	0.6	1.4	0.3	0.1	0.5	0.3	0.8	0.4	0.5	0.3
24-25	0.3	2.9	0.1	1.3	0.0	1.0	0.0	1.9	0.1	1.8	0.0	0.5	0.0	0.5	0.4	0.5	0.1	0.5
26-27	0.9	19.3	0.1	26.5	0.7	31.8	1.1	21.0	0.7	24.7	0.2	7.7	0.1	4.2	0.2	8.5	0.2	6.8
28-30	0.0	9.9	0.1	5.2	0.1	10.1	0.0	7.1	0.1	8.1	0.1	2.7	0.0	3.1	0.0	3.8	0.0	3.2
31-1	0.4	7.5	0.0	7.4	0.0	17.1	0.0	10.1	0.1	10.5	0.0	4.3	0.0	2.5	0.0	5.8	0.0	4.2
TOTAL	4.5	40.7	2.7	42.0	3.9	61.7	14.5	41.4	6.4	46.5	18.1	15.3	20.5	10.6	24.1	19.0	20.9	15.0

 =receptive period of orchard

xs= pine pollen density on regional monitors	xs= 46.5
ws= pine pollen density on orchard monitors	ws= 15.0
xt= spruce pollen density on regional monitors	xt= 6.4
wt= spruce pollen density on orchard monitors	wt= 20.9
ct= (ws/xs)xt if ws/xs is < 1 or xt if ws/xs is > 1	ct= 2.1
pc= ct/wt	pc= 0.099

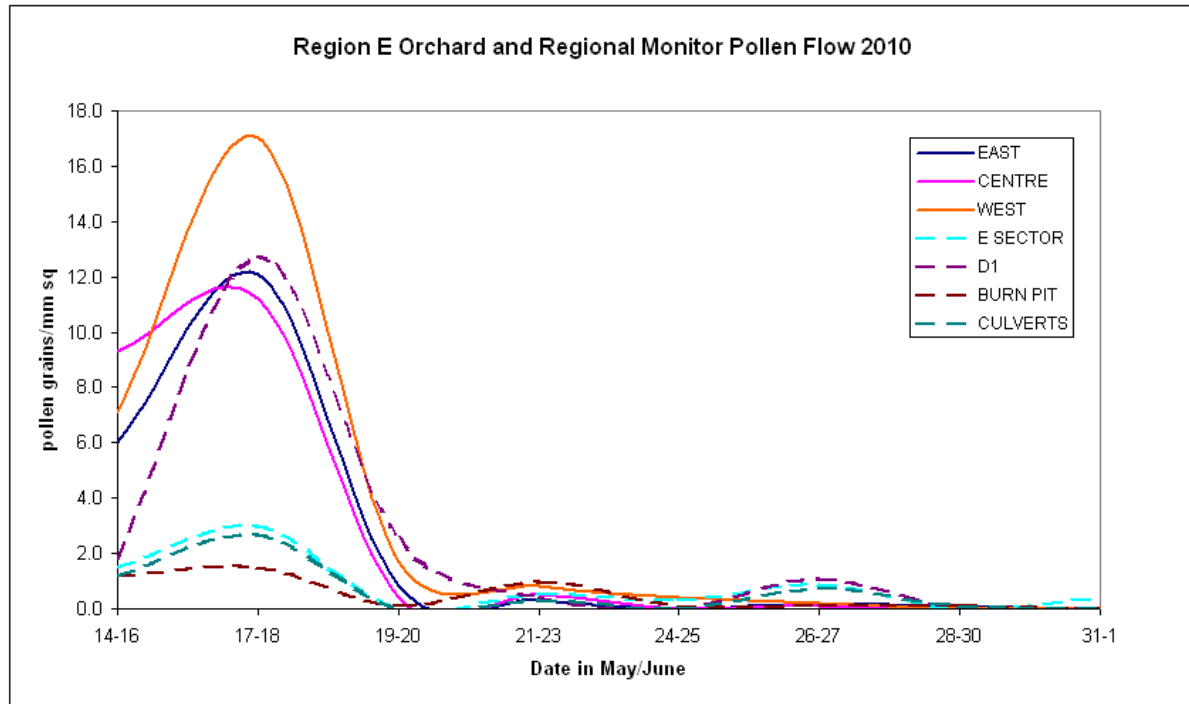


Fig. F-1

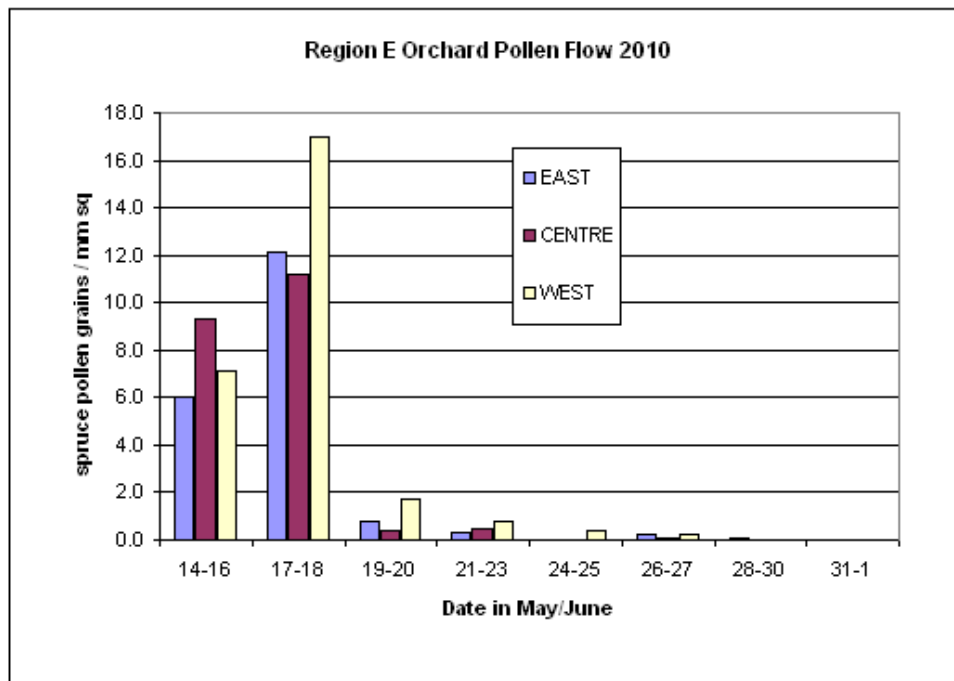


Fig. F-2.

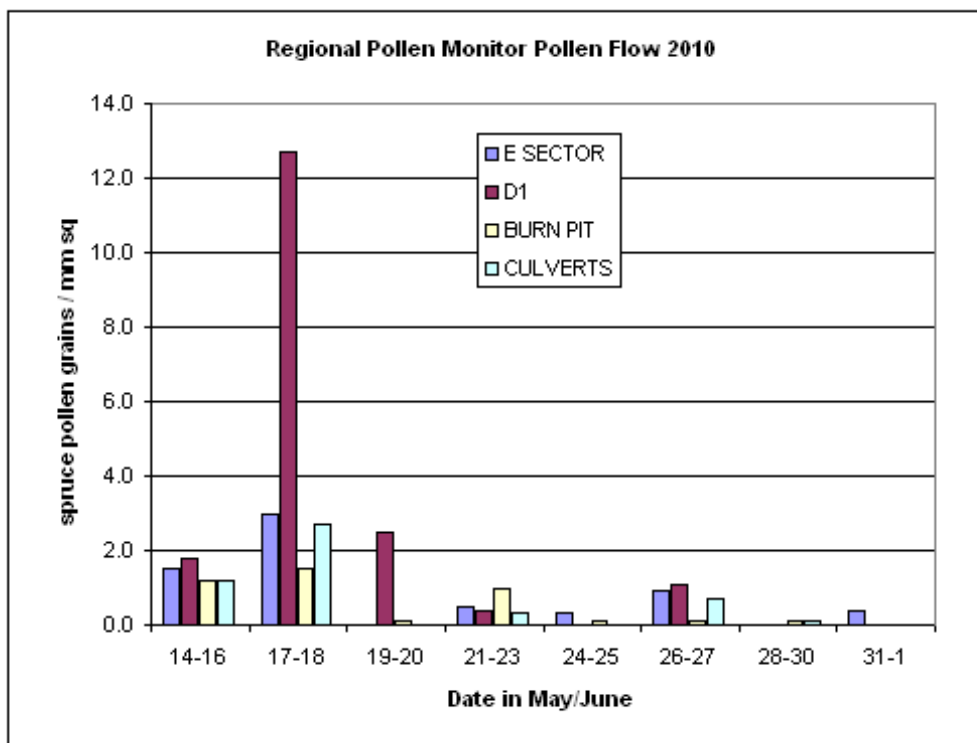


Fig. F-3.

Appendix G. 2010 G259C Addendum

ALBERTA TREE IMPROVEMENT PROGRAM

SUSTAINABLE RESOURCE DEVELOPMENT

ADDENDUM TO G259C (2010)

Project Title: Region E White Spruce Clonal Seed Orchard – Phase III

Planting: Planting of 5 grafts representing 2 clones took place on July 12, 2010. Holes were dug with shovels and rootballs were slashed to promote growth. Bone meal (50 grams) was added to each planting hole to improve rooting. Spaghetti tubing and emitters for above ground irrigation were connected and water was supplied to the grafts immediately after planting. Weather at the time of planting was 22°C. Planting was completed in the early morning.

At the end of the 2010 growing season, there were 1142 grafts established representing 97 clones. The orchard is 95.17% filled based on the orchard capacity of 1200.

Mortality: No mortality occurred in the seed orchard in 2010.

Planters: Margo Weirn and Erik Toews.

Mike Storp
November 18, 2010

Attachments

1. 2010 Planting Plans (G259C)
2. Region E white spruce clonal seed orchard (G259C) – graft distribution and inventory summary
3. 2010 Region E white spruce clonal seed orchard map (G259C)

2010 PLANTING PLANS

Clone	Ramet	Species	Region	Project	Row	Position
574	72	SW	E	259	25	32
574	75	SW	E	259	26	52
574	76	SW	E	259	26	38
574	78	SW	E	259	29	3
1838	57	SW	E	259	12	21

Total number of grafts = 5

Region E White Spruce Clonal Orchard (G259C) – Graft Distribution and Inventory Summary

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
239	55	1	8	1994				
239	71	16	13	1998				
					2	4	0	
240	1	3	8	1994				
240	2	6	10	1994				
240	3	8	20	1995				
240	4	11	6	1994				PST
240	8	1	25	1994				
240	9	13	16	1995				
240	12	2	16	1995				
240	13	7	24	1994				
240	14	11	26	1994				
240	15	2	37	1995				PST
240	16	17	27	1994				
240	20	10	33	1995				
					12	4	0	
241	56	11	5	2007				
241	59	15	9	2007				
241	60	21	9	2007				PST
241	61	25	1	2007				
241	62	29	22	2007				
241	52	19	40	1998				
					6	4	0	
242	52	29	1	1998				PST
242	53	25	5	1999				
242	55	17	7	1998				
242	56	24	13	1999				
242	58	10	1	2002				
242	59	27	16	2002				
242	60	18	51	2002				
					7	4	0	
245	50	29	52	1996				
245	51	1	16	1995				
245	54	17	1	1996				
245	56	14	35	1997				
245	57	16	34	1997				PST
245	58	19	25	1997				
245	59	12	15	1997				
245	60	24	16	1997				
245	61	23	35	1997				PST
245	62	28	11	1997				
245	63	10	31	1997				
					11	4	0	
303	22	27	51	1996				PST
303	51	15	13	1995				
303	58	23	5	1998				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
303	61	16	7	1997				
303	63	17	20	1997				
303	64	25	13	1997				
					6	4	0	
304	53	9	36	1997				
304	80	27	38	1997				
					2	4	0	
305	18	12	39	1997				PST
305	20	11	3	1996				
305	21	5	20	1996				
305	22	10	35	1997				
305	23	18	36	1997				
305	24	9	16	1996				
305	27	27	39	1997				
305	29	25	20	1997				
305	30	14	16	1996				PST
305	31	1	22	1996				
305	50	6	29	1996				
305	52	12	28	1996				
305	53	3	2	1995				
305	54	16	25	1996				
305	58	29	20	1997				
305	59	29	11	1997				
305	63	21	21	1997				
305	64	21	12	1997				
305	65	21	3	1997				
305	66	16	19	1997				
305	67	16	6	1997				
305	68	26	1	1997				
305	69	18	52	1997				PST
305	70	19	8	1997				
305	71	18	14	1997				
305	72	23	8	1997				
					26	4	0	
306	6	22	20	1997				
306	7	12	51	1996				PST
306	50	4	6	1995				
306	51	14	8	1995				
306	53	19	14	1997				
306	54	18	8	1997				
306	55	24	22	1997				
306	56	25	34	1997				
306	57	27	13	1997				
306	58	26	29	1997				
					10	4	0	
307	2	23	52	1996				
307	3	16	2	1996				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
307	4	16	18	1996				
307	7	28	36	1997				PST
307	10	25	10	1996				
307	50	4	7	1995				
307	52	9	6	1995				PST
307	53	13	12	1996				
307	54	6	25	1996				
307	57	14	9	1995				
307	59	10	13	1995				
307	60	3	16	1995				PST
307	61	14	24	1996				
307	62	19	28	1996				
307	63	1	31	1996				
307	64	4	25	1995				
307	65	27	19	1997				
307	71	8	33	1997				
307	72	28	29	1998				
307	73	13	35	1997				
307	74	19	32	1997				
307	75	22	38	1997				
					22	4	0	
308	50	15	27	1998				
					1	4	0	
310	52	22	9	1997				
310	53	24	31	1997				
310	58	16	12	1999				PST
310	59	27	23	1999				
310	60	16	3	2002				
310	61	26	8	2002				
					6	4	0	
314	50	15	1	1998				
314	52	9	12	1998				
314	54	24	38	1999				
314	55	23	3	2002				
314	57	1	1	2007				
314	59	1	20	2007				
314	60	1	30	2007				PST
314	61	5	31	2007				
314	62	6	21	2007				
314	64	6	39	2007				
314	65	10	52	2007				PST
314	66	13	19	2007				PST
314	67	16	28	2007				
314	68	17	40	2007				
314	69	18	21	2007				
314	70	20	16	2007				
314	71	23	20	2007				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
314	72	23	33	2007				
314	73	26	11	2007				
314	74	28	38	2007				
314	75	29	51	2007				
					21	4	0	
362	1	3	9	1989				
362	3	12	35	1990				
362	6	9	19	1989				
362	12	12	4	1989				
362	13	3	20	1989				
362	16	11	11	1989				
362	17	6	20	1989				
362	21	13	24	1990				
362	22	4	24	1989				
362	52	8	7	1994				PST
362	53	8	22	1994				
362	56	17	22	1993				
362	57	4	39	1993				
362	58	26	2	1995				
362	59	8	37	1993				
362	60	26	6	1995				
362	61	26	26	1995				
362	62	17	36	1993				PST
362	63	28	34	1995				
362	65	24	24	1995				
362	66	23	14	1995				
362	67	24	1	1995				
362	68	18	16	1996				
362	69	2	4	1996				
362	70	15	6	1996				
362	71	15	14	1996				
362	72	10	28	1996				
362	73	3	33	1996				
362	74	20	12	1996				
362	75	24	10	1996				
362	76	21	20	1996				
362	78	23	30	1996				
362	79	18	9	1995				PST
362	81	28	13	1997				PST
362	83	29	27	1997				
					35	4	0	
364	15	1	5	1992				
364	21	6	18	1992				PST
364	53	17	11	1999				
364	56	22	32	1999				
364	58	26	5	2002				
364	59	14	51	2002				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
364	60	18	24	2002				
					7	4	0	
366	1	5	26	1992				
366	52	18	32	2002				
366	53	5	32	2002				
366	55	23	4	1999				
366	56	25	29	2002				
366	57	23	11	1999				PST
366	58	28	5	2002				
					7	4	0	
368	7	4	4	1989				
368	8	7	9	1989				
368	10	6	12	1989				PST
368	15	1	28	1989				
368	16	5	35	1990				
368	19	15	20	1989				
368	21	4	20	1989				
368	50	29	35	1995				PST
368	51	7	28	1994				PST
368	52	14	26	1994				
368	53	20	37	1995				
368	54	19	24	1994				
368	55	27	20	1995				
368	57	26	15	1995				
368	60	9	33	1994				
368	62	19	52	1995				
368	63	16	11	1995				
368	64	12	31	1994				
368	65	18	7	1995				
368	66	25	14	1996				
368	67	24	28	1996				
368	68	21	22	1998				
368	69	25	2	1995				
368	70	23	36	1997				
368	71	4	23	1996				
368	72	7	40	1996				
368	73	26	37	1997				
368	74	20	15	1996				
368	75	29	4	1996				PST
368	76	11	30	1996				
368	77	16	33	1996				
					31	4	0	
372	4	1	2	1989				
372	9	11	31	1990				
372	13	7	17	1989				
372	21	15	22	1990				
372	24	8	10	1989				PST

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
372	50	2	20	1995				
372	52	15	11	1995				
372	54	19	22	1995				
372	55	1	26	1995				
372	56	2	38	1996				
372	58	8	38	1996				PST
372	61	10	21	1995				
372	62	17	34	1996				
372	65	18	28	1997				
372	66	22	52	1997				
372	68	24	8	1997				
372	69	17	3	1997				
372	71	20	18	1997				
372	72	24	14	1997				
372	73	21	29	1997				
372	74	21	36	1997				PST
372	76	28	7	1997				
372	77	19	51	1997				
372	78	26	27	1997				
372	79	26	35	1997				
372	81	26	4	1997				
372	82	14	31	1997				
					27	4	0	
374	1	4	3	1989				
374	2	5	11	1989				
374	5	8	6	1989				
374	6	15	5	1989				
374	7	14	11	1989				
374	11	6	16	1989				
374	15	11	23	1990				
374	19	3	35	1989				
374	50	9	24	1991				
374	51	23	25	1996				
374	53	3	25	1994				
374	54	9	37	1993				PST
374	56	14	33	1994				
374	57	19	31	1994				
374	60	16	20	1995				
374	61	22	12	1995				
374	62	9	14	1996				
374	64	11	16	1996				
374	65	22	31	1995				PST
374	66	6	30	1996				
374	72	16	26	1996				
374	73	26	21	1995				
374	74	5	39	1996				
374	75	28	35	1995				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
374	76	11	34	1996				
374	78	19	5	1996				
374	81	25	9	1995				PST
374	82	19	15	1996				
374	83	22	7	1996				
374	84	25	30	1996				
374	85	29	25	1996				PST
374	87	27	40	1996				
					32	4	0	
375	2	1	14	1989				
375	4	6	8	1989				
375	6	12	3	1989				
375	13	8	14	1989				PST
375	14	4	9	1989				
375	15	3	28	1989				
375	24	6	36	1989				
375	51	11	28	1993				PST
375	52	1	39	1996				
375	53	28	16	1997				
375	57	20	51	1997				
375	58	20	17	1997				
375	59	12	36	1996				
375	62	17	32	1996				
375	67	21	16	1997				
375	68	19	30	1995				PST
375	70	9	29	1995				
375	72	22	35	1997				
375	73	20	6	1996				
375	75	29	5	1997				
375	76	21	7	1997				
375	77	23	26	1997				
					22	4	0	
377	1	13	5	1989				
377	2	5	7	1989				
377	3	10	9	1989				
377	6	14	18	1989				
377	7	1	37	1992				
377	8	10	19	1989				
377	10	3	13	1989				
377	11	2	22	1989				
377	12	6	37	1989				
377	13	20	39	1989				
377	16	9	34	1989				
377	18	15	21	1989				
377	19	18	26	1989				PST
377	26	10	29	1992				
377	50	16	17	1995				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
377	52	20	1	1995				
377	53	21	35	1995				
377	54	22	21	1995				PST
377	56	21	14	1995				
377	58	13	31	1992				
377	59	24	2	1995				
377	60	29	34	1995				
377	61	16	31	1992				
377	62	29	24	1995				
377	65	18	13	1996				
377	66	23	29	1996				
377	68	8	25	1996				PST
					27	4	0	
378	6	19	36	1992				PST
378	50	2	2	1995				
378	52	4	17	1995				
378	53	28	28	1997				
378	59	24	17	1997				
378	61	13	32	1997				
378	62	6	22	1997				
378	79	7	11	2007				
378	80	9	7	2007				
378	81	9	39	2007				
378	82	13	28	2007				PST
378	83	17	31	2007				
378	84	18	5	2007				
378	85	26	12	2007				
					14	4	0	
402	2	4	19	1989				PST
402	4	7	14	1989				
402	6	9	17	1989				
402	7	13	17	1989				
402	9	9	5	1989				
402	12	4	10	1989				
402	13	8	21	1992				
402	15	2	27	1989				
402	17	5	34	1989				
402	20	11	33	1989				PST
402	21	13	40	1989				
402	24	18	31	1989				
402	25	10	32	1989				
402	26	11	27	1992				
402	27	12	7	1992				
402	54	23	39	1996				
402	55	18	20	1995				
402	56	16	5	1995				PST
402	57	20	27	1993				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
402	59	23	32	1995				
402	60	24	25	1995				
402	61	21	18	1995				
402	62	23	7	1995				
402	63	27	37	1995				
402	64	27	28	1995				
402	66	7	25	1996				
402	67	17	28	1996				
402	69	21	10	1997				
402	73	17	10	1997				PST
402	75	28	19	1997				
402	76	16	14	1997				
					31	4	0	
403	11	10	7	1989				
403	69	17	13	1996				
					2	4	0	
405	3	19	35	1992				
405	20	13	8	1992				PST
405	51	9	13	1997				
405	72	3	3	2007				
405	73	3	7	2007				
405	74	6	26	2007				
405	75	19	10	2007				
405	76	20	52	2007				
405	77	25	8	2007				
405	78	29	10	2007				
					10	4	0	
407	1	1	10	1989				
407	2	5	17	1989				
407	6	12	1	1989				
407	9	10	4	1989				
407	23	2	24	1989				
407	24	7	23	1989				
407	50	9	15	1994				PST
407	51	13	15	1994				
407	52	13	25	1994				
407	54	20	22	1993				
407	55	17	14	1995				PST
407	56	18	3	1995				
407	57	2	39	1994				
407	58	7	35	1993				
407	59	15	31	1994				
407	60	18	37	1994				
407	62	17	8	1996				
407	67	22	17	1995				
407	68	24	9	1995				
407	70	27	30	1995				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
407	71	26	24	1995				
407	74	25	19	1996				
407	76	29	21	1996				
407	77	29	39	1996				
407	78	14	19	1996				
407	80	4	27	1996				PST
407	84	11	22	1996				
407	86	4	34	1996				
407	88	11	35	1996				
407	89	20	32	1996				
					30	4	0	
408	24	3	1	1992				
					1	4	0	
441	16	2	13	1990				
441	17	16	30	1990				
441	34	15	4	1995				
441	50	17	39	1997				
441	53	21	24	1997				
441	54	22	10	1998				
441	55	14	12	1997				
441	56	15	25	1997				PST
441	57	15	51	1997				
441	58	19	2	1997				
441	59	19	17	1997				PST
441	61	26	7	2002				
					12	4	0	
442	2	3	5	1990				
442	6	6	7	1990				
442	8	9	27	1992				
442	9	12	14	1990				PST
442	10	10	18	1990				
442	15	15	3	1990				
442	18	4	16	1990				
442	29	4	26	1990				PST
442	50	7	33	1997				
442	51	1	36	1996				
442	52	15	32	1997				
442	53	17	21	1996				
442	54	14	21	1995				
					13	4	0	
443	1	4	14	1990				
443	2	6	6	1990				
443	4	10	15	1990				
443	14	1	4	1990				
443	16	3	29	1990				PST
443	18	13	13	1990				
443	20	2	32	1990				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
443	21	6	31	1990				
443	22	11	25	1990				PST
443	30	14	38	1990				PST
443	51	12	6	1995				
443	52	17	5	1996				
443	53	7	29	1995				
443	54	16	29	1995				
443	55	16	15	1996				
443	56	21	5	1996				
443	57	22	13	1996				
443	58	25	36	1997				
443	61	17	37	1995				
443	63	24	21	1996				
443	68	28	30	1997				
443	69	26	17	1997				
443	70	26	33	1997				
443	71	17	19	1997				
443	72	20	8	1997				
443	73	21	25	1997				
443	74	27	27	1997				
443	76	23	17	1997				
443	77	24	40	1997				
443	79	24	7	1997				
					30	4	0	
444	1	2	6	1990				PST
444	3	20	28	1990				
444	4	13	2	1991				
444	8	3	21	1991				
444	11	5	33	1991				
444	12	9	23	1991				
444	14	14	37	1991				PST
444	17	13	18	1990				
444	18	1	18	1990				
444	24	17	35	1991				
444	28	8	16	1991				
444	61	16	4	1998				
444	62	23	27	1998				
					13	4	0	
445	8	10	5	1992				
445	22	5	22	1992				
					2	4	0	
447	4	7	4	1989				
447	63	26	19	1997				
					2	4	0	
449	3	18	27	2002				
449	4	11	52	2002				PST
449	5	18	10	2002				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
449	10	22	8	2002				
449	15	24	36	2002				
449	16	26	14	2002				
449	17	23	51	2002				
					7	4	0	
450	1	1	3	1990				
450	2	6	13	1990				
450	17	13	26	1990				
450	18	4	12	1990				
450	21	11	1	1990				
450	27	18	35	1992				PST
450	28	9	4	1990				
450	29	3	27	1993				
450	50	10	23	1996				
450	53	4	35	1997				
450	54	18	22	1997				PST
450	57	12	17	1996				
450	59	9	35	1997				
450	60	12	34	1997				
450	62	17	15	1997				
					15	4	0	
451	19	15	2	1992				
451	56	21	51	2002				
451	57	29	15	2002				
451	60	2	12	2007				
451	63	5	25	2008				
451	65	5	36	2007				PST
451	67	7	16	2007				
451	68	13	39	2009				
451	69	24	20	2009				
451	70	14	29	2009				
451	71	15	24	2009				
451	72	9	31	2008				
451	74	20	5	2009				
451	75	21	17	2009				
					14	4	0	
452	10	11	18	1992				PST
452	15	10	24	1992				
452	52	9	1	1997				
452	53	13	33	1997				
452	55	29	29	1998				
452	56	7	36	1997				
452	57	27	1	1997				
452	58	21	32	1997				
					8	4	0	
453	5	12	8	1990				
453	13	5	3	1990				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
453	16	10	6	1990				
453	17	2	28	1990				
453	18	1	12	1990				
453	51	9	18	1995				
453	53	8	30	1997				
453	55	16	36	1997				
453	56	12	33	1997				
453	57	26	20	1998				
453	58	10	37	1997				
453	60	15	29	1997				
453	61	16	27	1997				PST
453	64	22	22	1997				PST
453	65	25	7	1998				
					15	4	0	
456	18	17	26	1992				
					1	4	0	
457	7	3	39	1992				
457	54	18	34	2002				
457	55	10	2	1999				
457	58	28	52	2002				
457	59	28	15	2002				PST
457	60	3	19	2007				PST
457	61	6	28	2007				
457	62	13	36	2007				
457	63	18	4	2007				
457	64	18	39	2007				
457	65	21	31	2007				
457	66	24	11	2007				
					12	4	0	
458	16	10	11	1990				
458	67	28	23	1995				
					2	4	0	
459	2	2	8	1990				
459	5	5	12	1990				
459	13	10	16	1990				
459	14	14	15	1990				
459	22	9	8	1990				
459	50	4	31	1997				
459	51	29	38	1997				
459	55	22	4	1999				PST
					8	4	0	
460	8	8	27	1993				PST
460	10	2	10	1990				
460	13	5	19	1990				
460	14	12	16	1990				
460	16	4	36	1990				
460	24	14	10	1990				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
460	26	8	8	1990				
					7	4	0	
461	29	8	9	1992				
461	58	14	52	2004				
461	60	27	31	2004				PST
461	63	24	34	2004				
461	64	29	12	2004				
					5	4	0	
462	1	2	7	1990				
462	4	5	23	1991				
462	6	6	3	1990				
462	7	11	19	1990				
462	9	5	16	1990				PST
462	16	12	2	1990				
462	17	9	28	1991				PST
462	19	11	29	1991				
462	24	18	30	1991				
462	26	7	34	1994				
462	28	7	15	1990				
462	30	1	38	1990				
462	51	14	34	1995				
462	59	26	30	1997				
					14	4	0	
463	5	2	14	1989				
463	7	16	32	1990				
463	8	5	8	1989				
463	11	14	3	1989				
463	13	12	30	1994				
463	14	17	29	1990				
463	16	6	14	1989				
463	17	2	23	1989				
463	18	11	37	1990				
463	19	6	24	1992				
463	22	3	32	1989				PST
463	23	6	38	1989				
463	27	11	20	1989				
463	53	22	18	1997				
463	55	23	31	1995				
463	56	27	2	1996				
463	58	19	1	1996				
463	59	19	11	1996				
463	60	21	1	1996				
463	62	28	17	1996				
463	63	21	27	1995				
463	64	28	31	1996				
463	66	20	29	1996				
463	67	25	11	1995				PST

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
463	68	3	37	1996				
463	71	24	27	1997				
463	74	27	25	1997				
463	75	7	31	1996				PST
463	76	16	10	1997				
463	77	18	17	1997				PST
463	78	28	14	1996				
463	79	26	40	1996				
					32	4	0	
464	12	3	6	1990				
464	13	8	17	1990				
464	16	12	5	1990				
					3	4	0	
466	1	3	4	1989				PST
466	4	15	19	1990				
466	5	4	21	1993				
466	7	14	30	1991				PST
466	13	18	40	1992				
466	14	7	18	1990				
466	17	2	34	1990				
466	20	17	25	1994				
466	22	15	39	1994				
466	24	6	34	1990				
466	28	5	13	1989				
466	29	10	27	1990				
466	30	11	9	1989				
466	51	22	25	1996				
466	53	22	14	1995				
466	54	21	6	1995				
466	56	20	20	1995				
466	57	18	6	1995				
466	64	22	33	1996				
466	66	29	13	1996				
466	67	24	30	1997				PST
466	69	28	22	1996				
466	74	29	37	1997				
466	80	18	2	1997				
466	84	27	52	1996				
					25	4	0	
467	16	20	31	1992				
467	19	10	3	1992				
467	76	5	14	2007				
467	80	8	24	2007				
467	81	11	12	2007				PST
467	85	7	39	2008				
467	86	23	38	2009				
467	87	26	13	2009				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
467	88	27	34	2009				
467	89	1	35	2009				
467	90	20	4	2008				
467	91	5	1	2009				
467	92	16	24	2009				
					13	4	0	
468	1	4	11	1989				
468	2	19	38	1992				
468	3	7	8	1989				
468	10	15	10	1989				
468	11	6	23	1992				
468	12	5	4	1989				
468	14	6	17	1989				PST
468	15	11	13	1989				
468	16	2	31	1989				
468	17	17	16	1995				
468	19	5	27	1989				
468	20	12	40	1989				
468	21	14	22	1989				PST
468	25	18	23	1989				
468	29	7	37	1989				
468	30	17	6	1995				
468	51	22	36	1995				
468	52	25	24	1995				
468	53	22	19	1995				
468	55	27	24	1995				
468	56	21	8	1995				
468	57	3	24	1996				
468	58	29	40	1995				
468	59	11	21	1996				
468	64	2	35	1996				
468	65	15	36	1996				PST
468	67	20	3	1996				
468	69	19	19	1996				
468	71	21	30	1996				
468	73	29	19	1996				PST
468	74	28	33	1996				
					31	4	0	
469	9	14	20	1992				
					1	4	0	
470	11	8	3	1990				
470	12	20	35	1992				
470	13	1	11	1989				
470	14	5	9	1990				
470	18	15	28	1992				PST
470	23	6	19	1989				
470	24	12	12	1991				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
470	25	11	10	1989				
470	26	1	21	1991				
470	52	9	21	1995				
470	57	15	35	1998				PST
470	75	1	27	2007				
470	76	2	36	2007				
470	77	5	28	2007				
470	79	18	12	2007				
470	80	21	40	2007				
470	81	23	15	2007				
470	82	27	29	2007				
470	83	28	39	2007				
470	84	29	17	2007				
					20	4	0	
523	10	1	17	1990				
523	12	6	1	1990				
523	14	12	19	1990				
523	23	15	8	1990				
523	28	4	1	1990				
523	52	2	21	1995				
523	53	19	27	1997				PST
523	54	3	36	1996				
523	55	9	25	1995				
523	56	10	34	1996				
523	57	11	32	1996				
523	58	14	27	1995				
523	59	13	38	1997				
523	60	10	14	1995				
523	61	25	16	1997				
523	63	20	38	1996				
523	66	22	28	1997				
523	73	21	2	1997				
523	74	16	1	1997				
523	76	18	11	1997				
523	77	23	13	1998				
523	80	18	18	1998				
523	82	27	21	1997				PST
523	83	27	35	1997				PST
523	84	27	4	1997				
523	86	23	34	1997				
					26	4	0	
561	4	14	2	1991				
561	7	12	24	1994				
561	11	1	19	1990				
561	14	4	32	1994				
561	17	5	29	1993				PST
561	18	6	5	1990				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
561	19	10	12	1990				
561	22	1	9	1991				
561	52	15	16	1995				
561	57	8	28	1995				PST
561	60	19	39	1998				
561	62	10	36	1997				
561	63	17	24	1997				
561	64	12	32	1998				
					14	4	0	
562	53	27	6	2002				
					1	4	0	
567	4	1	7	1991				
567	6	7	19	1991				PST
567	7	4	29	1992				
567	9	11	8	1991				
567	17	8	1	1994				
567	26	9	30	1992				
567	50	4	40	1997				
567	56	19	37	1997				
567	57	13	29	1997				
567	58	19	21	1997				
					10	4	0	
568	8	5	21	1992				
568	11	9	26	1992				
568	25	13	30	1992				
568	55	12	10	1998				
568	56	28	26	1999				PST
					5	4	0	
569	9	2	19	1990				
569	15	15	15	1993				
569	55	10	39	1998				
569	73	25	28	2005				
					4	4	0	
570	50	24	51	1998				
570	55	10	30	1997				
					2	4	0	
574	12	18	29	1992				PST
574	54	14	5	1997				
574	55	7	32	1997				
574	56	5	24	2007				
574	57	6	9	2007				
574	58	8	5	2007				
574	59	13	51	2007				PST
574	60	13	20	2007				
574	65	13	37	2007				
574	66	16	23	2008				
574	67	19	20	2008				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
574	68	20	13	2008				
574	69	22	40	2009				
574	70	23	16	2009				
574	72	25	32	2010				
574	75	26	52	2010				
574	76	26	38	2010				
574	78	29	3	2010				
					18	4	2	
575	1	4	33	1992				
575	3	8	34	1992				
					2	4	0	
576	1	16	51	1996				
576	2	21	4	1997				PST
576	4	12	9	1999				
576	12	19	7	1996				
576	14	19	12	1996				
576	15	23	9	1996				
576	16	21	19	1996				
576	17	21	28	1996				
576	18	25	35	1996				
576	19	22	51	1997				PST
576	20	23	40	1997				
576	21	28	6	1996				
576	22	29	28	1996				
576	26	28	20	1995				
576	28	19	26	1999				
576	29	27	12	1996				
					16	4	0	
579	2	3	17	1990				
579	4	7	6	1990				
579	5	14	13	1990				
579	6	14	1	1990				
579	8	5	10	1990				
579	11	8	12	1990				
579	14	2	30	1990				
579	18	7	38	1990				
579	19	2	40	1990				
579	20	20	40	1992				
579	21	18	25	1991				PST
579	23	15	34	1991				
579	25	15	30	1990				
579	50	25	3	1997				
579	52	27	9	1997				
579	53	27	3	1996				
579	54	16	8	1996				
579	55	17	12	1996				
579	56	7	27	1995				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
579	57	21	26	1997				
579	59	25	31	1997				PST
579	61	28	40	1997				
579	62	28	24	1997				
579	71	20	14	1997				
579	73	17	52	1997				
579	74	19	3	1997				
579	75	24	19	1997				PST
					27	4	0	
580	16	14	40	1992				
580	54	12	52	2002				
580	58	28	4	2002				
					3	4	0	
581	2	20	36	1992				PST
581	5	3	14	1992				
581	7	20	19	1997				
581	51	23	6	1997				PST
581	53	25	15	1997				
581	54	24	26	1997				
581	55	22	39	1997				
581	56	26	9	1997				
581	57	20	7	1998				
581	58	28	51	1997				
581	59	29	18	1997				
					11	4	0	
582	2	1	33	1992				
582	3	6	32	1992				
582	4	3	10	1991				PST
582	5	8	18	1991				
582	6	11	17	1991				
582	7	15	7	1991				
582	11	3	15	1991				
582	14	8	2	1991				
582	16	11	24	1992				
582	56	16	22	1998				
					10	4	0	
583	1	9	20	1991				
583	2	2	3	1990				
583	3	19	29	1992				
583	4	6	2	1990				
583	7	15	38	1990				
583	17	4	38	1991				
583	33	7	22	1991				
583	38	2	11	1990				PST
583	51	4	28	1997				
583	58	9	40	1997				
583	61	18	38	1997				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
583	62	12	26	1997				
583	63	11	4	1997				
583	64	23	2	1997				
583	65	28	2	1997				PST
583	66	27	5	1997				
					16	4	0	
584	53	29	6	2002				
					1	4	0	
585	2	2	17	1994				
585	3	4	2	1990				
585	6	10	26	1992				PST
585	13	7	20	1990				
585	14	17	30	1994				
585	15	9	3	1990				
585	16	1	23	1993				
585	17	13	10	1990				
585	50	16	37	1996				PST
585	51	13	21	1995				
585	52	6	35	1994				
585	53	15	18	1995				
585	55	3	34	1995				
585	56	15	40	1996				
					14	4	0	
586	2	8	11	1992				
586	4	4	22	1992				
					2	4	0	
587	21	11	15	1990				
587	25	7	7	1991				
					2	4	0	
588	1	19	33	1992				
588	2	6	4	1991				
588	3	1	6	1990				
588	4	3	31	1991				
588	5	6	27	1991				
588	7	7	12	1990				
588	8	14	14	1990				
588	10	13	9	1990				
588	11	15	37	1991				PST
588	12	3	23	1992				
588	14	17	23	1991				
588	16	8	35	1991				
588	17	1	15	1990				
588	18	11	38	1991				
588	53	12	23	1997				
588	54	26	36	1997				PST
588	56	23	21	1997				
					17	4	0	

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
589	1	2	9	1990				
589	2	20	24	1991				
589	3	5	18	1990				
589	4	12	18	1990				PST
589	5	1	29	1992				
589	6	17	38	1991				
589	7	8	29	1992				
589	9	13	7	1990				
589	10	9	10	1990				
589	12	2	33	1990				
589	14	14	23	1990				
589	16	9	32	1990				
589	17	13	34	1990				
589	19	16	16	1995				
589	51	18	1	1996				PST
589	52	22	2	1996				
589	54	25	17	1996				
589	57	24	32	1996				
589	59	29	16	1996				
589	60	26	34	1997				
589	62	8	23	1996				
589	63	13	27	1996				
589	64	8	36	1996				
589	65	20	10	1997				
589	66	27	18	1997				
589	67	19	13	1997				
589	71	18	33	1996				
589	73	23	12	1997				
589	74	23	22	1996				PST
					29	4	0	
591	2	4	5	1990				
591	7	6	15	1990				
591	9	10	8	1990				
591	11	15	12	1990				
591	13	11	2	1990				PST
591	14	8	32	1992				
591	17	7	5	1990				
591	18	3	38	1990				
591	27	10	25	1992				
591	30	5	30	1990				
591	31	12	25	1990				
591	33	15	33	1990				
591	34	20	21	1990				
591	39	2	15	1990				
591	52	21	52	1996				
591	54	23	18	1995				
591	55	18	15	1995				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
591	59	19	4	1996				PST
591	60	26	51	1996				
591	63	24	3	1996				
591	66	21	38	1996				
591	67	27	7	1996				
591	74	28	18	1996				
591	75	28	37	1996				
591	76	20	11	1996				
591	80	24	6	1996				
591	81	22	30	1996				PST
591	82	1	32	1996				
591	84	11	39	1996				
591	85	20	34	1996				
					30	4	0	
592	16	16	52	1997				
592	23	20	2	1997				PST
592	26	22	15	1997				
592	29	24	4	1997				
592	34	22	27	1997				
592	50	6	11	2005				
592	51	8	4	2005				
					7	4	0	
593	2	4	15	1990				
593	3	7	1	1990				
					2	4	0	
594	3	3	11	1990				
594	6	7	2	1990				
594	7	5	2	1990				
594	10	14	6	1990				
594	12	13	11	1990				
594	13	16	21	1992				
594	14	2	29	1990				
594	15	7	21	1990				
594	17	16	39	1992				
594	18	10	20	1990				
594	50	11	36	1995				
594	53	5	37	1995				PST
594	55	8	39	1995				PST
594	56	17	9	1996				
594	58	18	19	1996				
594	59	22	3	1996				
594	60	22	11	1996				
594	63	27	22	1997				
594	64	23	24	1996				
594	67	21	37	1996				
594	71	24	35	1997				
594	72	22	29	1997				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
594	74	17	2	1997				PST
					23	4	0	
595	2	7	3	1993				
595	6	1	13	1993				
595	7	12	20	1993				PST
595	51	9	38	1997				
595	53	3	26	1998				
					5	4	0	
596	1	4	8	1990				
596	6	12	37	1991				PST
596	7	3	12	1990				
596	8	14	7	1990				
596	9	1	34	1994				PST
596	10	8	13	1990				
596	12	13	22	1991				
596	13	13	14	1990				
596	14	20	25	1991				
596	15	3	22	1990				
596	16	8	40	1990				
596	55	17	17	1996				
596	57	17	33	1995				
596	58	25	6	1996				
596	59	22	16	1996				
596	66	22	34	1997				
596	71	29	23	1998				
					17	4	0	
597	1	4	13	1990				
597	2	3	30	1992				
597	4	14	25	1992				
597	7	5	5	1990				
597	8	13	3	1991				PST
597	9	9	9	1990				
597	10	5	38	1993				
597	11	8	19	1991				
597	50	26	18	1998				
					9	4	0	
598	1	2	26	1992				PST
598	2	2	1	1990				
598	4	5	15	1990				
598	20	8	26	1992				
598	21	15	17	1990				
598	53	10	10	1995				
598	56	20	30	1995				
598	58	26	32	1997				
598	60	6	33	1997				
598	61	4	37	1997				PST
598	62	15	26	1997				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
598	63	14	32	1997				
598	64	16	38	1997				
598	65	28	8	1997				
					14	4	0	
883	7	21	13	1996				
883	11	28	1	1996				
883	13	26	23	1996				
					3	4	0	
885	1	26	28	1995				
885	3	29	9	1995				
885	8	19	18	1995				PST
885	9	22	1	1996				
885	11	25	12	1996				
885	13	25	39	1997				
885	15	27	32	1997				
					7	4	0	
901	11	21	11	1996				
					1	4	0	
902	15	24	12	1997				
902	22	22	37	1996				
					2	4	0	
906	9	27	17	1996				
					1	4	0	
907	12	24	5	1996				
907	22	27	36	1996				
907	25	26	25	1996				
907	29	25	33	1997				
					4	4	0	
908	9	24	23	1996				
					1	4	0	
909	3	21	39	1996				PST
909	10	28	25	1995				
909	12	17	4	1997				
909	15	29	32	1996				
					4	4	0	
910	5	25	25	1997				
910	9	28	21	1997				
910	12	19	6	1996				
910	14	19	16	1996				PST
910	15	23	10	1997				
910	17	21	15	1997				
910	20	22	23	1997				
910	23	26	16	1997				
910	24	25	37	1997				
910	26	29	31	1997				
					10	3	0	
914	3	24	33	1996				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
914	6	26	22	1996				
914	8	27	33	1996				PST
914	53	7	26	2004				
					4	4	0	
916	1	24	18	1996				
916	3	21	23	1996				
916	5	21	33	1996				
916	8	29	7	1996				
916	10	28	27	1996				PST
916	11	29	36	1996				
					6	4	0	
1834	1	7	10	2007				
1834	2	8	15	2007				
1834	3	11	51	2007				
1834	4	13	23	2007				
1834	5	16	9	2007				
1834	6	19	34	2007				
1834	7	22	5	2007				PST
1834	8	23	1	2007				
1834	50	27	10	2009				
1834	51	27	26	2009				
					10	4	2	
1835	1	10	51	2007				
1835	2	11	7	2007				
1835	3	12	11	2007				
1835	5	14	4	2007				
1835	6	19	23	2007				PST
1835	7	20	9	2007				
1835	8	22	26	2007				
1835	51	26	3	2008				
1835	52	26	39	2008				
					9	4	2	
1836	1	5	6	2007				
1836	2	10	22	2007				
1836	5	11	40	2007				
1836	6	12	29	2007				
1836	7	14	36	2007				
1836	8	20	26	2007				PST
1836	50	23	23	2009				
1836	51	24	37	2009				
1836	52	27	8	2009				
1836	53	29	2	2009				
					10	4	1	
1837	1	1	40	2007				
1837	2	3	18	2007				
1837	3	4	30	2007				
1837	4	12	22	2007				

Clone	Ramet	Row	Pos	Year Planted	# of grafts in Seed Orchard	# of grafts in Clone Bank	# of grafts in Pots	Remarks
1837	5	12	27	2007				PST
1837	6	13	1	2007				
1837	7	16	40	2007				
1837	8	17	18	2007				
1837	9	23	37	2007				
1837	10	24	15	2007				
1837	11	25	52	2007				
1837	12	25	4	2007				
1837	50	25	22	2008				PST
1837	53	28	32	2008				
1837	58	29	14	2008				
					15	4	0	
1838	7	19	9	2007				
1838	22	3	40	2009				
1838	24	9	11	2009				
1838	51	10	17	2009				
1838	57	12	21	2010				
					5	2	6	
Clones					97			
Total					1142	385	13	

REGION E WHITE SPRUCE CLONAL SEED ORCHARD MAP - G259C

	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15
*51	X314-75r	X581-58i	X303-22h	X591-60h	X1837-11r	X370-30j	X449-17n	X576-19i	X451-56n	X375-57i	X372-77i	X242-60n	X579-73i	X576-1h	X441-57i
*52	X245-50h	X457-58n	X466-84h	X574-75u	X1837-11r	X307-2h	X372-66i	X372-66i	X591-52h	X405-76r	X368-62g	X305-69i	X579-73i	X592-16i	
1	X242-52j	X883-11h	X452-57i	X303-68i	X241-61r	X362-67g	X1834-8r	X885-5h	X463-60h	X377-52g	X463-58h	X589-51h	X245-54h	X523-74i	X314-50j
2	X1836-53i	X583-65i	X463-56h	X362-58g	X368-69g	X377-59g	X583-64i	X389-52h	X523-73i	X392-23i	X441-58i	X466-80i	X594-74i	X307-3h	X451-19d
3	X574-78u		X579-53h	X1835-51s	X579-50h	X371-63h	X314-55n	X594-59h	X303-65i	X468-67h	X579-74i	X407-56g	X372-69i	X310-60n	X442-13om
4	X368-75h	X580-58n	X523-84i	X372-81i	X1837-12r	X392-29i	X366-55k	X459-55k	X576-2i	X467-90s	X591-59h	X457-63r	X909-12i	X444-61j	X441-34g
5	X375-75i	X366-58n	X83-66i	X364-58n	X242-53k	X907-12h	X303-53i	X1834-7r	X443-56h	X451-74i	X374-78h	X378-84f	X443-52h	X402-56g	X374-6a
6	X384-53n	X576-21h	X62-52n	X362-60g	X596-58h	X591-80h	X581-51i	X374-83h	X466-54g	X375-73h	X910-12h	X466-57g	X468-30g	X303-67i	X362-70h
7	X916-8h	X372-81i	X591-67h	X441-61n	X453-65j	X442-52k	X402-62g	X375-76i	X375-76i	X581-57i	X368-65g	X242-55j	X407-62h	X579-54h	X582-7c
8	X598-65i	X1836-52i	X1836-52i	X310-61n	X405-77r	X372-68i	X305-72i	X449-10n	X468-56g	X443-72i	X305-70i	X306-54i	X407-62h	X579-54h	X523-23b
9	X885-3g	X579-52i	X579-52i	X581-56i	X307-10h	X407-68g	X576-15h	X310-52i	X241-60r	X1835-7r	X1838-7r	X362-79g	X594-56h	X1834-5r	X241-59r
10	X405-78r	X1834-50t	X1834-50t	X314-73r	X463-67g	X457-66r	X366-57k	X910-15i	X402-69i	X589-65i	X405-75r	X449-5n	X402-73i	X463-76i	X468-10am
11	X305-59i	X245-62i	X576-29h	X378-85r	X885-11h	X902-15i	X589-73i	X374-61g	X305-64i	X362-74h	X576-14h	X470-79r	X579-55h	X310-58k	X591-11b
12	X461-64p	X362-81i	X306-57i	X449-16n	X368-66h	X372-72i	X362-66g	X466-53g	X883-7h	X574-68s	X589-67i	X377-63h	X403-69h	X239-71j	X303-51g
13	X1837-58s	X463-78h		X368-57g	X581-53i	X1837-10r	X470-81r	X592-26i	X910-17i	X368-74h	X374-82h	X591-55g	X403-69h	X402-76i	X362-71h
14	X451-57n	X457-59n		X368-57g	X581-53i	X1837-10r	X470-81r	X592-26i	X910-17i	X368-74h	X374-82h	X591-55g	X403-69h	X402-76i	X362-71h
15	X589-59h	X375-53i	X242-59n	X910-23i	X523-61i	X245-60i	X574-70t	X596-59h	X375-67i	X314-70r	X910-14h	X362-68h	X468-17g	X589-19g	X561-52g
16	X470-84r	X463-62h	X906-9h	X443-69i	X378-59i	X443-76i	X407-67g	X463-53i	X451-75i	X375-58i	X441-59i	X450-62i	X596-55h	X377-50g	X598-21b
17	X581-59i	X591-74h	X589-66i	X397-50j	X589-54h	X916-1h	X591-54g	X463-53i	X402-61g	X372-71i	X885-8g	X523-80j	X1837-8r	X307-4h	X585-53g
18	X468-73h	X402-75i	X307-65i	X447-63i	X407-74h	X579-75i	X579-75i	X468-53i	X576-16h	X381-7i	X468-69h	X594-58h	X443-71i	X303-66i	X466-4b
19	X305-58i	X576-26g	X368-55g	X453-57i	X305-29i	X451-69i	X314-71r	X306-6i	X362-76h	X466-56g	X574-67s	X402-55g	X303-63i	X374-60g	X368-19am
20	X407-76h	X910-9i	X523-82i	X374-73g	X443-63h	X588-56i	X588-56i	X377-54g	X303-63i	X591-34b	X567-38i	X314-69r	X442-53h	X594-13d	X377-18a
21	X241-62r	X466-69h	X594-63i	X914-6h	X1837-50s	X306-55i	X589-74h	X453-64i	X368-68i	X407-54e	X372-54g	X450-54i	X362-56e	X582-56j	X372-21b
22	X396-71j	X438-67g	X310-59k	X883-13h	X908-9h	X1836-50t	X1836-50t	X910-20i	X916-3h	X368-68i	X1835-6r	X468-25a	X388-14c	X574-66s	
23	X377-62g	X579-62i	X468-55g	X407-71g	X468-52g	X362-65g	X594-64h	X306-6i	X441-53i	X589-2cm	X368-54f	X364-60h	X561-63i	X467-92t	X451-71i
24	X374-85h	X909-10g	X463-74i	X907-25h	X910-5i	X402-60g	X374-51h	X466-51h	X443-73i	X596-14c	X245-58i	X579-21c	X466-20f	X305-54h	X441-56i
25	X362-83i	X916-10h	X443-74i	X372-78i	X362-61g	X381-54i	X375-77i	X1833-8r	X579-57i	X1836-8r	X576-28k	X377-19a	X456-18d	X374-72h	X598-62i
26	X376-22h	X378-53i	X402-64g	X885-1g	X569-73q	X463-71i	X444-62j	X523-66i	X576-17h	X444-30m	X307-62h	X372-65i	X402-67h	X314-67r	X470-18d
27	X452-55j	X307-72i	X470-82r	X306-58i	X366-56m	X368-67h	X377-66h	X594-72i	X372-73i	X463-66h	X583-3d	X574-12d	X463-14b	X443-54g	X453-60i
28	X910-26i	X463-64h	X407-70g	X462-59i	X374-84h	X466-67i	X362-78h	X591-81h	X468-71h	X598-56g	X375-68g	X462-24c	X385-14f	X441-17bm	X579-23b
29	X909-15h	X1837-53s	X885-15i	X598-58i	X579-59i	X310-53i	X463-55g	X374-65g	X457-65r	X467-16d	X374-57f	X402-24e	X378-83r	X377-61d	X407-59f
30	X377-60g	X362-63g	X467-88t	X589-60i	X306-56i	X914-3h	X314-72r	X466-64h	X452-58i	X407-89h	X307-74h	X366-52n	X375-62h	X463-7b	X442-52i
31	X368-50g	X374-75g	X523-83i	X372-79i	X576-18h	X245-61i	X368-70i	X466-64h	X916-3h	X591-85h	X1834-6r	X457-54n	X372-62h	X245-57i	X579-23cm
32	X916-11h	X307-7i	X907-22h	X588-54i	X443-58i	X449-15n	X368-70i	X468-51h	X372-74i	X581-2d	X378-6d	X305-23i	X444-24c		X470-57j
33	X466-74i	X591-75h	X402-63g	X368-73i	X910-24i	X1836-51t	X1837-9r	X902-22h	X594-67h	X368-53g	X567-56i	X407-60f	X362-62e	X453-55i	X468-63h
34	X459-51i	X314-74r	X304-80i	X574-76u	X314-54k	X467-86t	X307-75i	X391-66h	X391-66h	X323-63h	X468-2d	X583-6i	X589-6c	X588-11c	X588-7bm
35	X407-77h	X470-83r	X305-27i	X1835-52s	X885-13i	X402-54h	X402-54h	X581-55i	X909-3h	X577-13am	X561-60j	X457-64r	X441-50i	X594-17d	X466-22f
36	X468-58g	X579-61i	X374-87h	X463-79h	X443-77i	X576-20d	X470-80r	X574-69f	X470-80r	X579-20d	X241-52j	X466-13d	X314-68r	X1837-7r	X583-56h

P O S I T I O N

a - planted 1989
 b - planted 1990
 c - planted 1991
 d - planted 1992
 dh - planted 1992-moved 1996
 e - planted 1993
 f - planted 1994
 g - planted 1995
 h - planted 1996
 i - planted 1997
 j - planted 1998
 k - planted 1999
 l - planted 1999
 m - moved 1992
 n - planted 2002
 p - planted 2004
 q - planted 2005
 r - planted 2007
 s - planted 2008
 t - planted 2009
 u - planted 2010

REGION E WHITE SPRUCE CLONAL SEED ORCHARD MAP - G259C

14	13	12	11	10	9	8	7	6	5	4	3	2	1
X364-59h	X574-59r	X306-7h	X1834-3r	X1835-1r	X452-52i	X593-3b	X582-14cm	X523-12b	X467-91t	X523-28bm	X408-24d	X598-2b	X314-57r
X461-58p	X1837-6r	X580-54n	X449-4n	X314-65r	X585-13b	X594-06b	X470-11bm	X583-4bm	X594-7bm	X585-5b	X305-53g	X378-50g	X372-4a
X579-0b	X444-4cm	X462-16bm	X591-13bm	X457-55k	X305-20h	X467-19d	X407-11bm	X462-06bm	X453-13b	X374-1a	X405-72r	X583-2b	X450-1b
X463-11a	X597-8c	X375-6a	X305-20h	X467-19d	X450-28bm	X569-73q	X447-4a	X588-2cm	X468-12am	X368-7a	X466-1a	X362-69h	X443-14bm
X1835-3r	X377-1am	X362-12am	X583-63i	X407-9am	X402-9am	X454-8d	X241-56r	X561-18b	X591-7b	X591-2b	X442-2b		X364-15d
X574-54i	X443-51g	X464-10b	X240-4f	X453-16b	X307-52g	X374-5am	X579-4b	X442-02b	X1836-1r	X306-50g	X464-12b	X444-1b	X588-3b
X594-10b	X589-9bm	X402-27d	X1835-2r	X403-11a	X378-80r	X362-52f	X387-2cm	X442-06bm	X377-2a	X307-50g	X405-72r	X462-1b	X367-4c
X306-51g	X405-20d	X453-59m	X567-9c	X591-9b	X459-22bm	X460-26bm	X468-3a	X375-4a	X463-8a	X596-1bm	X240-1f	X459-2bm	X239-55f
X307-57g	X588-10b	X576-4k	X466-30a	X377-3a	X597-9b	X368-8a	X368-8a	X574-57r	X470-14bm	X375-14am	X362-1a	X589-1bm	X561-22cm
X460-24bm	X585-17bm	X568-55j	X470-25a	X598-53g	X372-24am	X1834-1r	X1834-1r	X240-2f	X579-8bm	X402-12am	X582-4c	X460-10b	X407-1a
X374-7am	X594-12bm	X1835-3r	X362-16am	X458-16bm	X1838-24t	X378-79r	X378-79r	X592-30g	X374-2a	X468-1a	X594-3b	X583-38bm	X470-13a
X441-55i	X207-53h	X470-24cm	X467-81r	X561-19b	X314-52j	X588-7b	X579-11bm	X368-10am	X459-5b	X450-18bm	X596-7bm	X451-60r	X453-18bm
X579-36m	X443-18bm	X442-9b	X468-15am	X307-59g	X405-51i	X596-10bm	X596-10bm	X450-2b	X466-28a	X597-1b	X377-10am	X441-16b	X595-6e
X588-8bm	X596-13bm	X442-9b	X523-60g	X374-62h	X375-13am	X402-4a	X402-4a	X463-16am	X467-76r	X443-1b	X581-5d	X463-5a	X375-2a
X407-78h	X314-66r	X245-59i	X443-4b	X407-50f	X1834-2r	X462-28bm	X591-7b	X598-4b	X598-4b	X593-2b	X582-11cm	X591-39bm	X588-17bm
X469-9d	X240-9g	X460-14b	X459-13b	X305-24h	X444-28cm	X451-67r	X374-11am	X463-9bm	X463-9bm	X442-18bm	X307-60g	X240-12g	X245-51g
X442-54g	X585-51g	X1838-57u	X468-59h	X372-61g	X402-6a	X464-13b	X468-14am	X407-2a	X407-2a	X378-52g	X579-2b	X585-2f	X523-10b
X468-21a	X596-12c	X1837-4r	X407-84h	X1836-2r	X362-53f	X582-5c	X466-14bm	X364-21d	X589-3b	X362-22a	X1837-2r		X444-18bm
X307-61h	X362-21b	X561-7f	X582-16d	X452-15d	X374-50c	X467-80r	X240-13f	X463-19d	X574-56r	X362-22a	X374-53f	X407-23a	X240-8f
X597-4d	X407-52f	X591-31b	X443-22b	X591-27d	X444-12c	X589-62h	X407-24a	X468-11d	X462-4c	X307-64g	X374-53f	X598-1d	X372-55g
X368-52f	X450-17bm	X583-62i	X240-14f	X585-6d	X588-11d	X460-8e	X579-56g	X405-74r	X366-1d	X442-29b	X595-53j	X598-1d	X470-75r
X523-58g	X378-82r	X305-52h	X375-51e	X362-72h	X462-17c	X561-57g	X368-51f	X457-61r	X470-77r	X407-80h	X450-29e	X402-15a	X470-75r
X451-70t	X567-57i	X1836-6r	X462-19cm	X377-26d	X375-70g	X589-7d	X443-53g	X305-30h	X561-17e	X567-7d	X443-16bm	X594-14b	X368-15am
X466-7e	X568-25d	X463-13f	X368-76h	X570-55i	X567-26d	X453-53i		X374-66h	X591-30b	X1837-2r	X597-2d	X579-14b	X589-5d
X598-63i	X377-58d	X368-64f	X372-9b	X245-63i	X451-72s	X591-14d	X463-73h	X443-21b	X314-61r	X1837-3r	X591-30b	X579-14b	X314-60r
X374-56f	X452-53i	X453-56i	X402-20a	X240-20g	X368-60f	X307-71i	X442-50i	X598-60i	X444-11c	X575-1d	X463-22a	X443-20b	X307-63h
X462-51g	X589-17b	X490-60i	X374-76h	X523-56h	X377-16a	X575-3d	X462-26f	X466-24b	X402-17a	X575-1d	X362-73h	X589-12b	X582-2d
X245-56i	X307-73i	X362-3b	X407-88h	X305-22i	X304-59i	X588-16cm	X407-58e	X585-52f	X368-10b	X450-55i	X374-19a	X466-17b	X596-9f
X1836-7r	X457-62r	X375-59h	X594-50g	X561-62i	X304-53i	X589-64h	X452-56i	X375-24a	X451-65r	X460-16bm	X523-54h	X470-76r	X442-51h
X444-14c	X574-65r	X596-6c	X374-54e	X463-29am	X377-12a	X468-29am	X468-29am	X377-12a	X594-53g	X598-61i	X463-68h	X240-15g	X377-7d
X443-30b	X523-59i	X588-18c	X463-18bm	X453-58i	X378-58h	X579-18b	X372-58h	X463-23a	X591-10e	X383-17c	X591-18b	X372-56h	X377-7d
X380-16d	X402-21a	X468-20a	X1836-5r	X569-55j	X378-51i	X594-55g	X374-74h	X314-64r	X374-74h	X362-57e	X457-7d	X407-57f	X462-30b
							X368-72h			X567-50i	X1838-22t	X579-19bm	X1837-1r

a - planted 1989
 b - planted 1990
 c - planted 1991
 d - planted 1992
 dh - planted 1992-moved 1996
 e - planted 1993
 f - planted 1994
 g - planted 1995
 h - planted 1996
 i - planted 1997
 j - planted 1998
 k - planted 1999
 l - planted 2000
 m - moved 1992
 n - planted 2002
 o - planted 2004
 p - planted 2005
 q - planted 2005
 r - planted 2007
 s - planted 2008
 t - planted 2009
 u - planted 2010