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INTERAGENCY RIPARIAN/WETLAND PLANT DEVELOPMENT PROJECT

Second Quarter FY 1993 Progress Report

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Introduction

Nearly a year ago this project was established to work on many of the problems limiting wetland restoration, improvement and creation nationwide. After only a year, excellent progress can already be seen. We have made significant advances and will keep on doing so, with your assistance.

This last quarter has been spent on analyzing data, writing reports, and running several experiments in the greenhouse. A final draft Soil Conservation Service Technical Report on "How To Plant Willows And Poplars For Riparian Rehabilitation" was finished. Two technical papers were written for 2 training sessions that Chris will be instructing at in Wyoming and Nevada; one on "Use Of Willow And Poplar Cuttings For Vegetating Shorelines And Riparian Areas" and the other on "Selection And Acquisition Of Woody Plant Species And Materials." We are also in the final draft of the 1992 Progress Report on the American Fall Reservoir Vegetative Study for the USBR. Preliminary analysis on data collected on accessions of all the wetland species we are testing was completed. A list of the selected accessions is provided in Appendix 1. Additional seed needs to be collected from these accessions in 1993 (see Seed Collections).

Eric Walker, Wetland Biological Aid

As of October of last year, lack of funds forced the reduction of Eric's hours down to 32 hours per pay period. The chances of Eric going back to full-time were poor before May 17. Eric decided to get another job that was full-time, so he resigned effective 3/7/93. We are in the process of advertising for a replacement that will tentatively be hired about May 17 and extend through September 30. If anyone knows of a qualified person, please have them contact me at 397-4133.

Seed Collections

A seed inventory was completed in February, 1993. The majority of accessions for ELPA3, SCAC, and SCAM2 have very little or no seed available for further testing. Seed needs to be collected for accessions that we plan on testing in 1993. Directions to collection sites are available, so seed can be collected by volunteers, cooperators or during other travel to save on expenses (Appendix 1).

Live Plant Collections

In the last progress report the high mortality of SCMA and SCAM2 was addressed. We did not know what had caused the problems so a stem clipping trial was initiated. The trial ended in February, 1993. The preliminary results show that the plants did not die when their stems were clipped (see Appendix 2). The clipped stems grew to varying heights then ceased to grow but new growth did come from the roots. The high mortality may have resulted from a combination of things such as, older stems, small plugs, and transplant stress.

Evaluations

Evaluations this year will tell us more about the mortality of the SCMA and SCAM2. The greenhouse propagated plants were transplanted late in the season to the ponds, so there may be a big change in mortality this year. The traits being evaluated and the way they are evaluated may need to be adjusted so that the plants are not damaged during evaluations. For instance, The pond containing JUBA, CANE2 and ELPA3 has nearly all the rows filled with new growth, so walking in the rows should be minimized.

Data Analysis

Evaluation data from the ponds has been entered in to MSTATC, a statistical package form Michigan State University. Analysis of Variance and Duncans Range Test are being used to rank accessions for height, width, and rhizome spread. Some rankings do not follow the normal curve and have required further transformation and analysis. An example of the type of data generated is shown in Table 2, which is a Range Test on height for *Juncus balticus*. James Henson, SCS in Los Lunas, NM, and Tom Jones, ARS in Logan, UT have been working closely with us to ensure scientific validity. Some accessions have already been eliminated due to lack of seed, extremely poor germination, and failure to locate collection sites. The combined MSTATC data from 1992 and 1993 will be used to make a more aggressive selection in 1994.

Stratification

The first stratification tests consisted of eight trials for each accession. We have reduced the number of trials per accession by eliminating alternating temperatures, distilled water, and pond water. Alternating temperatures were dropped because the majority of accessions had the greatest amount of germination in the first cycle, with no significant germination in cycles 2-4 (Appendix 3). Pond water and distilled water were dropped because they did not enhance germination. Differences between species have been noted in the different stratifications mediums (wet or moist). Originally all the species were stratified under wet and moist conditions. We will now be focusing on using the stratification medium that indicated the best germination for each species. Moist stratification will be used for SCMA, SCAC and POLYG4, and wet stratification will be used for ELPA3 and SCAM2.

Seed Drying

In November, 1992 seeds that had been soaking in the cooler for 6 months were tested to determine the percent viability. The test was completed in February, 1993. Three accessions from *Scirpus acutus*, *Eleocharis palustris*, and *Scirpus maritimus* were tested. Germination was lower than recorded in 1992 for all nine accessions, except for one trial in accession 9067394 of SCAC, see Table 1. ELPA3 had the biggest decrease in viability overall, from 65% to 22%. The seeds that were dried, then planted, had the lowest germination. The main conclusion is that seeds still soaking in the cooler can be used, but a reduction in viability should be expected.

On March 16, 1993, a stratification test on SCMA was initiated that exposes the seeds to freezing conditions for 6 days before the 28 day cold stratification. This test was proposed in November, 1992. It was initiated to determine whether or not freezing the seeds prior to stratification would enhance germination. Germinated seeds will be counted and removed from the cups, the temperature will also be monitored in the cups with the Thermistors.
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Greenhouse Temperature and Lighting

Temperatures in the greenhouse have consistently been between 26°C for the low and 37°C for the high. The boiler did break down several times allowing the temperature to plunge into the low 20's. Plastic on the west side windows in the greenhouse was installed during the winter to try and hold the temperatures at a more stable range. It was removed the second week of March because the temperature did occasionally reach 40°C on sunny days. The lights are now on for 12 hours a day.

Special Tests

The temperatures needed for successful germination of wetland seed is not known, but warmer temperatures in the past have resulted in better germination than anticipated. Therefore, in January, 1993, thermistors and an Ohm meter were used to monitor the temperature of the soil in the greenhouse in covered and uncovered tanks. This was done to determine if the plastic covering the tank did significantly increase the temperature of the soil. Temperatures were taken at least twice a day at varying times, for 28 days. The temperature of the soil in the covered tank ranged between 1-5°C warmer than the uncovered soil. The thermistors will be used to monitor the temperature in the cups in relation to air temperature in the Seed Freezing Test.

Poulson Constructed Wetland System Demonstration Site (CWS)

This site is being built to show how plant materials and techniques for building constructed wetlands can be used to improve water quality in irrigation waste water, in addition to the development of quality wildlife habitat. The CWS will be functioning to improve the water quality of irrigation waste water from the Poulson Farm before it returns to the American Falls Reservoir.

In the last progress report, the CWS was in the early stages of planning. Funding has been obtained from the USBR for construction. The SCS Engineers have been working on designs. Plans for vegetation of the different components are ready, and the greenhouse has been prepared for growing the required plants. Construction is planned for late May or early June. Two meetings to date have been held on the CWS with SCS Engineers and interested local parties to discuss the designs and concepts. The meetings have been very valuable. Several changes needed to be made to allow for accurate water quality sampling. A meeting will be held at the PMC once a month up to the construction date to coordinate all aspects of the project.

Sterling WMA

Monitoring of the water depth gauges will continue as soon as access to the area is possible. The snow has been too deep for several months to get to the tubes. Mapping of the plant communities in relation to the water regimes around the tubes will be completed by September, 1993.

The maps will be used to determine where the different species should be planted when we begin testing plant materials in natural wetlands.

Willow Collections

Willow collections of the following species is in progress:

Coyote Willow, *Salix exigua*
Geyers Willow, *Salix geyeriana*
Booth Willow, *Salix boothii*
Yellow Willow, *Salix lutea*
Pacific Willow, *Salix lasiandra*
Narrowleaf Poplar, *Populus angustifolia*

A collection plan was developed to include 2-3 collections of each species from each state (except California). Collections have been sent to the Project from: Lone Peak Nursery, Drapper, UT; J. Brown and B. Prevedel, SCS Roosevelt Field Office, UT; and, H. Hodak, USFS, Twin Falls, ID. Information on collection areas have been provided by: Al Winward, USFS, Ogden, UT; Seril Goodrich, USFS, Vernal, UT; and H. Hodak, USFS, Twin Falls, ID. More information and collections sites are coming from the USFS and NDOW in Nevada.

Collection trips for Utah and Idaho are lined up for late March/early April. Collections in Nevada will begin in mid-late April.

American Falls Reservoir

All the evaluation data from 1987-1992 has been organized. Tables have been constructed that show survival rates for the different plantings. Sorting of the data is now in progress so that it may be entered into MSTATC for analysis. A complete random design (CRD) will be used for entry.

Table 1

INTERAGENCY RIPARIAN/WETLAND PLANT DEVELOPMENT PROJECT
Stratification Trial 4

Final Germination Percents

Species Accession #	PG*	Trial numbers 1	2	3	4	5	6
SCAC							
9067394	40%	25%	43%	14%	27%	15%	26%
9067396	65%	57%	42%	47%	49%	45%	44%
9067395	50%	29%	33%	1%	19%	7%	20%
SCMA							
9067377	70%	53%	54%	36%	37%	46%	44%
9067374	75%	27%	36%	17%	25%	45%	36%
9067375	70%	19%	30%	7%	15%	38%	33%
ELPA3							
9067387	5%	0%	2%	1%	0%	2%	2%
9067389	65%	24%	5%	8%	5%	9%	3%
9067391	65%	17%	22%	10%	16%	7%	14%

Legend:
* PG - preliminary germination percent from 1992.

Trial number description:
1 & 2 - Seeds were removed from the cold stratification cups, dried for 28 days, restratified 1 in wet conditions, 2 in moist, then planted.
3 & 4 - Seeds were removed from the cold stratification dried for 28 days, then planted.
5 & 6 - Seeds were removed from the cold stratification cups and planted immediately.

Appendix 1

1993 SELECTED ACCESSIONS AND LOCATIONS FOR WETLAND SPECIES

DATE 3/16/93

Acc. #	GH #	Species	State	Location	Legal descrip. SEC TWN RG	Date planted
9067420		CANE2	ID	F & G		
9057599	2	CANE2	ID	Centennial Marsh WMA	11 2S 12E	8/18/92
9057606	6	CANE2	OR	Malheur NWR	29 26S 29E	8/6/92
9057612	7	CANE2	CA	Modoc NWR	19 42N 13E	7/23/92
9057623	13	CANE2	ID	Bear Lake NWR	22 14S 44E	7/15/92

9067412	14	CANE2	UT	Lone peak nursery		8/6/92
9067406	8	CANE2	ID	F&G by our tubes	13 5S 31E	8/26/92
9067407	16	CANE2	ID	Johnson Segment	13 5S 31E	8/26/92
9057639	9	CANE2	NV	Ruby Lake NWR	18 27N 58E	8/14/92
9057592	17	CANE2	UT	Heiners Creek	25 4N 5E	8/6/92
9057652	1	CANE2	UT	G. Blackburn Ranch	25 4N 5E	1/6/92
9067382	5	CANE2	NV	Trout Cr. OATS	34 46N 65E	8/5/92
9067371	4	CANE2	ID	Lower Salmon Dam	2 7S 13E	
9067421		ELPA3	ID	F & G		
9067387	1	ELPA3	NV	Ruby Lake NWR	18 27N 58E	8/14/92
9067389	8	ELPA3	ID	North Lake WMA	31 7N 35E	8/20/92
9057588	5	ELPA3	UT	Hinckley Ranch	19 1N 1W	8/6/92
9067385	14	ELPA3	NV	Trout Cr. OATS	34 46N 65E	8/5/92
9067410	2	ELPA3	ID	Orth Segment	13 5S 31E	7/29/92
9057604	3	ELPA3	ID	upper Cow Lake	27 28S 44E	8/6/92
9057607	12	ELPA3	OR	Malheur NWR	29 26S 29E	8/6/92
9057585	4	ELPA3	ID	Bruneau River	23 6S 5E	7/31/92
9057581	6	ELPA3	ID	Squaw river	8 7N 1E	8/26/92
9067386	7	ELPA3	ID	Sublett Reservoir		7/15/92
9057600	11	ELPA3	ID	Centennial Marsh WMA	11 2S 12E	8/18/92
9057601	9	ELPA3	ID	Ponderosa St. Park	34 19N 3E	8/27/92
9067391	13	ELPA3	ID	Grays Lake NWR	19 3S 43e	7/2/92
9057609	8	JUBA	OR	Malheur MWR	29 26S 29E	8/6/92
9057613	2	JUBA	CA	Modoc NWR	19 42N 13E	7/23/92
9057617	6	JUBA	ID	Minidoka NWR		7/15/92
9057621	7	JUBA	ID	BF. Reservoir	31 4S 41E	7/15/92
9057630	3	JUBA	NV	Kirch WMA		8/14/92
9057632	4	JUBA	NV	Stillwater NWR	17 19N 31E	8/14/92
9057641	10	JUBA	NV	Railroad Valley WMA		8/13/92
9067384		JUBA	UT	Willard Bay Park	22 8N 2W	no seed
9067383	5	JUBA	UT	Locomotive Springs WMA	2 11N 10W	7/30/92
9057589	14	JUBA	UT	Hinckley Ranch	19 1N 1W	8/6/92
9057591	15	JUBA	UT	Echo canyon	17 3N 5E	8/6/92
9067411	9	JUBA	ID	F&G by our tubes	13 5S 31E	8/26/92
9067370		JUBA	UT	G. Blackburn ranch	25 4N 5E	not clean
9057583	11	JUBA	ID	Bruneau River	23 6S 5E	7/31/92
9057580	13	JUBA	ID	Rosewell WMA	25 5N 6W	7/31/92
9057602	1	JUBA	ID	N of Maki Ln.	10 17W 3E	8/27/92

Acc. #	GH #	Species	State	Location	Legal descrip. SEC TWN RG	Date planted
9057597	6	SCAC	ID	Hagerman WMA	35 7S 13E	7/31/92
9057608	5	SCAC	OR	Malheur NWR	29 26S 29E	8/6/92
9057614	19	SCAC	CA	Modoc NWR	25 42N 12E	7/23/92
9057620	7	SCAC	ID	Grays Lake NWR	8 5S 43E	7/2/92
9057625	2	SCAC	ID	Ft Hall Reservation		7/22/92
9057629	21	SCAC	NV	Kirch WMA		8/14/92
9057634	1	SCAC	NV	Stillwater NWR	18 19N 31E	8/14/92
9057636	20	SCAC	NV	Weeks on Alt. Hwy 95		8/14/92
9057643	3	SCAC	ID	Camas NWR	18 7N 36E	8/20/92
9057646	8	SCAC	ID	Market Lake WMA	7 5N 37E	8/18/92
9067394	4	SCAC	ID	Carey Lake WMA	23 15 21E	8/18/92

9067395	11	SCAC	UT	Bear River NWR	3 8N 4W	7/30/92
9067393	18	SCAC	UT	Ogden Bay WMA	10 5N 3W	7/30/92
9067396	10	SCAC	UT	Locomotive Springs WMA	2 11N 10W	7/30/92
9057587		SCAC	UT	Hinckley Ranch	19 1N 1W	not clean
9057651	9	SCAC	UT	Deb Kawaguchi farm	6 4N 5E	8/6/92
9067392	13	SCAC	UT	Hinckley ranch	1 1N 1W	8/6/92
9067413	15	SCAC	ID	Johnson Segment	13 5S 31E	8/26/92
9067409	17	SCAC	ID	Orth Segment	13 5S 31E	7/29/92
9067414	23	SCAC	ID	F&G by our tubes	13 5S 31E	8/26/92
9067419		SCAC	ID	F & G		
9067418		SCAC	ID	F & G		
9057577	16	SCAC	ID	Fort Boise WMA	36 6N 6W	7/13/92
9057578	10	SCAM2	ID	Fort Boise WMA	36 6N 6W	7/31/92
9057596	3	SCAM2	ID	Bruneau Dunes Park	13 6S 6E	7/13/92
9057610	9	SCAM2	OR	Malheur NWR	29 26S 29E	8/6/92
9057635	2	SCAM2	NV	W. of Fallon		8/14/92
9057638	6	SCAM2	NV	Rosewood Lakes		8/14/92
9057642	1	SCAM2	NV	Railroad Valley WMA		8/13/92
9057644	11	SCAM2	ID	Camas NWR	7 7N 36E	8/20/92
9067408	4	SCAM2	ID	American Game Seg.	13 5S 31E	8/26/92
9057648	5	SCAM2	ID	Market Lake WMA	7 5N 37E	8/18/92
9057654	7	SCAM2	UT	Deb Kawaguchi farm	6 4N 2W	8/6/92
9067425		SCAM2	ID	F & G		
9067427		SCAM2	ID	F & G		
9057579		SCMA	ID		na	**not clean
9057584		SCMA	ID	Bruneau River	23 6S 5E	not clean
9067376	3	SCMA	NV	Kirch WMA		8/14/92
9067380	1	SCMA	ID	Bear Lake NWR	16 14S 44E	7/15/92
9067375	7	SCMA	NV	Rosewood Lakes		8/14/92
9067377	5	SCMA	UT	Salt Creek WMA	35 11N 4W	7/30/92
9067374	6	SCMA	UT	Bear River NWR	3 8N 4W	7/30/92
9067381	8	SCMA	UT	Ogden Bay WMA	10 5N 3W	7/30/92
9057594		SCMA	UT	Deb Kawaguchi farm	6 4N 5E	not clean
9067378	2	SCMA	UT	Deb Kawaguchi farm	6 4N 2W	8/6/92
9067379	4	SCMA	UT	Horseshoe Springs		8/6/92
9057586		SCMA	ID	Canyon County		not clean
9067422		SCMA	ID			
9067424		SCMA	ID			
9067426		SCMA	ID			
9067428		SCMA	ID			

Acc. #	**GH #**	**Species**	**State**	**Location**	**Legal descrip. SEC TWN RG**	**Date planted**
9057611	1	POLYG4	CA	Modoc NWR	19 42N 13E	7/23/92
9057618	2	POLYG4	ID	Yale road	35 10S 27E	7/16/92
9057624	3	POLYG4	ID	Bear Lake NWR	17 14S 44E	7/16/92
9057633	4	POLYG4	NV	Stillwater NWR	18 19N 31E	8/14/92
9057649	5	POLYG4	ID	Market Lake WMA	1 5N 36E	8/18/92
9067415	6	POLYG4	ID	Mud Lake	31 7N 35E	8/20/92
9067416	7	POLYG4	ID	Deer Flats	7 2N 2W	7/31/92
9067417	8	POLYG4	ID	Malheur	7 31S 32E	8/6/92

LEGEND:

Reasons for dropping or replacing accessions:
1) Germination less than 30%. (CANE2 less than 20%)
2) Original collection site was not found
3) No seed in the original collection envelope

All other accessions will continue to be tested, a total of **102**

Appendix 2

Report on Stem Clipping Trial

Introduction:

Little is known about propagation and transplanting techniques of many wetland plants. One of the Interagency Riparian/Wetland Plant Development Project goals is to develop successful propagation techniques for our target species. The cause of the high mortality of the SCMA, as reported in our last Progress Report, is unknown, but further study of our techniques, such as clipping the stems, was warranted.

In 1992 the Wetland/Riparian Plant Development project began greenhouse propagation of wetland plants and making live collections from the field. Transplanting plants to the Created Wetland Ponds at the Aberdeen Plant Materials Center began in July of 1992.

Before transplanting the plants, the stems were clipped to 15 cm. Most of the plants responded well to clipping and transplanting, with new growth, the *Scirpus* species, however, responded poorly. *Scirpus maritimus* (SCMA), specifically, had 73% mortality in the live collections.

In October, 1992, a proposal was written for a Stem Clipping Trial on the *Scirpus* species and *Eleocharis palustris*. The trial began in October 1992, and ended in February, 1993.

This report looks at the effects of clipping on plant stems, specifically on: 1) stem growth, 2) rhizome activity, 3) seed production, and 4) plant establishment. Four species were used in the Trial; *Scirpus acutus* (SCAC), *S. americanus* (SCAM2), *S. maritimus* (SCMA) and *Eleocharis palustris* (ELPA3).

Collected Data

Plant stems are clipped to make transportation to the planting site easier, and to reduce the amount of biomass that must be supported by the root system as the plant tries to reestablish itself. Most plants do not have a negative reaction to clipping then transplanting, even though some stress is incurred.

The Stem Clipping Trial was evaluated periodically throughout a 5 month period. The height of clipped and unclipped stems was measured, the number of clipped stems that grew, number of rhizomes/tillers, and the number of stems under 15 cm in the clipped cells were all recorded.

Clipped stems do continue to grow, but slow down significantly or stop growing at various heights. Based on the total number of stems cut, an average of 35% continued to grow. Only new shoots produced seed heads in all the species tested. SCAC did not set seed. New shoots from all the clipped plants came from **tillers**, except for SCMA which had **tillers and new growth from the middle of clipped stems. Stems that were shorter than 15 cm in the clipped samples were, on the average, twice as tall as the clipped stems at the end of the trial.** All the accessions and species tested responded similarly to the different treatments.

Conclusions:

Clipping the stems did not kill the plants. Seed production was reduced until new growth could mature and produce seed. The number of rhizomes at the end of the trial was greater in most of the clipped samples.

Based on our findings, the high mortality of the SCMA cannot be attributed to clipping the stems alone. A number of factors working together appeared to have contributed to the mortality rate, such as; small plugs, clipped stems, and transport stress.

For future collections, plugs of SCMA should be of larger size with many rhizomes, stems should be clipped to 15 cm, and handled carefully to reduce transport stress before transplanting.

Appendix 3

SEED GERMINATION PERCENTAGES ALTERNATING TEMPERATURE
(Seeds began stratifying 5/19/92)

Species Access. #	Wet Strat. First cycle*	Wet Strat. Second cycle	Wet Strat. Third cycle	Wet Strat. Fourth cycle	Moist Strat. First cycle	Moist Strat. Second cycle	Moist Strat. Third cycle	Moist Strat. Fourth cycle
POLYG4								
9057611	98%+/- 2%	--	--	--	98%+/- 2%	--	--	--
9057618	98%+/- 2%	--	--	--	98%+/- 2%	--	--	--
9057624	98%+/- 2%	--	--	--	98%+/- 2%	--	--	--
9057633	98%+/- 2%	--	--	--	98%+/- 2%	--	--	--
9057649	95%+/- 2%	--	--	--	96%+/- 2%	--	--	--
9057637	98%+/- 2%	--	--	--	98%+/- 2%	--	--	--
ELPA3								
9067387	5%+/- 1%	5%+/- 1%	0%	0%	30%+/- 3%	0%	0%	0%
9067390	60%+/- 3%	0%	15%+/- 2%	0%	30%+/- 3%	0%	5%+/- 1%	0%
9057604	95%+/- 5%	--	--	--	60%+/- 3%	5%+/- 1%	5%+/- 1%	6%
9057585	95%+/- 5%	--	--	--	95%+/- 5%	--	--	--
9057588	95%+/- 5%	--	--	--	65%+/- 3%	5%+/- 1%	0%	1%
9057581	95%+/- 5%	--	--	--	95%+/- 5%	--	--	--
9067386	60%+/- 3%	10%+/- 2%	5%+/- 1%	1%	70%+/- 3%	5%+/- 1%	5%+/- 1%	0%
9067389	65%+/- 3%	10%+/- 2%	5%+/- 1%	3%	75%+/- 4%	5%+/- 1%	0%	0%
9057601	90%+/- 10%	--	--	--	90%+/- 10%	--	--	--
9067388	10%+/- 2%	0%	0%	0%	15%+/- 2%	5%+/- 1%	0%	1%
9057600	95%+/- 5%	--	--	--	80%+/- 4%	0%	0%	0%
9057607	95%+/- 5%	--	--	--	95%+/- 5%	--	--	--
9067391	65%+/- 3%	15%+/- 2%	5%+/- 1%	1%	95%+/- 5%	--	--	--
9067385	95%+/- 5%	--	--	--	60%+/- 3%	0%	5%+/- 1%	0%
SCAC								
9057634	15%+/- 2%	40%+/- 3%	30%+/- 3%	11%	70%+/- 4%	10%+/- 2%	10%+/- 2%	--
9057625	35%+/- 3%	25%+/- 3%	25%+/- 3%	2%	25%+/- 2%	30%+/- 3%	40%+/- 3%	--
9057643	45%+/- 3%	35%+/- 3%	5%+/- 1%	4%	40%+/- 3%	30%+/- 3%	10%+/- 2%	3%
9067394	40%+/- 3%	30%+/- 3%	25%+/- 3%	--	80%+/- 4%	10%+/- 2%	5%+/- 1%	--
9057608	20%+/- 4%	10%+/- 3%	55%+/- 5%	5%+/- 2%	40%+/- 5%	10%+/- 3%	10%+/- 3%	20%+/- 4%
9057597	65%+/- 3%	20%+/- 2%	10%+/- 2%	--	45%+/- 3%	40%+/- 3%	10%+/- 2%	--
9057620	40%+/- 3%	30%+/- 3%	15%+/- 2%	2%	45%+/- 3%	30%+/- 3%	0%	4%
9057646	30%+/- 3%	40%+/- 3%	10%+/- 2%	20%	30%+/- 3%	45%+/- 3%	5%+/- 1%	3%
9057651	75%+/- 4%	15%+/- 2%	5%+/- 1%	--	95%+/- 5%	--	--	--
9067396	65%+/- 3%	10%+/- 2%	20%+/- 2%	--	95%+/- 5%	--	--	--
9067395	50%+/- 3%	0%	10%+/- 2%	10%	95%+/- 5%	--	--	--
9057640	25%+/- 2%	50%+/- 3%	5%+/- 1%	18%	25%+/- 2%	55%+/- 3%	0%	15%
9067392	15%+/- 2%	50%+/- 3%	5%+/- 1%	4%	70%+/- 4%	15%+/- 2%	10%+/- 2%	--
9057616	20%+/- 4%	50%+/- 5%	20%+/- 4%	--	25%+/- 4%	30%+/- 5%	25%+/- 4%	15%+/- 3%
9057628	30%+/- 3%	55%+/- 3%	10%+/- 2%	--	30%+/- 3%	55%+/- 3%	10%+/- 2%	--
9057577	40%+/- 3%	45%+/- 3%	10%+/- 2%	--	95%+/- 5%	--	--	--
9057622	10%+/- 3%	65%+/- 6%	5%+/- 2%	10%+/- 3%	10%+/- 3%	10%+/- 3%	5%+/- 2%	20%+/- 4%
9067393	10%+/- 2%	40%+/- 3%	15%+/- 2%	4%	55%+/- 3%	30%+/- 3%	10%+/- 2%	--
9057614	55%+/- 3%	30%+/- 3%	10%+/- 2%	--	65%+/- 3%	20%+/- 2%	10%+/- 2%	--
9057636	20%+/- 2%	50%+/- 3%	10%+/- 2%	13%	70%+/- 4%	15%+/- 2%	10%+/- 2%	--
9057629	40%+/- 3%	40%+/- 3%	5%+/- 1%	0%	70%+/- 4%	15%+/- 2%	10%+/- 2%	--
9057582	10%+/- 3%	70%+/- 7%	5%+/- 2%	5%+/- 2%	20%+/- 4%	60%+/- 6%	5%+/- 2%	5%+/- 2%

Species Access. #	Wet Strat. First cycle	Wet Strat. Second cycle	Wet Strat. Third cycle	Wet Strat. Fourth cycle	Moist Strat. First cycle	Moist Strat. Second cycle	Moist Strat Third cycle	Moist Strat. Fourth cycle
SCAM2								
9057642	30%+/- 5%	10%+/- 3%	5%+/- 2%	5%+/- 2%	30%+/- 5%	20%+/- 4%	5%+/- 2%	5%+/- 2%
9057635	45%+/- 5%	40%+/- 5%	5%+/- 2%	0%	35%+/- 5%	30%+/- 5%	5%+/- 2%	10%+/- 3%
9057596	90%+/- 10%	--	--	--	80%+/- 8%	15%+/- 3%	--	--
9057593	65%+/- 6%	20%+/- 4%	10%+/- 3%	--	60%+/- 6%	15%+/- 3%	20%+/- 4%	--
9057648	55%+/- 5%	0%	0%	0%	45%+/- 5%	0%	0%	0%
9057638	90%+/- 10%	--	--	--	80%+/- 8%	15%+/- 3%	--	--
9057654	65%+/- 6%	10%+/- 3%	5%+/- 2%	0%	60%+/- 6%	10%+/- 3%	5%+/- 2%	5%+/- 2%
9057615	25%+/- 4%	5%+/- 2%	5%+/- 2%	0%	30%+/- 5%	5%+/- 2%	0%	0%
9057610	35%+/- 5%	25%+/- 4%	15%+/- 3%	0%	30%+/- 5%	15%+/- 3%	10%+/- 3%	5%+/- 2%
9057578	15%+/- 3%	0%	5%+/- 2%	0%	60%+/- 6%	15%+/- 3%	0%	0%
9057644	70%+/- 7%	15%+/- 3%	10%+/- 3%	--	75%+/- 8%	20%+/- 4%	--	--
SCMA (Species did not begin stratifying until 7/9/92 and has not completed the fourth cycle.)								
9067380	60%+/- 3%	5%+/- 1%	0%	12%	75%+/- 4%	10%+/- 2%	0%	0%
9067378	45%+/- 3%	15%+/- 2%	0%	2%	55%+/- 3%	30%+/- 3%	0%	1%
9067376	65%+/- 3%	5%+/- 1%	2%	9%	75%+/- 4%	10%+/- 2%	3%	3%
9067379	70%+/- 3%	5%+/- 1%	1%	0%	95%+/- 5%	--	--	--
9067377	70%+/- 3%	10%+/- 2%	6%	1%	80%+/- 4%	15%+/- 2%	--	--
9067374	75%+/- 4%	5%+/- 1%	2%	2%	65%+/- 3%	30%+/- 3%	--	--
9067375	70%+/- 3%	5%+/- 1%	9%	2%	70%+/- 3%	25%+/- 3%	--	--
9067381	55%+/- 3%	5%+/- 1%	2%	2%	55%+/- 3%	5%+/- 1%	0%	0%

Species Access. #	Total Germination
CANE2	
9057652	75%
9057599	20%
9057647	15%
9067371	80%
9067382	45%
9057606	90%
9057612	70%
9057598	1%
9057639	20%
9057631	5%
9057619	1%
9057650	15%
9057623	20%
9057653	40%
9057627	5%
9057655	1%
9057592	55%
9057605	10%

Species Access. #	Total Germination
JUBA	
9057602	85%
9057613	95%
9057630	90%
9057632	90%
9067383	95%
9057617	95%
9057621	95%
9057609	95%
9057626	65%
9057641	85%
9057583	80%
9057580	90%
9057589	95%
9057591	95%

* A cycle is an eight week period of time consisting of four weeks at 3°C. and four weeks at 37°C. The germination percent is a sum of the germination during each cycle.

-- Germination percentage is not recorded because no seed remained in cup after previous transplanting.

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