92-M5

Project Number: 92-M5

1992 Comprehensive Project Report to the Almond Board of California

Project Title: Almond Variety Development

Project Leader: Tom Gradziel

Cooperating Personnel: D.E. Kester, M.A. Thorpe and K. Pelletreau

Location: University of California at Davis

Objectives for 1992-93:

Long Range:

I. Develop pollenizers for current varieties, particularly 'Nonpareil'.

II. Develop replacement varieties for 'Nonpareil' and other market types that are self-fertile and with a wide range of bloom times and maturities.

Current:

A. Test genetic strategies for developing protection from Bud-failure, Aspergillus flavus, NOW, and other disease and insect problems, and for improving tree yield.

B. Identify effective parental combinations resulting in high quality and yield, late flowering period and self-fertility. Continue studies to clarify the underlying physiology and genetic control and inheritance of these traits.

C. Improve the evaluation and testing of breeding lines and selections. Characterize nut quality and yield potential of present selections, breeding lines and variety standards.

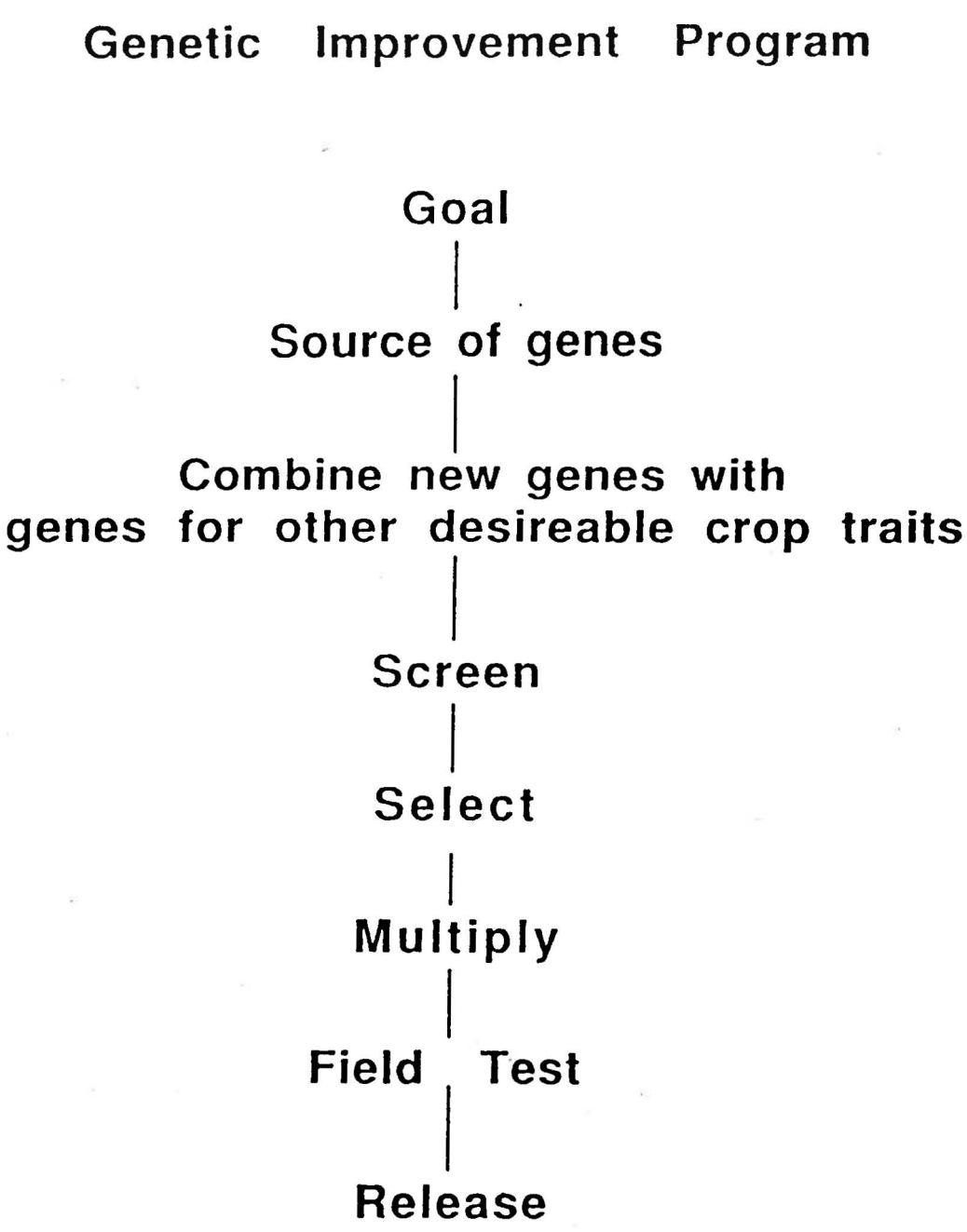
D. Improve efficiency for the genetic transformation of established almond varieties. Develop efficient shoot regeneration methods. Develop protocols for testing the genetic stability of resultant chimeric shoots.

Progress Report: January, 1992 - January, 1993

Introduction.

The framework, methodologies, and strategies employed by the almond cultivar breeding program have been detailed in the 1991-92 Annual Report and these issues will only be summarized here. The basic components of a crop breeding program are the generation of new genetic combinations, the selection of promising individuals from these recombinant populations, and the thorough testing of these selections over the range of environments likely to be met in the course of production. The critical components of such a genetic improvement program are shown in Figure 1. The determination of appropriate and focused goals for the breeding program, the appraisal and collection of genetic material with potential for achieving the defined goals, the recombination of genetic material in order to concentrate the most desirable genes from quality and production standpoints into superior individuals, and the screening and selection from progeny populations resulting from this recombination in order to eliminate all but the most promising or elite selections constitute the breeding portion of this program. The thorough, regional testing of these selections occurs at the Regional Variety Trials, and in test blocks with cooperating growers. The basic framework of the variety development program (Fig. 1.)will be used as the outline of this report in an attempt to more clearly present the interrelatedness of the projects described.

Figure 1


Genetic Improvement Program
Goal
Source of genes
Combine new genes with genes for other desireable crop traits
Screen
Select
Multiply
Field Test
Release

Goal.

The primary goal of the breeding program is to develop high yield and high quality pollinizers which are fully cross-compatible with 'Nonpareil', and to develop replacement varieties for 'Nonpareil' and other market types exhibiting dependable and high productivity even under conditions of reduced agro-chemical and cultural inputs. Desirable characteristics include self-compatibility and reduced vulnerability to insects, disease, and Bud-failure. Two distinct strategies have been used: The first is to develop varieties possessing the desirable attributes of a high quality item such as 'Nonpareil' yet having characteristics needed by the next generation of California almond varieties, i.e. cross-compatibility with 'Nonpareil', self-fruitfulness, freedom from diseases including bud-failure, etc. This project uses traditional crossing methods often with 'Nonpareil' as a parent. (A parallel project attempt to recreate a 'Nonpareil' type variety from breeding lines free from bud-failure).

A second and untill recently, relatively small (~10% of total) project explores opportunities for the direct genetic engineering of 'Nonpareil' in order to correct specific deficiencies (lack of self-fruitfulness, Bud-failure, etc.) in an otherwise highly desirable cultivar.

Source of genes

In order to breed cultivars which are fully cross-compatible with 'Nonpareil', including cultivars which are fully self-compatible, the genetic nature and identities of the California almond cross-incompatibility groups have now been determined using 1992 and earlier data. This data was obtained as a result of several thousand controlled, and replicated crosses between the range of current cultivars. Self-incompatibility in almond, a diploid tree crop (2n=16), appears to be of the monogenic, gametophytic type as are other self-incompatible crops in the Rosaceae. The self-incompatibility (S) locus controls both self- and intra-specific cross-incompatibility and appears to exist as a series of numerous distinct alleles.

Seven cross-incompatibility groups have been identified, including the previously described 'Mission' and 'Nonpareil' groups, and the four cross-incompatibility groups expected from their progeny (Table 1). Twenty-nine of the 41 cultivars tested have been placed in one of these cross-incompatibility groups with the cross-incompatibility identity of the remaining 12 cultivars being separate from these established groups. Data from these crossing studies have allowed the identification of specific S-genotypes for the majority of important almond cultivars providing a precise definition of their genetic as well as cross-compatibility relationship (Table 1). All predicted 'Mission'-'Nonpareil' cross-incompatibility groups were identified in seedling populations as well as commercial cultivars (which

originated predominantly as seedling selections).

Cross-incompatibility Group-IV is represented by a single cultivar, 'Monterey', while other groups contained at least five separate commercial varieties. Cross-incompatibility Group-I and Cross-incompatibility Group-IV together account for less than 4% of 1990 production. The total production of cross-incompatibility groups appears determined more by specific cultivar rather than total number of cultivars within groups, however. Plantings of 'Mission', 'Nonpareil', 'Thompson' and 'Carmel' represent virtually all of the acreage of their respective groups, with remaining cultivars usually constituting less than 1,000 ha each. The relatively high acreage of Cross-incompatibility Group-II results from comparable contributions (ca. 10,000 ha each) from three cultivars: 'Merced', 'Ne Plus Ultra', and 'Price Cluster'.

The identification of 'Ne Plus Ultra' as being within the 'Mission'-'Nonpareil' progeny groups presents a dilemma as its introduction preceded that of 'Mission'. 'Ne Plus Ultra', 'Nonpareil', and 'IXL' originated from a single seedling orchard planted by A.T. Hatch, of Suisun, California, in 1879. The predominant cultivars in early California plantings apparently originated from seedling material of the Languedoc region of France. Two early California cultivars were known as 'Languedoc' (previously reported to be in the 'Mission' Cross-incompatibility group) and 'Princess', and may have been related to the population used by Hatch. 'Nonpareil' rapidly became the main cultivar because of its very good tree and nut qualities, with 'Ne Plus

Ultra' planted extensively as its pollenizer. 'Mission' originally called 'Texas Prolific' and originating in Houston, Texas, is thought to be a seedling of the French cultivar 'Languedoc 302' also from the Languedoc region of France. 'Texas Prolific' was introduced to California about 1900 where it was renamed 'Mission' and quickly became a major pollenizer for 'Nonpareil'.

The possibility that present accessions of 'Ne Plus Ultra' are not the original Hatch selection but resulted from a later cross between 'Mission' and 'Nonpareil' is not supported by historical records and tree and nut morphology, isozyme inheritance patterns and pollen ultrastructure analysis. As both the Hatch seedlings and the original 'Mission' seedling reportedly originated from limited material brought to the United States from the Languedoc region of France, S-alleles of 'Ne Plus Ultra' could be identical by descent with S-alleles of both 'Nonpareil' and 'Mission'. A relatively recent and common origin for 'Mission' and the Hatch seedlings 'Nonpareil', 'Ne Plus Ultra', and 'IXL' would indicate an much narrower genetic base for these cultivars which dominate California production.

The origin of some of the Cross-incompatibility Group-I cultivars from natural crosses between 'Ne Plus Ultra' and 'Mission' while genetically plausible, are improbable due to a poor bloom overlap between these cultivars. Considerable bloom overlap occurs between 'Nonpareil' and 'Ne Plus Ultra' so that 'Monterey', the sole cultivar identified in Cross-incompatibility Group-IV may have resulted from this cross.

It has been proposed that the extensive use of 'Nonpareil' as a parent for cultivars from controlled crosses, and for seedling selections from open-pollinations in 'Nonpareil' with 'Mission' plantings has contributed to the proliferation of genetic disorders of 'Nonpareil'. The reported distribution of noninfectious bud-failure and, to a lesser extent, graft-incompatibility with 'Marianna 2624' plum rootstock supports this proposal as their incidence is closely associated with cross-incompatibility groups where 'Nonpareil' is a probable parent (Table 1). This association would also support 'Nonpareil' rather than 'Ne Plus Ultra' as the parent of 'Monterey' since 'Monterey' shows evidence of graft-incompatibility with 'Marianna 2624' while 'Ne Plus Ultra' does not. 'Monterey', 'Monarch', 'Butte' and 'Pearl' showed such a rapid collapse on 'Marianna 2624' rootstock that other, possibly independent, causes are also possible. Noninfectious bud-failure is not commonly found in the cultivars which lie outside the 'Nonpareil' progeny groups, though this may be due, in part, to their limited plantings. Cultivars in Cross-incompatibility Group-V are the progeny of crosses between 'Nonpareil' and 'Eureka', with subsequent backcrossing to 'Nonpareil' ('Kapareil') or selfing of the F_1 hybrids ('Solano' and 'Sonora'). The expression of the S_8 allele in 'Butte' and 'Grace' suggest 'Nonpareil' as a parent with the other parent unknown but not being 'Mission' or 'Ne Plus Ultra'. The remaining unclassified cultivars could have the S_7 allele from a 'Nonpareil' cross to an almond other than 'Mission'. Isozyme inheritance data indicates 'Mission' as a probable parent

of 'Fritz' though the cross-compatibility of 'Fritz' with all cultivars in the 'Nonpareil'-Mission' progeny groups make 'Nonpareil' as the other parent improbable. 'Padre' reportedly resulted from a controlled cross between 'Mission' and 'Swanson', a seedling selection of unknown origin. Similarly, 'Carmel' has been reported to be a bud-mutation of 'Nonpareil'. However, 'Carmel's' S-genotype of S_5S_8 indicates a 'Nonpareil' x 'Mission', seedling origin. The cultivar 'Nonpareil' accounted for approximately 52% of the California acreage in production in 1990. 'Mission' and the four progeny groups account for an additional 41%. Thus, approximately 93% of the California almond acreage is planted to cultivars which appear to be closely related. While the identified S-alleles appear to segregate randomly in seedling populations the scarcity of the allelic combinations S_5S_7 and S_6S_8 in commercial production suggests a possible association with reduced horticultural value. Evidence for S-allele linkage with deleterious genes has been previously proposed for a European almond population.

Present knowledge of the identification of specific S-genotypes for these cross-incompatibility-groups will allow a more accurate assessment of such genetic linkages. This knowledge will lead to more rapid breeding progress in several areas: the cross-compatibility group of new cultivars can now be confidently determined after only a few test crosses to known standards rather than the comprehensive reciprocal crosses with all other cultivars as was needed in the past, and the knowledge of crossing parent

cross-incompatibility genotype will enable the tailoring of specific, desirable (cross-compatible to 'Nonpareil', etc.) progeny genotypes. In addition, this detailed information on the controlling genotype is the first step in the genetic engineering of self-compatible cultivars. The almond breeding program is now cooperating in $170,000 USDA project to map such economically important genes in almond and other stone fruit.

Genetic Recombination

Favorable, though rapid flowering conditions in Spring, 1992 allowed good seed set following approximately 12,000 controlled crosses using parents selected for tree and nut quality and productivity, resistance to bud-failure and other diseases, late flowering, and self-fertility. Over 2,000 of the resultant seed are now being planted in the greenhouse (Table 5) with approximately 1,000 additional seed to be planted this spring. Several thousand seedlings from 1989 and 1990 crosses will be field evaluated this summer.

Some of the controlled crosses involved the enforced selfing of self-compatible breeding lines. There is concern that such inbreeding may result in inferior nut or tree quality as this has been demonstrated in other naturally self-incompatible crops. A 4-year project to test for such inbreeding depression has now been completed using seed resulting from enforced selfing of 'Nonpareil', as well as seed resulting from the equivalent of a 'Nonpareil' self -the compatible cross of 'Nonpareil' as pollen

parent to "Jeffries', a cross-compatible mutation of 'Nonpariel'. Resultant seed set following enforced selfing of 'Nonpareil' was less than 0.001%, supporting a very strict self-incompatibility in this material (Table 2). Seed set in crosses to the 'Jeffries' mutant was approximately 35%, which is typical of controlled outcrosses under good environmental conditions. No significant difference in kernel dimensions, including weight, length, width, and thickness, was observed when comparing selfed material with out-crossed controls (Table 3). No difference in the proportion of double or twin kernels were observed. Sizable differences in growth vigor and survival were observed, however, when seed were planted (Table 4). Inbred material demonstrated significantly poorer performance when compared with out-crossed controls. These differences became even more pronounced by the second growing season. Results indicate no major penalty to kernel quality following self-fertilizations. Losses in progeny vigor should be a concern when utilizing such selfed seed in the breeding program, however,

Field methods have been developed, allowing planting densities as high as 5,000 trees/ha and seed-to-seed cycles of only 4-5 years. This was necessary since plant size, long generation period, and need for thorough field testing have been principal constraints to genetic improvement of tree crops by traditional avenues. The screening of large, segregating populations remains the only effective strategy for selection of the multiple genetic loci controlling crop yield, quality and maturity period.

Transformation and plant regeneration.

In order to exploit the opportunities for rapid and extensive genetic change offered by genetic engineering techniques, I am pursuing the capability for the genetic transformation and plant regeneration of almond. Transformation of almond tissue has been achieved by Agrobacterium tumefaciens mediated procedures in my program. However, regeneration of transgenic tissue has only been possible when seedling tissue is utilized. Transgenic seedlings may be of value in rootstock improvement, and as parents for crosses by traditional methods. The most significant contribution of the developing biotechnologies to vegetatively propagated crops will be the direct transformation of established cultivars such as 'Nonpareil'. I am attempting to circumvent regeneration barriers in non-seedling tissue by targeting meristematically competent tissue for transformation. I have advanced earlier work on the efficiency of particle bombardment for the transformation of recalcitrant tissue by developing a more focused and less damaging particle gun which has previously been used for the successful gene transfer to inbred cereal tissue and shoot meristems of almond cultivars. Very low and transient rates of expression result, however, due to meristem die-back caused by trauma from leaf removal (to expose apical domes) and the bombardment process, and possibly due to an inherent incongruity of DNA integration with the nuclear environment of dividing meristem cells. I am simultaneously exploring the feasibility of micro-grafting previously transformed tissue to within the apical meristem. While

any damage to the apex surface results in loss of meristem function, sub-epidermal implants via the basal ground tissue of seed growing points, has recently resulted in some continued meristem development. I have now modified my equipment and procedures for allowing the insertion of meristematic donor cells to within a few cell layers of the apical meristem surface, and large scale testing of this approach is now beginning. Tissue from actively growing meristems of the relatively anthocyaninless almond cultivar 'Nonpareil' are being implanted into the growing points of non-stratified peach rootstock (Nemared) seed of high red (anthocyanin) color. Only limited growth will normally occur in the nonstratified peach seedlings, thus promoting a possible selection advantage for the growth of the more competent 'Nonpareil' donor tissue. The absence of red color and peach DNA markers should identify successful transformed shoots in subsequent seedling growth.

Success of either the particle bombardment or meristem implant approaches would allow regeneration of recalcitrant cultivar shoots, which can then be propagated and maintained through vegetative methods. The chimerism of resultant shoots will provide a powerful and rapid tool for genetic change through the development of periclinal chimeras in almond. We have developed vegetative selection, stabilization, and propagation methods for maintaining integrity of such genetic mosaics. Long term genetic integrity of chimeras can be maintained commercially using protocols already developed and tested by us for controlling bud-

failure in nursery propogations of almond.

Greater emphasis will be directed in the future towards research on meristem implants due to the following perceived advantages: (a) avoidance of tissue specific DNA integration problems, and (b) option use of either engineered or non-engineered (for example, species, species-hybrid, breeding lines) as donor tissue. The later would result in a greater range of donor tissue to select from, as well as opportunities for avoiding the regulatory and marketing obstacles for transgenic material. Long term goals would include the development of periclinal chimeras with self-compatible epidermis and hypodermis tissue of selected almond species-hybrids with the very high quality kernel of the cultivar 'Nonpareil'. (Such chimeras have been shown by others to overcome incompatibility barriers in the gametophytic, monogenic self-incompatibility system in Solanaceous crops). The wide range of donor sources identified for avoiding aflatoxin contamination and providing self-compatibility will be utilized to increase genetic heterogeneity as well as incorporate multiple traits, (for example, the incorporation of a self-compatible epidermis also possessing a worm resistant seed coat in almond-species hybrids, since the seed coat in Prunus is derived from the epidermal layer of the meristem). Once identified, epidermis donor sources could be rapidly incorporated into a number of cultivars.

Screening

The purpose of the first project reported in this category was to assess almond seed coat and seed embryo resistance to A. flavus and to better characterize kernel susceptibility to Navel orangeworm (NOW) in commercially planted California almond cultivars. Results will be used to identify potential problems in present cultivars as well as to identify resistance in future crossing parents and their progeny.

Aflatoxin contamination in almond is due to the filamentous fungi, Aspergillus flavus and, to a lesser extent, Aspergillus parasidicus Speare. Preliminary research has suggested barriers to aflatoxin contamination in the shell, the seed coat and seed cotyledon. Worm damage, particularly by the navel orangeworm (NOW) Amyelois transitella (Walker) has been frequently associated with aflatoxin containing nuts. While the seed coat appears to offer little protection from NOW, a well sealed endocarp (shell) has been suggested to be an effective barrier to worm infestation.

Fruit samples of selected almond cultivars were collected from Central Valley cultivar evaluation plots at the time of harvest. Two inoculation treatments were used. In the first, inoculation was made to intact, uninjured kernels. In the second, inoculation was made to artificially injured kernels. Artificial injury was achieved by slicing away a section of the seed coat and approximately 1 mm of underlying cotyledon tissue prior to inoculation.

To assess the association of NOW damage with shell seal a range of almond germplasm, including 21 cultivars, was collected

(10 reps at 50 nuts/rep) and the proportions of intact shells as well as the proportion of each sample infested with NOW or Peach Twig Borer (PTB) (Anarsia lineatella Zell.) was recorded as in 1991. [This work was supplemented by a $24000 USDA grant].

No colonization was observed by the third day following inoculation of unwounded kernels (Table 6). The intact, mature seed coat, thus appears to be a barrier to fungal infection. This barrier may act by inhibiting the fungus directly or it may act by restricting water uptake to the previously dried seed. Significant differences were observed by 14 days after inoculation which were very similar in ranking and relative magnitude to day 7 observations. Significant differences in susceptibility were also observed among the different cultivars when cotyledon tissue was directly inoculated after artificial wounding (Table 7). As with the unwounded inoculations, two susceptibility categories could be distinguished. The first category appears highly susceptible, as represented by the performance of 'LeGrand'. Cultivars showing approximately 60% less colonization, including 'Ne Plus Ultra' and 'Ruby', make up a second category with distinctly reduced susceptibility. Rankings of sporulation density are nearly identical to those based on colonization frequency. Results indicate barriers to A. flavus development in both the seed coat and seed cotyledon composition. The seed coat appeared to be an effective barrier to infection when intact. No differences in cultivar performance were observed for this response. Improved levels of A. flavus resistance in the cotyledon tissue of 'Ruby', 'Ne Plus Ultra' and

'Carrion' are indicated by the relatively low colonization frequencies for both wounded and unwounded treatments, and the low sporulation ratings. These levels of resistance, however, may be inadequate during seasons of high disease pressure and are easily overcome following kernel damage by insects, etc.

Considerable variability was also found to exist among almond cultivars for susceptibility to NOW as well as integrity of shell (Table 8). While cultivars with the highest and lowest proportion of intact shells show the lowest and highest rates of NOW damage respectively, the association is less clear for intermediate samples. Cultivars having the highest shell integrity (i.e. 'Padre' and 'Mission') also possess a hard, highly lignified endocarp, while those with poor shell seals ('Jordanolo', 'Merced', etc.) have a thin, easily fractured paper shell. Paper shells are preferred by the California industry because of increased crack-out ratios and decreased damage to the nut meat.

The distribution of a range of almond genotypes for worm damage relative to proportion of fully intact shells is shown in Fig. 2. PTB infestation is skewed towards genotypes with poorer shell seals, as expected. NOW infestation, however, is greatest for genotypes intermediated in average shell integrity. Greater NOW success on intermediate shell types may result from it's fragile nature, as it quickly desiccates if it does not access the protected nut meat environment. Almond genotypes expressing poorly sealed shells may thus offer less protection to NOW and will rapidly dry down to kernel moistures unfit for fungal growth than

nuts with better seals. If confirmed, this finding would support breeding program priority to carefully examined, complete seal integrity rather than incremental improvements in average seal. A more detailed understanding of the relationship between shell seal and worm damage is needed in order to develop fast and reliable screening techniques.

Selection

A second year of detailed data collection for nut and tree performance of all advanced selections in the breeding program has now been completed with results summarized in Tables 9, 10, and 11. Items showing particular promise include:

7906-13

7914-26

7927-54

8011-11

8011-22

This data is now being further evaluated to determine suitability of these lines for regional testing and/or as parents for Spring, 1993 crosses. Major breeding goals leading to these selections include low bud-failure, increased tree productivity, and self-compatibility.

Multiplication -Field Testing - Release

Five advances selections from the breeding program are being included in the grower tests and/or the Regional Variety Trials as proposed in the 1991-92 annual report. These selections, their parentage and characteristics are:

1-87W and 1-102W

13-1 5001-31 Sel. 3-1 x Sel 6-27

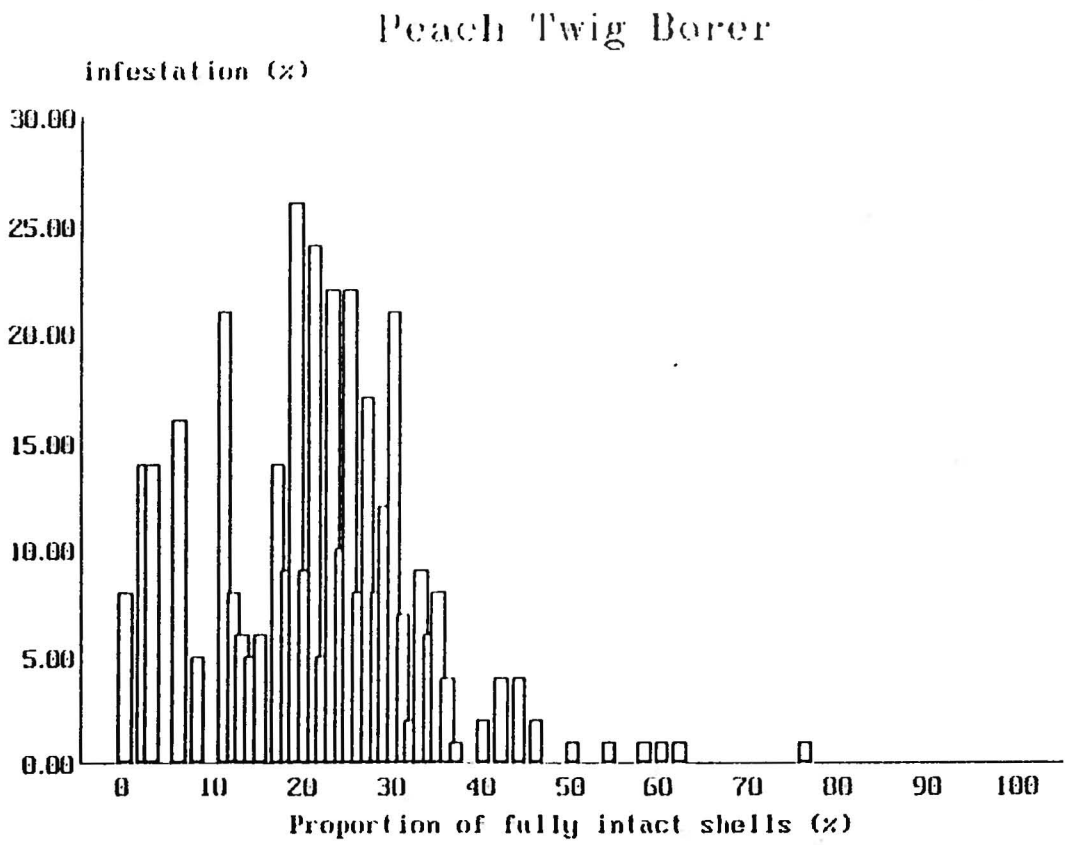
This selection has been one of the most productive selections as well as producing a very large tree which has a dense canopy of very green leaves. It was tested at Kearney Field Station and at the UCD Selection block. 1979 data from Kearney shows to have the highest yield of its group. Kernel size was 31/oz. with 56% to be virus positive and subsequently heat treated.

25-75 (Arbuckle x Alm. sel. 24-6)45-96 x [(Prunus mira x unknown almond) 1-31 x Alm Sel. 3C-29]4-24E

Self-fertile and believed to have a high level of self-pollinating ability. Late Bloom. Trees are being propagated at Burchell Nursery and Dave Wilson nursery for establishing test orchards in Fresno and Kern Cos. under test agreement.

2-19E Tardy Nonpareil x Arbuckle. Late blooming variety with good performance and reasonably good nut. Matures medium just after Nonpareil. Not difficult to knock. Compatible with Nonpareil, Mission, Arbuckle and Padre and 2-19.

2-43/W Tardy Nonpareil x Arbuckle. Similar to and intercompatible with 2-19E. Potential for planting together.



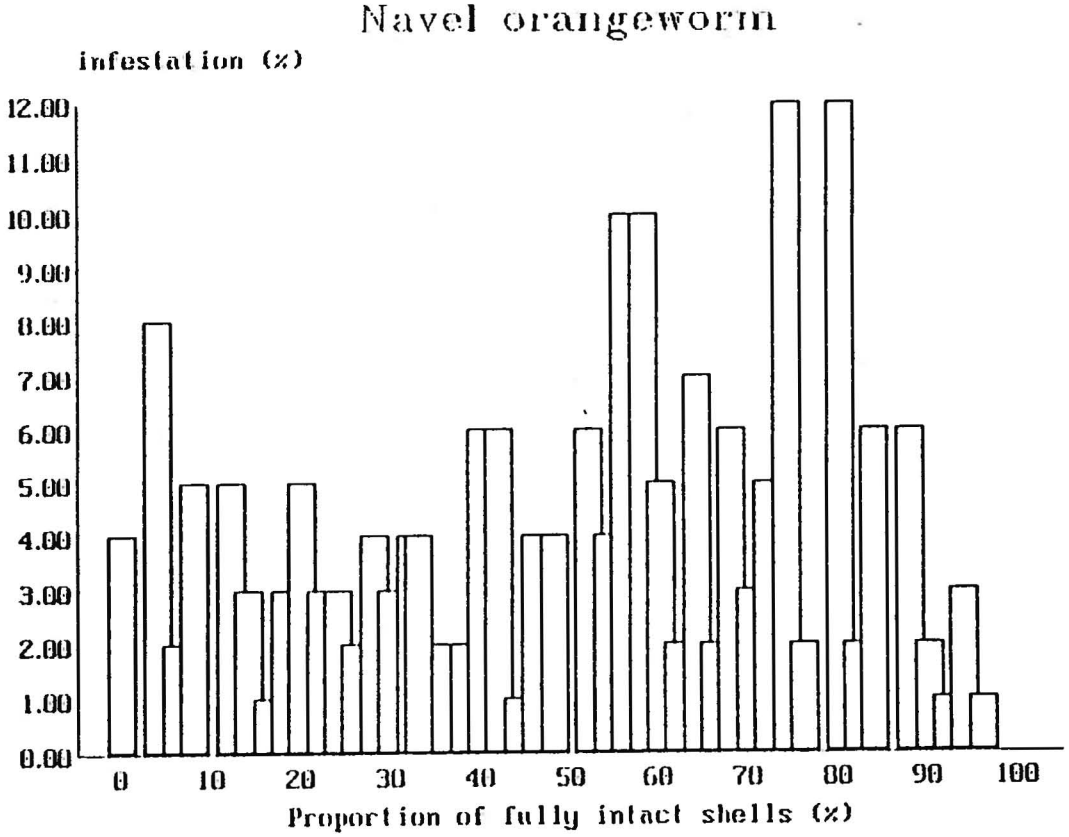


Fig. 2. Distribution of worm infestation relative to proportion of fully sealed shells for a range of almond genotypes.

Table 1. Summary of cross-incompatibility groups responses, their S-genotypes, and proportion of 1990 acreage.

Group	Assigned genotype		Cultivars	% Acreage[x]
Mission	S_aS_b	S_5S_6	Mission, Languedoc, Ballico	10.0
Nonpareil	S_cS_d	S_7S_8	Nonpareil[yz], I.X.L.[z], Long IXL, Profuse, Tardy Nonpareil[yz]	51.7
CIG-I	S_aS_c	S_5S_7	Thompson[y], Robson, Harvey[y], Mono[z] Sauret #2[z], Granada, Wood Colony	2.8
CIG-III	S_aS_d	S_5S_8	Carmel[y], Carrion[y], Sauret #1[y], Livingston[z], Monarch[z]	12.6
CIG-II	S_bS_c	S_6S_7	Merced[y], Ne Plus Ultra, Ripon, Norman[y], Price Cluster[y], Rosetta	14.3
CIG-IV	S_bS_d	S_6S_8	Monterey[z]	0.9
CnIG-V	$S_?S_d$	$S_?S_8$	Solano[z], Sonora, Vesta, Kapariel[z]	<0.1
Unclassified	$S_?S_d$	$S_?S_8$	Butte[z], Grace	1.1
		$S_?S_?$	Aldrich, Dottie Won[z], Fritz, Pearl[z], Ruby, Padre, and Tokyo.	1.6

x source: (California Agricultural Statistics Service, 1990)

y susceptible to noninfectious bud-failure

z shows possible graft-incompatibility with Marianna 2624 plum rootstock.

Table 2. Seed-set following enforced selfing of the almond cultivar *Nonpareil*, and following the equivalent of 'selfing' of *Jeffries* - the unilaterally cross-compatible *Nonpareil* mutation (i.e. *Jeffries* x *Nonpareil*)[z]

	Nonpareil		*Jeffries*	
	Self	Outcross	'Self'	Outcross
Seed set (%)	<0.001 a	2.59 b	34.4 c	36.7 c

z Mean separation in rows by Duncan's multiple range test (P=0.05).

Table 3. Effects of selfing on almond seed quality.[y]

	Nonpareil		*Jeffries*	
	Self	Outcross	'Self'	Outcross
Weight (gm)	1.35	1.38	1.25	1.25
Length (mm)	26	26	23	23
Width (mm)	14	14	12	12
Thickness (mm)	8	8	8	8
Crack-out[z] (%)	2.24 a	2.26 a	2.05 b	2.07 b
Double kernels (%)	0	0	0	0
Twin Kernels (%)	0	0	0	0
Sample size	112	120	400	400

y Mean separation in rows by Duncan's multiple range test (P=0.05).
z Crack-out = kernel weight/(kernel + shell weight).

Table 4. Effect of selfing on almond seedling quality. [z]

	Nonpareil		*Jeffries*	
	Self	Outcross	'Self'	Outcross
First year of growth				
Height (cm)	89.9 a	121.8 b	81.9 a	111.7 b
Stem diam. (mm)	19 a	24 b	18 a	21 b
Survival (%)	83 a	96 b	88 a	97 b
Second year of growth				
Stem diam. (mm)	43 a	68 b	49 a	71 b
Survival (%)	64 a	87 b	57 a	83 b
Sample size	112	120	200	200

z Mean separation in rows by Duncan's multiple range test (P=0.05).

Table 5.

ALMOND SEEDS IN 1992 28-Jan-93

Cross Code	Seed Code	PARENTS Seed	Pollen	Source, Location	Number of Frts	Seeds	Pack Date	Remarks
1	A92.1	F10C,25-10	OP	F10D,10-1	210	210	11/1	Br.dwarf,self-fruitful,bitter,PLANT EASY!
2	A92.2	F10C,25-10	OP	F10D,10-2	142	134	11/1	Br.dwarf,self-fruitful,bitter,PLANT EASY!
3	A92.3	90,1-4	OP	90,1-4	74	70	11/1	PA;18,8-11 x F10C,20-51
4	A92.4	90,10-120	OP	90,10-120	62	61	11/1	PA; 18,8-11 X F10C,12-28(Spurry)
5	A92.5	F5,19-13	Self	F10D,3-25	85	87	11/1	
6	A92.6	F5,18-73	Self	F10D,2-18	1	0	11/1	
7	A92.7	F5,20-44	Self	F10D,1,2-24	2	1	11/1	
8	A92.8	F5,18-64	Self	F10D,1,2-26	4	4	11/1	
9	A92.9	F5,20-42	Self	F10D,3,4-14	10	9	11/1	
10	A92.10	F5,19-49	Self	F10D,3-15	14	14	11/1	
11	A92.11	F5,20-52	Self	F10D,3,4-17	20	20	11/1	
12	A92.12	F5,5-58	Self	F10D,6-6	1	1	11/1	
13	A92.13	F5,4-62	Self	F10D,5,6-12	3	3	11/1	
14	A92.14	F5,4-10	Self	F10D,5-19	46	45	11/1	
15	A92.15	2	Self	F10D,5,6-21	16	16	11/1	
16	A92.16	F5,18-75	Self	F10D,5,6-26	8	7	11/1	
17	A92.17	6	Self	F10D,6-20	7	7	11/1	
18	A92.18	F5,4-6	Self	F10D,7-10	37	36	11/1	
19	A92.19	F5,4-42	Self	F10D,7,8-4	88	88	11/1	
20	A92.20	F5,4-5	Self	F10D,8-17	2	2	11/1	
21	A92.21	3	Self	F10D,7,8-19	46	49	11/1	
22	A92.22	F5,4-4	Self	F10D,7,8-21	4	4	11/1	
23	A92.23	4	Self	F10D,7-23	34	32	11/1	
24	A92.24	F5,19-82	Self	F10D,7-26	32	28	11/1	
25	A92.25	LeGrandSdlg	OP	F10D,10-3	268	238	11/2	Plant lg and small kernels separately
26	A92.26	LeGrandSdlg	OP	F10D,10-4	196	183	11/2	Plant lg and small kernels separately
27	A92.27	F10C,20-51	Self	F10D,10-16	1	1	11/2	Small tree,self-fruitful,bitter
28	A92.28	89,4-37	Self	89,4-37	14	17	11/2	89,4-37(F10C,1-42XSelf)Heavy crops
29	A92.29	Mission	F10D,10-3,4	F10D,5-8	55	54	11/4	for Sfert+spurry+small tree
30	A92.30	Mission	F10D,9-25,26	F10D,5-8	45	45	11/4	for Sfert+spurry+small tree
31	A92.31	Mission	F10D,10-15,16	F10D,6-8	27	28	11/4	for Sfert+spurry+small tree
32	A92.32	Mission	F10D,10-1,2	F10D,6-8	53	53	11/4	for Sfert+spurry+small tree
33	A92.33	Mission	F10E,22-59	F10D,5-8	3	3	11/4	for Sfert+spurry+small tree
34	A92.34	Nonpareil	F10D,10-15,16	F10D,2-20	7	7	11/4	for Sfert+spurry+small tree
35	A92.35	Nonpareil	F10D,10-1,2	F10D,2-20	6	7	11/4	for Sfert+spurry+small tree
36	A92.36	Nonpareil	F10D,10-3,4	F10D,2-20	1	2	11/4	for Sfert+spurry+small tree
37	A92.37	Nonpareil	F10D,9-25,26	F10D,1-20	1	1	11/4	for Sfert+spurry+small tree
38	A92.38	SB4,2-19E	Nonpareil	F7,8-4	10	9	11/4	F7,4-8 = NO TREE AS RECORDED
39	A92.39	SB4,2-19E	Mission	F7,8-4	6	6	11/4	F7,4-8 = NO TREE AS RECORDED
40	A92.40	SB4,2-19E	Mission	F7,8-4	3	3	11/4	F7,4-8 = NO TREE AS RECORDED
41	A92.41	SB13,25-75	Self	F7,7-5	47	43	11/4	F7,5-7 = NO TREE AS RECORDED
42	A92.42	SB13,25-75	Self	F7,8-5	83	80	11/4	F7,5-8 = NO TREE AS RECORDED
43	A92.43	UC,13-1	Kapareil	F7,8-5	36	35	11/4	F7,5-8 = NO TREE AS RECORDED
44	A92.44	UC,13-1	Kapareil	UC,13-1	28	27	11/5	
45	A92.45	UC,13-1	Milow	UC,13-1	8	8	11/5	
46	A92.46	UC,13-1	Milow	UC,13-1	22	21	11/5	
47	A92.47	UC,13-1	NPU	UC,13-1	6	6	11/5	
48	A92.48	UC,13-1	NPU	UC,13-1	4	4	11/5	
49	A92.49	UC,13-1	Nonpareil	UC,13-1	0	0	11/5	
50	A92.50	UC,13-1	Nonpareil	UC,13-1	5	4	11/5	
51	A92.51	UC,13-1	25-75	UC,13-1	13	13	11/5	
52	A92.52	UC,13-1	25-75	UC,13-1	0	0	11/5	
53	A92.53	90,13-31	J(White label)	90,13-31	2	2	11/5	90,13-31(JeffriesxNp)
54	A92.54	90,13-38	J(White label)	90,13-38	2	2	11/5	90,13-38(Jeffries x Self)
55	A92.55	90,13-38	N?(Red label)	90,13-38	1	1	11/5	90,13-38(Jeffries x Self)
56	A92.56	90,13-42	J(White label)	90,13-42	2	2	11/5	90,13-42(Jeffries x Self)

Table 6. Comparison of colonization frequency means for samples of unwounded kernels of California almond cultivars.[z]

Cultivar	Day 3	Day 7	Day 14
Jeffries	0	56.7	90.0 a
LeGrand	0	50.0	90.0 a
Mission	0	58.3	86.7 a
Rosetta	0	37.5	77.5 ab
Woods Colony	0	47.5	75.0 ab
Butte	0	40.8	73.3 ab
Sauret #2	0	41.7	68.3 ab
Carmel	0	36.7	65.8 ab
Dottie Won	0	43.3	63.3 ab
Nonpareil	0	26.9	62.5 ab
Aldrich	0	45.0	60.0 ab
Norman	0	23.3	56.7 ab
Mono	0	32.5	56.7 ab
Sonora	0	22.5	53.3 ab
Padre	0	31.7	48.3 ab
Price Cluster	0	19.0	46.7 ab
Carrion	0	20.0	46.7 ab
Fritz	0	26.7	45.0 ab
Monterey	0	21.7	40.0 ab
Ruby	0	7.5	34.2 b
Ne Plus Ultra	0	8.3	28.3 b

[z] Mean separation in columns by Duncan's multiple range test (P=0.05).

Table 7. Comparison of colonization frequency and sporulation rating means for samples of wounded kernels of California almond cultivars.[y]

Cultivar	Seed colonization (%) Day 3	Seed colonization (%) Day 7	Sporulation rating[z] Day 3	Sporulation rating[z] Day 7
LeGrand	100.0 a	100.0 a	5.0 a	5.0 a
Dottie Won	98.3 a	100.0 a	4.5 ab	4.7 a
Sauret #2	91.7 ab	100.0 a	4.5 ab	5.0 a
Jeffries	88.3 abc	100.0 a	4.0 a-d	4.0 a
Carmel	87.5 abc	100.0 a	4.0 a-d	4.8 a
Aldrich	87.5 abc	100.0 a	4.0 a-d	4.3 a
Padre	82.5 abc	100.0 a	4.3 abc	4.7 a
Woods Colony	82.5 abc	100.0 a	4.0 a-d	5.0 a
Butte	81.7 abc	100.0 a	4.0 a-d	5.0 a
Normans	81.7 abc	100.0 a	3.3 a-d	4.3 a
Mission	81.7 abc	100.0 a	3.4 a-d	4.8 a
Fritz	79.2 abc	100.0 a	3.8 a-d	4.5 a
Nonpareil	66.3 abc	100.0 a	2.5 bcd	3.5 ab
Monterey	65.0 abc	100.0 a	3.0 a	4.3 a
Rosetta	65.0 abc	100.0 a	3.5 a-d	4.5 a
Price Cluster	60.0 abc	100.0 a	3.3 a-d	4.3 a
Mono	52.5 abc	100.0 a	2.8 a-d	3.5 ab
Sonora	51.7 abc	100.0 a	2.0 cd	3.5 ab
Carion	33.3 bc	73.3 b	1.7 d	2.7 b
Ruby	31.7 bc	86.7 ab	1.6 d	2.7 b
Ne Plus Ultra	28.3 c	100.0 a	1.7 d	3.7 ab

[y] Mean separation in columns by Duncan's multiple range test (P=0.05).

[z] 0 - no sporulation to 5 - dense sporulation

Table 8. Navel orangeworm infestation and the proportion of well sealed shells in California almond cultivars.

	Well sealed shell (%)		Infested kernels (%)	
Cultivar	Mean	STD	Mean	STD
JORDANOLO	43.5	(24.9)	16.0	(11.1)
MERCED	40.4	(26.9)	10.4	(6.8)
ROBSON	51.8	(22.9)	9.4	(10.6)
VESTA	55.3	(23.7)	9.0	(11.4)
CARRION	68.0	(24.9)	8.5	(11.1)
THOMPSON	57.6	(27.5)	8.0	(9.5)
SONORA	50.0	(17.6)	5.1	(4.8)
MILOW	63.0	(23.2)	5.0	(5.1)
NE PLUS ULTRA	73.5	(17.5)	4.7	(5.1)
HARVEY	36.6	(30.7)	4.3	(4.3)
GRANADA	47.0	(25.2)	4.3	(4.1)
NORMAN	26.4	(17.4)	4.2	(4.7)
BUTTE	70.7	(22.1)	3.8	(3.5)
NONPAREIL	31.9	(19.8)	3.7	(4.4)
RIPON	97.6	(3.7)	3.3	(3.7)
CARMEL	75.0	(21.7)	1.8	(2.5)
FRITZ	76.0	(19.6)	1.6	(2.5)
SOLANO	66.3	(23.7)	1.6	(1.7)
PRICE	47.8	(20.5)	1.5	(2.5)
PADRE	99.8	(0.5)	0.9	(2.7)
Mission	99.6	(0.4)	0.4	(1.4)

Table 9.

PARENTS	SLDG NO.	ROW	TR	SLD %	AVERAGE HULL	AVERAGE INSH	AVERAGE KERN	DBL %	TWN %	TGB %	NO %	BLK %	BRK %	LNK %	ANT %	GUM %	SHR %	CAL %	CRS %	OTH %	PRY %	SCR %	W/L	L/W	THK	NO./ OZ	WR %	HULL %	INSH %	KERN %
SB08 01-46W	8009-39	1,2	16																											
SB08 01-60W	8003-02	1,2	12																											
SB08 02-04W	8008-12	1,2	14																											
SB08 03-100W	8021-18	5,6	13	76	0.87	0.51	0.71	30	0	0	0	2	2	0	0	0	4	0	0	0	0	26	1.93	0.05	0.78	39.7	0	42	24	58
SB08 04-03E	8021-39	7,8	8	38	1.26	0.44	0.83	12	0	0	0	0	2	0	0	0	2	0	0	0	0	58	1.73	0.58	0.85	34.3	0	50	17	65
SB16 09-09 (TEXAS X HYBRID A)	8855-01	7,8	18	100	1.44	2.67	1.03	4	0	0	0	0	2	0	0	0	4	0	0	0	0	0	1.46	0.69	0.86	27.5	0	28	52	28
TITAN X SB16,8-60 (PARENT)	7309-07	1,2	19																											
TITAN X SB16,8-60 (PARENT)	7310-46	3,4	24																											
SB16 02-44 X SB6 56-68 (PARENT)	7326-01	5,6	18	100	0.85	1.67	0.76	0	0	0	0	0	0	32	0	2	0	2	0	0	0	2	1.84	0.54	0.72	37.4	0	26	51	31
SB16 02-44 X SB6 56-68 (PARENT)	7326-02	7,8	21	100	0.60	1.10	0.58	0	0	0	0	0	0	0	0	0	2	0	16	0	0	0	1.61	0.62	0.73	48.1	0	26	48	34
SB16 02-44 X SB6 56-68 (PARENT)	7326-03	7,8	17	100	0.55	0.96	0.53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.78	0.56	0.73	53.2	0	27	47	26
SB16 02-44 X SB6 56-68 (PARENT)	7326-04	7,8	10																											
SB16 02-44 X SB6 56-68 (PARENT)	7326-08	5,6	19	100	0.79	1.46	0.70	0	2	0	0	0	0	2	0	0	0	2	0	0	0	0	1.78	0.56	0.68	40.3	0	27	49	33
SB16 09-69 X SB16 09-80	7339-02	7,8	4	100	0.64	1.01	0.54	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1.87	0.53	0.75	52.7	0	29	48	35
SB16 09-82 X OP	7340-05	5,6	12	100	1.15	1.06	0.74	0	0	0	0	0	8	0	0	0	2	0	2	0	0	0	1.93	0.52	0.82	38.3	0	39	35	41
SB16 12-64 X OP	7347-05	5,6	7	98	1.08	0.76	0.77	0	2	0	0	2	2	0	0	0	10	0	0	0	0	0	1.88	0.53	0.74	35.6	0	41	29	51
SB16 12-64 X OP	7347-15	5,6	9																											
SB16 12-64 X OP	7347-16	5,6	6	100	1.21	0.88	0.75	22	0	0	0	0	0	0	0	0	2	0	14	0	0	10	1.76	0.57	0.78	38	0	43	31	46
J.H. HALE X CARMEL	7804-02	7,8	6																											
J.H. HALE X CARMEL	7804-04	7,8	13																											
J.H. HALE X CARMEL	7804-10	5,6	16																											
J.H. HALE X BUTTE	7805-05	5,6	17																											
J.H. HALE X BUTTE	7805-10	5,6	2																											
J.H. HALE X BUTTE	7805-14	5,6	10																											
SB20 01-05 X SONORA	7908-01	1,2	7	100	1.34	2.73	1.09	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	1.72	0.58	0.8	25.9	0	26	53	29
SB20 01-05 X SONORA	7908-13	3,4	18	82	1.07	0.97	0.94	0	6	0	0	2	0	0	0	0	2	0	0	0	0	0	1.97	0.51	0.84	30.2	0	38	33	49
SB20 01-05 X SONORA	7908-22	5,6	24	78	1.29	0.78	1.03	8	0	0	0	0	0	0	0	0	4	0	0	0	10	8	1.97	0.51	0.87	27.6	0	42	25	57
SB20 01-05 X SONORA	7908-26	1,2	6	98	1.58	1.59	0.98	4	0	0	0	0	0	0	0	0	0	0	20	0	0	0	1.72	0.58	0.76	28.8	0	38	38	38
SB20 01-05 X SONORA	7908-31	1,2	3	100	1.40	2.48	1.12	16	2	0	0	0	0	0	0	0	2	0	0	0	0	0	1.65	0.6	0.84	26.2	0	28	50	31
SB20 01-05 X SONORA	7908-33	3,4	1	100	1.35	2.83	1.07	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1.76	0.57	0.75	28.6	0	28	54	27
SB20 01-05 X SONORA	7908-53	3,4	19	92	1.79	1.28	1.11	20	2	0	0	0	0	0	0	0	8	0	14	0	0	0	1.92	0.52	0.88	25.6	0	43	31	46
SB20 01-19 X SONORA	7914-26	1,2	4	98	1.02	0.60	0.77	0	0	0	0	0	0	0	0	0	2	0	2	0	0	10	2.03	0.49	0.85	36.8	0	43	25	56
SB20 01-21 X SB20 01-29	7915-88	3,4	4	100	0.98	0.56	0.88	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.1	0.48	0.76	41.8	0	44	26	56
SB20 01-21 X SONORA	7916-09	5,6	23	84	1.08	0.69	0.85	0	2	0	0	2	0	0	0	0	2	0	0	0	0	0	2.37	0.42	0.81	33.5	0	41	26	55
SB20 01-23 X SONORA	7918-16	1,2	25	90	0.97	1.05	0.91	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	1.98	0.5	0.82	31.3	0	33	36	46
SB20 01-28 X SONORA	7920-20	3,4	8	78	1.89	0.97	1.23	4	0	0	2	0	0	2	0	0	2	2	0	0	0	38	1.98	0.51	0.87	23.1	2	46	24	56
SB20 01-28 X SONORA	7920-22	1	21	74	1.21	0.56	0.73	0	8	0	0	2	4	0	0	0	8	0	0	0	0	68	2.27	0.44	0.75	38.9	0	48	23	55
SB20 01-28 X SONORA	7920-24	3,4	5	22	2.32	0.65	1.01	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	1.68	0.6	0.8	28.1	0	68	16	61
SB20 01-28 X SONORA	7920-45	3,4	3	100	0.98	0.83	0.92	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	1.94	0.52	0.77	30.9	0	35	31	53
SB20 01-28 X SONORA	7920-61	7,8	24	60	1.64	0.93	0.98	0	12	0	0	0	0	0	0	0	0	0	0	0	10	16	1.77	0.57	0.88	29	0	46	26	51
MILOW X F5 03-60	7923-55	3,4	7	24	0.91	0.60	0.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.94	0.51	0.73	40.9	0	41	27	53
MILOW X F5 03-39	7924-05	1,2	11	60	0.84	0.43	0.63	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	1.79	0.56	0.8	34	0	40	20	66
MILOW X F5 03-39	7924-14	1,2	1																											
PADRE X P54P455	7926-01	7,8	22																											
PADRE X P54P455	7926-02	5,6	21																											
PADRE X P54P455	7926-03	7,8	19																											
PADRE X P54P455	7926-04	7,8	23																											
PADRE X P54P455	7926-05	7,8	20																											
PADRE X P54P455	7926-08	5,6	20																											
PADRE X SB20 1-29	7927-53	3,4	20	100	1.58	0.80	1.00	6	0	0	0	2	14	0	0	0	2	0	0	0	0	0	2.26	0.44	0.84	28.3	0	47	24	66
PADRE X SB20 1-29	7927-54	3,4	13	100	1.54	0.66	0.69	2	0	0	0	0	0	0	0	0	4	0	0	0	0	0	1.68	0.59	0.84	41.2	0	53	23	51
PADRE X SB20 1-29	7927-66	3,4	10	100	1.14	1.05	0.84	36	0	0	0	0	0	0	0	0	2	0	0	0	2	4	1.72	0.58	0.92	33.8	0	38	35	44
SB07 02-01E X SB20 01-29	7932-87	3,4	12																											
SB07 02-01E X F5 03-52	7934-54	1,2	8	96	1.22	0.62	0.84	0	8	0	4	2	0	0	0	0	2	0	4	0	0	10	2.15	0.46	0.74	33.8	4	46	23	68
SB07 02-01E X F5 03-52	7934-55	3,4	9	65	0.49	0.39	0.56	8	0	0	0	0	0	94	0	8	16	0	2	0	0	0	1.94	0.51	0.84	51	0	34	27	59
NONPAREL X F5 03-02	8008-10	3,4	16	100	1.21	2.10	0.91	0	0	0	0	0	0	0	0	0	6	0	2	0	0	0	1.92	0.52	0.75	31.2	0	29	50	30
NONPAREL X F5 04-04	8007-15	5,6	26	100	1.01	2.01	0.84	2	2	0	0	2	4	0	0	0	6	0	4	0	0	0	1.81	0.62	0.74	33.8	0	28	52	29
NONPAREL X F5 04-04	8007-19	1,2	18	100	0.77	1.14	0.79	0	0	0	0	0	0	10	0	0	4	0	0	0	0	2	1.77	0.56	0.83	35.8	0	28	42	41
NONPAREL X F5 04-04	8007-24	1,2	26	96	1.32	1.63	0.84	2	2	0	0	0	0	0	0	0	2	0	0	0	0	0	1.66	0.6	0.76	33.6	0	36	43	34
NONPAREL X F5 04-08	8009-02	1,2	23																											
NONPAREL X F5 04-11	8010-22	3,4	25	0	1.45	0.60	0.87	0	0	0	0	0	0	0	0	0	4	0	4	0	0	100	2.12	0.47	0.78	32.5	0	60	21	69
NONPAREL X F5 04-42	8011-04	3,4	15	100	0.80	2.00	0.84	4	0	0	0	0	0	0	0	0	4	0	0	0	0	0	1.92	0.52	0.82	33.8	0	22	55	30
NONPAREL X F5 04-43	8011-11	1,2	22	90	1.14	1.09	0.87	0	0	0	0	0	0	0	0	0	10	0	0	0	2	0	1.71	0.59	0.87	32.7	0	37	35	44
NONPAREL X F5 04-42	8011-20	7,8	25	100	0.75	1.54	0.73	10	0	0	0	0	0	0	0	0	2	2	0	0	0	0	1.69	0.53	0.72	38.6	0	25	51	32
PADRE X F5 03-02	8012-33	7,8	26	58	1.38	0.61	0.86	2	0	0	0	0	0	0	0	0	8	0	26	0	0	0	1.8	0.56	0.78	33	0	46	22	68
PADRE X F5 04-04	8013-08	3,4	23	100	1.51	1.00	0.83	0	0	0	0	0	0	4	0	2	0	22	0	0	0	0	1.78	0.56	0.82	34.1	0	46	30	46
PADRE X F5 04-04	8013-12	5,6	26	100	1.34	2.03	0.87	0	0	0	0	0	0	0	0	0	2	0	68	0	0	0	1.59	0.63	0.74	32.7	0	32	48	30
PADRE X F5 04-10	8016-05	3,4	14	44	2.01	0.49	0.93	0	0	0	0	0	0	0	0	2	8	0	0	0	0	98	1.81	0.55	0.84	30.6	0	59	14	65
PADRE X F5 04-10	8016-06	3,4	17	48	1.55	0.54	0.83	0	0	0	0	0	0	0	0	0	4	0	24	0	0	0	1.78	0.56	0.82	34.3	0	53	19	61
PADRE X F5 04-10	8016-07	1,2	24																											
PADRE X F5 04-10	8016-17	3,4	21	30	1.73	0.78	1.05	2	0	0	0	2	2	0	0	0	14	0	0	0	0	4	1.67	0.6	0.1	27.1	0	49	22	57
F5 04-08 X SOLANO	8021-35	5,6	22	78	1.28	0.37	0.99	0	0	0	0	0	0	0	0	0	2	0	0	0	0	10	2.17	0.46	0.89	28.7	0	48	14	73
F5 04-08 X SOLANO	8021-38	3,4	2																											
F5 04-08 X SOLANO	8021-77	1,2	5	38	0.77	0.42	0.72	0	0	0	2	0	0	0	0	0	0	0	0	0	0	40	2.01	0.5	0.85	39.5	2	40	22	60
F5 04-08 X SOLANO	8021-89	1,2	2																											
F5 04-08 X SOLANO	8021-95	3,4	26	100	1.19	1.55	0.88	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2.02	0.5	0.85	32.2	0	33	43	36
F5 04-10 X MILOW OR SOLANO	8023-10	1,2	13																											
F5 04-10 X SOLANO	8024-12	3,4	6	8	1.54	0.47	0.71	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	2.19	0.46	0.67	39.6	0	57	17	60
F5 04-10 X SOLANO	8024-15	1,2	16																											
F5 04-10 X SOLANO	8024-18	1,2	17	6	1.12	0.34	0.67	0	0	0	0	2	0	0	0	0	0	0	0	0	0	4	1.98	0.5	0.71	42.6	0	53	18	68
F5 04-10 X SOLANO	8024-20	3,4	22	94	1.29	0.88	0.97	0	0	0	0	0	2	0	0	0	2	0	10	0	4	0	1.96	0.51	0.78	32.6	0	42	28	60
USDA 76-3	.	5,6	1																											
USDA 20.5-13	.	7,8	16	98	1.57	0.80	0.88	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	1.87	0.53	0.78	33.3	0	46	25	62
THOMPSON (PARENT)	.	7,8	5	54	1.60	0.58	0.98	0	2	0	2	0	0	0	0	0	4	0	0	0	0	4	1.78	0.56	0.87	28.9	2	60	18	63
USDA 82-69	.	5,6	14	100	1.62	0.43	0.90	0	0	0	0	0	2	0	0	0	4	0	10	0	0	0	1.77	0.56	0.78	31.6	0	65	16	67
USDA 20.5-18	.	7,8	7	100	1.68	0.82	1.00	0	0	0	0	0	2	0	0	0	4	0	0	0	0	0	1.69	0.53	0.78	28.6	0	51	22	56
USDA 19.5-12	.	5,6	11	100	1.60	1.05	0.84	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	2	0.5	0.63	33.9	0	46	30	44
USDA 14-67	.	7,8	9																											
MISSION (PARENT)	.	5,6	8	100	1.26	1.15	0.92	0	0	0	0	0	4	0	0	2	0	0	0	0	0	0	1.63	0.61	0.81	30.9	0	38	34	44
USDA 18.5-8	.	7,8	11	100	1.19	1.04	0.88	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	1.72	0.58	0.94	32.3	0	38	34	46
USDA 20.5-13	.	5,6	5	98	1.68	0.98	0.90	6	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1.75	0.57	0.81	31.6	0	62	21	57
USDA 25-26 X SELF	.	5,6	15	98	1.55	3.12	1.05	2	2	0	0	0	2	0	0	0	4	0	0	0	0	8	0	1.55	0.64	0.76	27	0	27	55	26
USDA CP 05-33 X OP	.	5,6	4	100	1.83	1.22	1.44	0	0	0	0	0	2	4	0	0	0	0	0	0	0	0	1.79	0.56	0.94	19.7	0	41	27	54
USDA 19.5-08	.	7,8	15	100	3.31	0.94	1.03	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	1.98	0.51	0.75	27.5	0	63	18	62
PADRE (PARENT)	.	5,6	3	100	1.50	0.77	0.83	0	0	0	0	0	4	0	0	0	4	0	0	0	0	0	1.68	0.6	0.87	34	0	46	26	52
USDA 18-130	.	7,8	2	80	1.92	0.71	0.93	4	2	0	4	0	0	0	2	0	0	0	0	0	0	4	1.77	0.57	0.79	30.6	4	54	20	57
	.	3,4	11	48	0.92	0.66	0.98	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	2.34	0.43	0.82	28.9	0	38	28	60
USDA 19.5-09	.	7,8	12	100	1.94	1.00	0.91	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	1.77	0.56	0.75	31	0	60	26	48
NONPAREL (PARENT)	.	1,2	20	68	1.60	0.58	1.02	0	0	0	0	0	0	0	0	0	0	10	0	0	0	8	1.82	0.55	0.85	27.7	0	50	18	64
USDA 10A-14 X SELF	.	7,8	3	60	2.03	0.64	1.15	2	4	0	0	0	0	0	0	0	0	0	0	2	0	4	1.51	0.66	0.81	24.6	0	53	17	65
40A-17	.	7,8	14																											
PLANT PATH 01-15	.	7,8	1																											
SONORA (PARENT)	.	1,2	10	70	1.57	0.66	1.07	2	0	0	0	0	0	0	0	0	0	0	4	0	6	14	2.03	0.49	0.75	28.4	0	48	20	62
SB02 6A-11 (PARENT)	.	1,2	9	62	1.67	0.75	0.98	0	0	0	2	4	0	2	0	0	2	0	0	0	2	4	1.89	0.53	0.78	28.4	2	49	22	68

Table 10.

F7_92S.WK1

ITEM	ROW	TR	SLD %	AVHULL	AVSHL	AVKERN	DBL %	TW %	TGB %	NO %	BLK %	BRK %	UNK %	ANT %	GU %	SHR %	CAL %	CRS %	OTH %	PRY %	SCR %	L/W	W/L	THK	NO./ OZ.	WRM %	HULL %	INSH %	KERN %
F7,3-6E	1,2	1	84	1.42	1.14	0.75	0	0	2	0	0	0	0	0	0	0	0	12	0	0	0	1.73	0.58	0.81	38	2	43	34	40
F7,3-6S	3,4	1	22	2.45	2.21	1.28	2	0	0	0	0	0	0	6	0	4	0	0	0	20	22	1.60	0.62	0.84	22	0	41	37	37
4-12	5,6	1	92	1.50	1.77	1.22	0	20	0	0	0	2	4	0	0	6	0	0	0	20	10	1.79	0.56	0.93	23	0	33	39	41
NONPAREIL-125	7	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4-55	8	1	26	1.69	1.49	0.93	0	2	0	0	6	0	0	0	0	16	0	4	0	2	2	1.79	0.56	0.90	30	0	41	36	39
SBD,12-3	9,10	1	70	1.68	1.69	0.96	0	2	6	0	0	0	0	0	0	12	2	8	0	22	20	1.80	0.56	0.83	30	6	39	39	36
F7,8-3	11,12	1	46	1.30	1.18	0.79	2	0	2	0	2	0	0	0	0	4	0	0	0	0	0	1.97	0.51	0.73	36	2	40	36	40
SBD,19-17	1	2,4	36	1.63	1.20	0.70	6	0	2	0	0	0	0	0	2	2	0	0	0	10	10	2.37	0.42	0.70	41	2	46	34	37
MISSION-SHAW	2,3	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
F7,4-5	4,5	2	54	1.42	1.40	0.79	2	20	0	0	0	0	0	0	0	8	2	0	0	4	10	1.77	0.56	0.74	36	0	39	39	36
NONPAREIL-3-8-2	6	2	56	1.77	1.79	1.14	0	4	0	0	0	0	0	0	0	6	0	2	0	20	14	1.89	0.53	0.88	25	0	38	38	39
F7,4-15E	7	2,3	100	2.55	7.06	1.34	8	0	0	0	2	4	0	0	0	0	4	0	0	18	14	1.78	0.56	0.63	21	0	23	64	16
(no tree)	8	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SBD,10-9	9,10	2	52	1.61	1.63	1.09	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	1.69	0.59	0.72	26	0	37	38	40
SBD,10-13	11,12	2	36	1.30	1.27	0.79	6	4	0	2	0	0	0	0	0	4	0	6	0	0	0	2.01	0.50	0.72	36	2	39	38	38
F7,6-17	2	3	88	1.98	1.79	1.08	0	0	0	0	2	0	0	0	0	6	0	0	0	0	4	1.97	0.51	0.87	26	0	41	37	38
F7,6-17	3	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SBD,18-10	4,5	3	100	1.74	1.84	1.03	4	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1.81	0.55	0.87	27	0	38	40	36
MISSION-3-6-1	6	3	100	1.26	1.77	0.89	0	0	0	0	0	10	0	0	0	2	0	0	0	4	2	1.71	0.58	0.94	32	0	32	45	34
MISSION-3-6-1	1	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
40A-17	8,9	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SBD,17-13	10,8	3,4	100	2.06	2.03	0.97	2	4	0	0	0	2	0	0	0	2	0	0	0	0	0	1.80	0.56	0.78	29	0	41	40	32
F8S,59-1	11,12	3	94	1.45	2.21	0.72	18	0	0	0	0	2	0	0	2	0	0	0	0	0	4	1.68	0.60	0.73	39	0	33	50	25
84X3-59.11	2	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FERRANDAL	3	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FERRANDAL	4	4	100	1.45	4.28	1.27	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	1.69	0.59	0.88	22	0	21	61	23
FERRAGNES	5	4	100	1.86	3.03	1.21	0	0	0	0	2	18	0	0	0	2	0	10	0	0	2	1.91	0.52	0.88	24	0	30	50	28
FERRANDAL	6	4	100	1.42	3.82	1.10	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	1.63	0.61	0.79	26	0	22	60	22
FERRAGNES	7	4	100	2.21	3.56	1.34	0	0	0	0	2	10	0	0	0	2	0	20	0	0	2	1.93	0.52	0.87	21	0	31	50	27
(no tree)	9	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	10	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SBD,10-11	11,12	4	86	1.76	1.76	1.08	0	4	2	0	0	4	0	0	2	6	0	0	0	0	2	1.89	0.53	0.86	26	2	38	38	38
F7,3-6NW	1,2	5	86	3.05	1.81	1.11	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	1.62	0.62	0.73	25	0	51	30	38
(no tree)	3	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SB18,1-71	5	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
F7,6-15	6	5	100	2.23	2.08	1.16	0	0	0	0	0	0	2	0	14	0	0	0	0	2	0	1.62	0.62	0.87	24	0	41	38	36
F7,6-15	7	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SBD,19-15	7,8	5	50	1.59	1.57	0.82	0	0	0	2	0	0	0	0	0	2	0	0	0	8	0	1.95	0.51	0.76	35	2	40	39	34
SBD,18-3	9,10	5	100	2.07	1.78	1.01	0	12	0	0	2	2	0	2	0	2	0	0	0	4	0	1.41	0.71	0.85	28	0	43	37	36
SBD,19-10	11,12	5	80	2.08	1.58	0.90	0	0	0	2	0	0	4	0	0	4	0	0	0	0	8	1.74	0.57	0.82	31	2	46	35	36
SB18,1-59	1	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
STUMP-NPV	2	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
JORDANOLO,BF	3	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	4	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
HARPAREIL	5,6	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
NONPAREIL,BF	7	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
NONPAREIL,IR-2	8	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SBD,19-5	9,10	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SBD,19-12	11,12	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	1	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	2	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	3	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	4	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	5	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	6	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	7	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	8	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	9	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SBD,19-11	10,12	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	11	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	1	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	2	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	3	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	4	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	5	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	6	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SBD,9-13	8,9	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	10	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	11	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(no tree)	12	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

F5_92S.WK1

Table 11.

ITEM	RO	TR	SLD %	AVERAGE HULL	AVERAGE INSH	AVERAGE KER	DBL %	TW %	TGB %	NO %	BLK %	BRK %	UN %	ANT %	GU %	SHR %	CAL %	CRS %	OTH %	PRY %	SCR %	L/W	W/L	THK	WR %	% HULL	% INSH	% KER
JORDANOLO	1,2	1	84	2.82	0.82	1.36	0	0	0	2	2	2	0	0	0	0	0	2	0	0	2	2.36	0.42	0.79	2	56	16	62
TARRAGONA	1	2	96	2.87	2.60	1.35	18	0	0	0	2	0	0	0	0	0	0	16	0	12	2	1.66	0.6	0.89	0	42	38	34
MARCONA	2	3	100	1.24	2.83	1.20	0	0	0	0	0	4	0	0	0	0	0	0	0	0	2	1.3	0.77	0.95	0	24	54	30
NE PLUS ULTRA	1,2	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BIGELOW	1,2	5	98	1.18	1.04	1.13	34	0	0	0	0	0	0	0	0	6	0	6	0	0	2	2.23	0.45	0.85	0	35	31	52
ALMENDRO d.l.p.	1,2	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PEERLESS	1,2	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
HARRIOTT	1,2	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
I X L	1,2	9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
GOLDEN STATE	1,2	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SONORA	1	11	64	2.25	0.59	1.33	0	0	2	2	0	0	0	0	0	2	0	2	0	6	40	2.33	0.43	0.75	4	54	14	69
SB 2,6A-11	1,2	12	36	2.40	0.77	1.24	0	4	2	4	2	0	0	0	0	2	2	0	0	0	36	1.79	0.56	0.8	6	54	18	62
TRUSITO	1,2	13	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SYDNEY SPECIAL	1,2	14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
LA PRIMA	1,2	15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
KAPAREIL	1,2	16	14	1.86	0.46	0.79	2	0	0	2	0	0	0	0	0	2	0	0	0	0	2	1.95	0.51	0.74	2	60	15	63
LA MARIE	1,2	17	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SMITH I X L	1,2	18	98	3.30	1.47	1.09	34	0	0	0	0	2	0	0	4	12	0	4	0	0	40	1.7	0.59	0.79	0	56	25	43
MISSION	3,4	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ARBUCKLE	3,4	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CP 5-46	3,4	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
LANGEUDOC	3,4	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
TARDY NONPAREI	3,4	5	100	1.71	0.78	1.00	0	0	0	0	0	0	0	0	0	0	0	2	2	0	6	1.89	0.53	0.78	0	49	22	56
WALTON	3,4	6	100	1.73	1.16	0.95	2	0	0	0	2	2	0	0	2	12	0	4	22	4	0	1.71	0.59	0.87	0	45	30	45
PADRE	3,4	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SANS FAUTE	3,4	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
DAVEY	3,4	9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MILOW	3,4	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
EUREKA	3,4	11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
NONPAREIL	3	12	76	2.30	0.80	1.10	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	1.99	0.5	0.79	4	55	19	58
VESTA	3,4	13	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SB 3,7A-17	3,4	14	78	2.08	0.72	1.30	0	0	6	10	0	0	0	0	0	0	0	0	0	0	58	2.17	0.46	0.8	16	51	18	64
LONG I X L	3,4	15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
LEWELLING	3,4	16	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SB 1,4A-12	3,4	17	10	2.66	1.33	1.61	0	0	0	2	0	0	0	2	4	2	0	0	0	2	0	1.66	0.6	0.94	2	48	24	55
KUTSCH	3,4	18	78	2.43	0.89	1.14	2	0	0	4	0	0	0	0	0	2	0	0	0	0	64	2.02	0.5	0.86	4	55	20	56
PIONEER	5	1,2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
THOMPSON	5	3,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
WEST STEYN	5	5,6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
STANDARD	5	7,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SB 7,1-87W	5	10	76	2.04	0.83	0.87	0	4	0	0	2	0	0	0	0	4	0	0	0	2	2	1.83	0.55	0.74	0	54	22	51