The Analysis of Flotation Samples from Market Street Chinatown, San Jose, California

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Preface to MSCAP Technical Report 12

Dr. Virginia S. Popper continues to investigate the plant use of San Jose's early Chinese immigrant community in this sixth technical report about the archaeobotany of the Market Street Chinatown Archaeology Project. In this report, Dr. Popper integrates analysis of botanical remains from 15 soil samples through the flotation method with the previously reported results from macrobotanical remains collected by hand during excavation and from matrix samples, bags of gravel-sized mixed materials collected from inside archaeological screens after larger artifacts have been removed.

With the additional analysis of these 15 soil samples, Dr. Popper highlights the impressive variety and abundance of cultivated plants in this community. Additionally, she shows how the recovered plants reveal activities at the site, including food production, waste disposal, medicinal practices, and the movement of people and animals in and out of town. This report shows further evidence of the ties between residents of the Market Street Chinatown and home villages in South China as well as the residents' exploration and integration of what were at first less familiar foods into their daily lives.

The data tables are available in a Microsoft Excel file on the Market Street Chinatown Archaeology Project website (marketstreet.stanford.edu) as a separate appendix.

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Introduction

The Market Street Chinatown Archaeology Project researches a collection of artifacts that were excavated in downtown (Block 1) San José, California, by Archaeological Resource Services (ARS) in 1985-1988. The ARS archaeologists uncovered 63 features associated with the Chinese occupation of the area, including lined and unlined pits and wooden structures. ARS collected many samples from the features including soil samples, screen matrix samples from which major artifacts had been removed, and individually cataloged macrobotanical specimens.

This report provides the results of the analysis of 15 soil samples from 7 features (Table 1) sent to the University of Massachusetts, Boston. These samples complement previous studies of the screen matrix samples and macrobotanical specimens from the features (Popper 2014) and the analysis of soil samples from three of the features (Puseman et al. 2012). From inspection of the soil samples and discussions with ARS archaeologists, it appears that soil samples were mostly (but not always) collected from feature soils that had already been passed through a mesh screen to remove larger artifacts (Voss personal communication).

Methods

The soil samples were processed in a Flote-Tech flotation machine at the University of Massachusetts, Boston. Samples were measured and then poured into the Flote-Tech machine where the low-density botanical remains (light fraction) were collected in chiffon netting (0.02 mm openings). The heavy fraction, material remaining in the insert screen (1 mm openings), was collected, dried, and examined for plant material. All botanical material that did not float was removed from the heavy fraction and added to the light fraction before further processing.

Sample 86-36/13-333 contained densely packed organic material, some of which was rock hard, and much of it remained in the heavy fraction after the initial flotation. I soaked the heavy fraction in the deflocculent Calgon (sodium hexametaphosphate) and I broke up many of the clumps by hand. However, some clumps would not disperse. As a result, the seeds contained in these clumps are not recorded.

The light fraction was sifted through a series of nested sieves (2.00, 1.00, and 0.50 mm), yielding four size fractions in preparation for sorting. The light fraction is divided because it is easier to sort material of similar size, given the shallow depth of field of the incident light binocular microscope (10-40x), and it allows one to selectively remove distinct materials from each fraction. In this analysis, wood, charcoal, amorphous material, bark, stems, and unknown plant parts were removed only from the >2.00 mm fraction. Whole seeds and fruits were collected from all fractions as were all seed fragments in the >2.00 mm fraction. The smaller fractions of some samples contained so many plant fragments that only seed and fruit fragments larger than 1.00 mm were recorded and unidentifiable seed fragments smaller than 1.00 mm were not recorded. The <0.50 mm fraction was scanned for seeds, but none were present. Some samples contained hundreds of seeds and rice floret calluses, so after pulling out about 100 of any one type of seed in a sample, the rest were counted, but not pulled.

Three samples contained too many small remains to sort in a timely manner (Table 1). My sampling strategy aimed to get a representative picture of the remains and to target rare items. Consequently, the smaller fractions were split using a riffle box, with the final subsample size (based on sample weight) determined by the density of remains and the variety of recovered types. All the unsorted portions were scanned for types not yet recovered in the subsample.

The plant remains were identified using comparative plant and seed collections at the University of Massachusetts Boston, floras, and seed identification manuals (Cappers et al. 2009; Hickman 1993; Martin and Barkley 1961; Hu 2005). Wood and charcoal were not identified. Most of the seeds and fruits were counted, but nutshell, cereals, beans, *Prunus* seeds, and some other plant parts were weighed because variations in fragmentation can make weight a more representative measure of abundance. Seeds were recorded as carbonized (C) even if they were only partially carbonized in order to indicate exposure to fire. When only one fragment of a seed or fruit type was recovered, it was considered a whole if more than half of the seed was present. If there were multiple fragments of a type that clearly came from different seeds, the minimum number of seeds was noted in the raw data table in parentheses. Some samples contained many fragments of squash/gourd and watermelon seeds. For these, tops and bases were matched to tabulate a minimum number.

Results

The analysis of the 15 flotation samples, totaling 33.6 liters soil, recovered about 100 types of botanical remains (seeds, fruits, and other plant parts). These include a variety of cultivated, non-domesticated, native and introduced plants. Non-domesticate is a useful term to use for wild plants that could have been exploited as potherbs and medicines. Table 2 lists the scientific and common names (in English and Chinese if available) of the identified taxa. Most Chinese names are standard Mandarin transliterations (pinyin without diacritical marks) from Hu (2005) or the Flora of China (2008); not all variations of the Chinese names are listed in the table.

The results of the macrobotanical analysis are presented in Tables 3-8. Table 3 presents the plant material absolute counts and weights (grams) for the analyzed samples. For the three samples where some of the smaller screen fractions were subsampled, the count of a taxon from a sorted subsample was multiplied up to 100% and added to the fully sampled count. These are estimated counts and are in italics. The remains pulled from scanning the unsorted subsamples were counted as representative of the whole (100%) sample and added to the total count. Any numbers in parentheses indicate a minimum number of whole specimens based on the appearance of the fragments. Table 3 presents whole and fragments of a taxon separately. For further analysis of the samples it proved useful to combine these, estimating the total whole count of each type of remain (Table 4). Fragments were converted into whole counts using formulas specific to each type as noted in Table 5 unless the minimum number was determined during sorting. Some formulas were based on the average weight of whole specimens in the 2014 screen matrix samples and macrobotanical specimens (Popper 2014). Others were based on a conservative estimate of the percentage of a whole seed represented by the average fragment. Unidentified and unknown plant part fragments were not converted to wholes since it was possible that the items came from different taxa. (If a value in Table 4 includes converted fragments it is in bold.)

Table 6 presents density values (counts/liter or grams/liter) of the plant remains based on the estimated whole counts. Because the soil sample volumes differed, density permits comparisons among samples and with the flotation samples analyzed by Puseman et al. (2012). Sample 86-36/13-328 was smaller than one liter, so the densities are higher than the absolute counts and may inflate the value of rare items. The total density of remains for each sample does not include amorphous, bark, charcoal, and wood.

Table 7 calculates the relative proportions of each taxon or type of remain in each sample, merging the carbonized and uncarbonized items, and presents some summary statistics: percentage of the remains that are carbonized and number of types present. (Amorphous, bark, charcoal, and wood were not included.) Relative proportions give some indication of the concentration of different types and allows for comparisons with the screen matrix samples and macrobotanical specimens (Popper 2014 Tables 7 and 8). Table 7 from Popper (2014) showed the percentage of each feature's matrix sample comprised by *Rubus* in bold, but all the other calculation were for the remains excluding *Rubus* because *Rubus* seeds swamped the calculations, masking difference among the other types. In the current study, although large numbers of some taxa also swamped the calculations, the particularly abundant taxon varied among samples, so all taxa were included. Caution is necessary when interpreting these tables. One cannot determine the precise importance of various fruits in the diet from these figures, because fruits contain different numbers of seeds. For example, grapes have only one to four seeds per fruit, while blackberries may contain 30 or more seeds. And the nutritional value of a single large fruit, such as a peach, would be equivalent to many smaller grapes or berries. In addition, when comparing the relative proportions among samples, it is important to remember that in richer samples with more types, the proportion of any individual type will be lower even if the amount is comparable to that of another sample.

Finally, Table 8 shows the presence of each type by sample compared to the matrix samples (M) and macrobotanical Specimens (B) from these features.

The organization of the types in the tables begins with the classification of Chinese foodstuff. The traditional southern Chinese food classification system distinguishes the staple grain dishes (*fan*) from the flavorful side dishes of vegetables, meats, and seasonings that accompany them (*tsai*). These are more than functional categories. Chinese foodways prescribe a balance between *fan* and *tsai* foods to maintain balance in the body and good health (Chang 1977; Simoon 1991). Eating must also balance foods with *yin* and *yang* qualities, and as part of this, foods categorized as "hot" or "cold" (Chang 1977:10; Anderson and Anderson 1977:367). Anderson and Anderson

(1977; see also Anderson 1988) present a more detailed classification of Chinese foodstuffs that combines functional and taxonomic categories. This is the basis for organizing these report tables.

The first category of plants is the *fan* staple grains. The second category is vegetables or *tsai*, which is sometimes translated as "greens" (Anderson 1988:126). Within the *tsai* category a group mainly of cucurbits (members of the Cucurbitaceae family such as squashes, gourds, cucumber, and melons) are grouped as *kua*. Another subgroup, the legumes (*tou*) could be considered *tsai*, because they are ingredients in dishes eaten with rice or other grains, but also *fan*. Anderson and Anderson (1977:326-327) note that soybeans traditionally were one of the classic Five Stapes (Five Grains) and that "Bean sprouts bridge the gap between grains and *ts'ai* "vegetables," since they are considered *ts'ai* but are made from grains (beans)." Fruits and nuts (*kuo*) are distinct from vegetables (Anderson and Anderson 1977:332). Because of the importance of maintaining bodily balance for good health, most of these foodstuffs have medicinal properties. Finally, plants and plant parts that do not clearly fit into one of the above categories are grouped as "other." This does not preclude the possibility the item was deposited in the site as the result of utilitarian, food, or medicinal use. More specific information on these types follows.

For all the report tables, remains were uncarbonized unless noted as carbonized (C); the combination of carbonized and uncarbonized items was designates as C/UC. And except for the Unknown Types, remains were whole (or considered whole) unless followed by the designation "frag." Any uncertain identification is indicated "cf" (compares favorably).

Descriptions of Taxa, Unknowns, and Plant Parts

This section describes the taxa recovered in the current analysis of flotation samples from Features 85-31/6, 85-31/13, 86-36/5, 86-36/6, 86-36/8, 86-36/13, and 86-36/18 from Market Place Chinatown. When appropriate it discusses the origin of the taxon, its uses, history of cultivation in California and/or China, and the likely source of the plant. It summarizes the charred/uncharred status, feature location, and other findings of the taxon from previous analyses of plant remains at the site (see Popper 2014; Puseman et al. 2012). The discussion draws on a number of references including Anderson (1988), Hu (2005), and Simoons (1991) for the history and uses of plants in China. Medicinal uses of plants also came from Beth Howlett (personal communication 2014), Li et al. (1973), Lim (2012), and Lu (1994). Calfora (2014) was the primary source for the distribution of individual taxa in California, and the Flora of China (2008) and Hu (2005) provided this information for plants growing in China.

Adenostoma sp. Chamise/red shank

Adenostoma is a common Rosaceae (rose family) shrub that grows on the dry slopes, flats, and chaparral in the San Jose area. Native California groups used the leaves as medicine and the wood for tools and fuel (Strike 1994). Feature 85-31/13 Layers 2 and 3 contained charred seeds that probably are *Adenostoma*. These may have been attached to branches used for fuel. Puseman et al. (2012) recovered charred *Adenostoma* from Feature 86-36/5: seeds from Layer 4 and charcoal from Layer 8.

Arachis hypogaea Peanut

Peanut, a native plant of South America, is a commercial crop in California today. It was introduced to China by Portuguese traders in the 16th century and by the end of the 19th century was extensively cultivated there. The Chinese boil or roast and eat the seeds as a snack or add it to other dishes. According to Simoons (1991:282) roasted peanuts are highly regarded by the Chinese. Lim (2012:535) records that the seeds, oil, and whole plant are used in traditional Chinese medicine. The nuts have a neutral energy in the Chinese diet. These flotation samples from Market Street Chinatown only contained peanut shells, with clear uncharred examples from Features 85-31/6 Layers 1 and 3 and 86-36/13 Layer 2, and very small charred probable fragments from Features 85-31/6 Layer 3, 85-31/13 Layers 2 and 3, and 86-36/5 all layers. The 2014 analysis of screen matrix samples and macrobotanical specimens identified uncharred shell fragments from Features 85-31/18, 85-31/6, 86-36/7, 86-36/9, 86-36/13, 86-36/18, 86-36/20, and 88-91/26 as well as one seed inside a pod fragment from Feature 86-36/19. So peanuts were a familiar food to the Chinese immigrants and were readily available in California.

Arctostaphylos sp. Manzanita

Manzanita is a very common native chaparral and woodland plant of coastal California. Its berries (drupes) ripen in early summer. While many native California groups ate the berries (Strike 1994), the presence in this analysis of only one uncarbonized seed from Feature 86-36/13 Layer 2 along with one identified previously from Feature 85-31/18 suggests it was not an important resource and probably reflects the local vegetation.

Bambusa sp. cf. Bamboo

Feature 85-31/13 Layer 2 contained charred stem fragments that may be bamboo. These small thick stems are not the parts used for food (the young shoots) or medicine (the leaves, sap, roots, and bark), but probably come from one of a variety of useful items made from bamboo such as mats, hats, baskets, utensils, furniture, and musical instruments. Puseman et al. (2012) found charred bamboo stem fragments from Feature 85-31/6 Layer 2 and Feature 86-36/5 Layer 4. Seiter and Worthington (2013:50) found bamboo charcoal (Features 85-31/18, 86-36/5 Upper Layer, 86-36/13 Layer 3) and wood (Feature 86-36/13 Layers 2 and 3) and suggest that is was imported from Hawaii or China.

Benincasa hispida var. *chiehqua* (*mao gua*) Hairy gourd/fuzzy melon
Benincasa hispida var. *hispida* (*dong gua*) Winter melon/white gourd

Mao gua is one of the most widely cultivated cucurbits and important vegetables in China. This summer crop, generally eaten when immature, tastes like zucchini and is cooked in soups and stir-fries. Uncarbonized *Benincasa hispida* var. *chiehqua* seeds were recovered in the flotation samples coming from Features 85-31/6, 85-31/13 Layers 3 and 4, 86-36/8, and 86- 36/13 Layers 1 and 2. The 2014 analysis of screen matrix samples and macrobotanical specimens identified them from nine features including Features 85-31/6, 85-31/13, 86-36/5, 86-36/8, 86-36/13, and 86-36/18.

The *dong gua* variety of *Benincasa hispida* is also widely cultivated in China. This variety is harvested when mature and can weigh up to 18kg. Its firm rind and waxy coat makes it good for storing. The flesh is cooked fresh in soup and other dishes; it may be dried or preserved for later use. Lim (2012:169, 176) notes for both varieties that the fried or roasted seeds are eaten and that the fruits and seeds have a variety of medicinal uses in China. Uncarbonized *Benincasa hispida* var. *hispida* seeds were recovered in the flotation samples coming from Features 85-31/6 Layers 1 and 3, 85-31/13, 86-36/13 and 86-36/18. The 2014 analysis of screen matrix samples and macrobotanical specimens identified then from 10 of the features including Features 85-31/6, 86-36/5, 86-36/8, 86-36/13, and 86-36/18. *Benincasa hispida* var. *hispida* seeds were slightly more ubiquitous and abundant than the *chiehqua* variety in the loationa samples, similar to the matrix samples and macrobotanical specimens. *Benincasa hispida* fragments that were too small to identify more specifically were recovered from Features 86-36/5 Layer 1 and 86-36/18 Layer 4.

Puseman et al. (2012) also recovered *Benincasa hispida* (subspecies unknown): a charred seed from Feature 85-31/11, many uncarbonized fragments from Feature 86-36/5 Layer 6, and some whole and uncarbonized remains from Feature 86-36/5 Layer 8. Today both plants are minor crops for Asian specialty farmers in the Central Valley of California (Molinar and Yang 2001:5). According to Chan (1986:86), fresh vegetables were so important in Chinese cuisine that the Chinese in California grew them in kitchen gardens and truck gardens starting in the 1850s. The seeds from Market Street Chinatown probably come from locally grown fruits.

Brassicaceae Mustard family

Many types of mustards grow in the San Jose area. These herbs are common weeds and some are introduced plants. A charred Brassicaceae seed was recovered from Feature 85-31/13 Layer 2 and uncharred possible Brassicaceae from Feature 86-36/13 Layer 2. These small seeds come from a wild type. Puseman et al. (2012) found a charred Brassicaceae seed in Feature 85-31/11 and Brassicaceae pollen in all samples. The pollen probably reflects the use of cultivated mustard greens and other vegetables in this family as well as the local weedy flora.

Calandrinia sp. Red maids

Calandrinia sp. grows in a variety of coastal California habitats, including grassy and disturbed areas. The seeds ripen in the late spring and early summer. Uncarbonized seeds were present in Features 85-31/13 Layer 2 and 86-36/5 Layer 1, and carbonized seeds in Feature 85-31/13 Layer 4. The 2014 analysis of screen matrix samples and macrobotanical specimens identified uncarbonized *Calandrinia* from the upper two layers of Feature 86-36/13. Puseman et al. (2012) found charred *Calandrinia* in Feature 85-31/11 and uncharred seeds in Features 86-36/5, 85-31/6, and 85-31/18**.** Native California groups ate the tender leaves and seeds of *Calandrinia*, but these seeds probably represent the local weedy vegetation.

Canarium cf. *album* Chinese olive

Canarium album is a native plant of China, which is widely grown in southern China. Its fruit is eaten raw, dried, pickled, or preserved in sugar, and is used for tea. Canarium kernels, which taste like almonds, are also esteemed in southern Chinese cuisine. Traditional Chinese Medicine uses *Canarium* fruits and seeds for a variety of ailments. Charred *Canarium* seed fragments were identified from Feature 85-31/6 Layer 1 in this study. The 2014 analysis of screen matrix samples and macrobotanical specimens identified *Canarium* seeds in half of the features, including Features 85-31/6, 85-31/13, 86-36/5, 86-36/6, 86-36/13, and 86-36/18, with slightly more uncarbonized than carbonized. Blasdale (1899:43) mentions finding green and salted and dried *Canarium* for sale in the Chinese section of San Francisco and preserved Chinese olives are common in American Chinese stores today. The Market Street Chinatown seeds probably come from imported fruits.

Capsicum sp. Chili pepper

Chili pepper is native to Mexico or South America, depending on the species, but was cultivated in California beginning in the Spanish-colonial Period. Chili peppers also were introduced early to China, brought by Portuguese traders in the 16th century. Today *C. annuum* is widely cultivated and used fresh or dried as a flavoring in Chinese cuisine, although Cantonese cooking typically uses less chili than Szechuanese. Traditional Chinese medicine uses chili peppers to induce sweating. Many uncarbonized *Capsicum* seeds were embedded in the matted grass deposit of Feature 86-36/13 Layer 1 and others were found in Feature 86-36/13 Layer 2, where because of the small sample size the density is higher than the absolute count. The 2014 analysis of screen matrix samples and macrobotanical specimens identified uncarbonized *Capsicum* seeds from Feature 86-36/13 Layer 3. These probably were grown in California.

Caryophyllaceae Pink family

Feature 86-36/13 Layer 2 contained uncharred Caryophyllaceae seeds. The local San Jose flora contains a variety of native and introduced taxa from this family and some grow in disturbed places. Puseman et al. (2012) identified Caryophyllaceae from Feature 86-36/5 indicating that weeds from this family were probably growing in the area.

Centrospermae

The Centrospermae category refers to members of the Caryophyllales order in which the embryo curves around a centrally located, generally cylindrical, perisperm. Seeds placed in this category lack diagnostic seed coats upon which identifications to the family or genus Layer are made. One charred Centrospermae seed was recovered from Feature 85-31/6 Layer 3. Centrospermae taxa identified in this and other samples include *Calandrinia* sp., Caryophyllaceae, and *Chenopodium* sp.

Cereal grain Wheat, rice, or barley

Carbonized cereal grain fragments, probably wheat, rice, or barley, were recovered from Feature 85-31/6 Layer 3 (closer to rice) and Feature 85-31/13 Layer 3, which also contained wheat and barley grains. See the discussions below of wheat, rice, and barley for more information.

Chenopodium sp. Goosefoot

Goosefoot is one of the most ubiquitous non-domesticated seeds in these samples, occurring unburnt in Features 85-31/6 Layer 3, 85-31/13 Layers 2 and 3, 86-36/5 Layer 1A, 86-36/8, and 86-36/13 Layers 1 and 2. Burnt goosefoot seeds were recovered from Features 85-31/6 Layer 3, 85-31/13 Layers 2 and 3, 86-36/8, and 86-36/13 Layer 2. Goosefoots are widespread, growing in open disturbed places and wet marshy lands. Native California groups ate the greens in the spring and summer and the small seeds when they ripened in the summer and fall (Strike 1994). Several species of *Chenopodium* grow in China and a few are used as food (young leaves cooked as greens and seeds). Puseman et al. (2012) found goosefoot seeds uncharred from Features 85-31/18 Layer 2 85-31/28, and 86-36/5 Layer 8, and charred from Features 85-31/11 and 85-31/18 Layer 2. Cheno-Am pollen was present in all the samples and some of this may have come from goosefoot weeds growing in the area.

Citrullus lanatus Watermelon

Watermelon cultivation in California dates back to the Spanish-colonial period. (Allen 1998). Watermelons, which are native to Africa, also have a long history of use in China where they are valued as a fresh summer fruit and for their roasted and sometimes spiced seeds. Some varieties have been bred to produce little flesh and many seeds. In addition, the fruit and seed have medicinal properties and cold energy. The flotation samples contained uncarbonized seeds (whole and many fragments) from Feature 86-36/13 Layers 1 and 2 and carbonized seed fragments from Features 85-31/6 (all layers) and 85-31/13 (all layers).

Watermelon seeds were one of the most abundant remains in 2014 analysis of screen matrix samples and macrobotanical specimens, occurring mainly uncarbonized in

9 of the 26 features, including Features 85-31/13, 86-36/5, 86-36/13, and 86-36/18. The carbonized seeds came primarily from Feature 85-31/18 Layer 2/3, but also from Feature 86-36/5 Layer 8 and Feature 85-31/6. Wohgulmuth and Honneysett (Clevenger 2004:38-39) also identified charred and uncharred watermelon seeds from Feature 85-31/18 and charred seeds from Feature 85-31/20. Puseman et al. (2012) recorded charred seed fragments from Feature 85-31/11. Blasdale (1899:48) noted that in the Chinese section of San Francisco, watermelon seeds were frequently eaten. Given the large number of watermelon seeds in the samples, it seems more likely that they come from eating fresh locally grown watermelon as well as snacking on the seeds. However, some of the seeds could have been imported (see Cucurbitaceae seed kernels below).

Claytonia perfoliata Miner's lettuce

Miner's lettuce is a common annual herb that grows in a variety of habitats including agricultural fields and disturbed sites in urban areas. Native California groups ate the leaves raw or cooked and its common name refers to its consumption by miners during the California Gold Rush. It is a good source of vitamin C and was presumably used to avoid scurvy (USDA Forest Service 2014). Uncharred seeds were recovered from the Feature 86-36/13 Layer 1 flotation sample. One uncharred seed was recovered from the Feature 86-36/13 Layer 2 macrobotanical specimens. These seeds probably came from weeds growing in the vicinity, although the plants may have been collected as pot greens.

Cucumis melo Melon

Melons, native to Africa and southwestern Asia, were mentioned in a late 5th century Chinese herbal and are widely cultivated in China today. There are many varieties, some eaten fresh while others are cooked or pickled. Chinese traditional medicine uses melon root, peduncle, fruit pulp and seeds to cure a variety of ailments (Lim 2012:229). One uncarbonized melon seed was recovered from the Feature 86-36/13 Layer 2 flotation sample. The 2014 analysis of screen matrix samples and macrobotanical specimens identified uncarbonized melon seeds from Feature 85-31/24, and Feature 86-36/13 Layers 2 and 3. Melons have been grown in California since Spanish-colonial times, so these likely come from local farms (Vallejo 1890).

Cucumis sativus cf. Cucumber

A variety of *Cucumis* species grow in China, but the seeds recovered from Feature 86-36/13 Layer 2 probably come from the commonly cultivated cucumber. Documents dating to the 7th century mention cucumber use in China. Today it is a major summer vegetable, which is eaten raw, cooked, or pickled. The fruits, shoots, leaves, and roots are used in traditional Chinese medicine and cucumbers have cooling energy in the Chinese diet. Cucumbers have been grown in California since Spanish-colonial times, so the seeds in these samples most likely came from local farms (Vallejo 1890). Whole uncharred seeds were identified in the 2014 analysis of screen matrix samples and macrobotanical specimens from Feature 86-36/13 Layers 2 and 3, but the flotation sample from Feature 86-36/13 Layer 2 contained only uncharred fragments. The *Cucumis* seed fragment from Feature 85-31/6 Layer 3 most likely is cucumber.

Cucurbitaceae Squash/gourd family

A number of uncharred seed fragments from the Feature 85-31/6 Layer 3, 85-31/13 (all layers), 86-36/8, and 86-36/13 (all layers) flotation samples could not be more specifically identified than as squash or pumpkin. And a charred rind fragment from Feature 85-31/13 Layer 3 could be from a squash. The 2014 analysis of screen matrix samples and macrobotanical specimens identified similar seed fragments from several features as well as a possible charred rind fragment from Feature 85-31/18 Layer 2/3. Cucurbitaceae seeds are an extremely popular snack food in China, coming from a variety of squashes as well as watermelons and melons. Pumpkin seeds also were listed in an inventory of the medicines used by Ing Hay, a Chinese doctor who began practicing in eastern Oregon in the 1880s1880s (Beth Howlett, personal communication 2014). Robert Spier (1958:80) examined invoices of Chinese imports during the early 1850s, housed at the U. S. Custom House at San Francisco. Melon seeds were among the less common items mentioned (Spier 1958:80). Salted melon seeds were still being imported to San Francisco in 1873 (Coe 2009:119). These could be from watermelon, a squash, or another melon. Therefore the remains in the Market Street Chinatown features could come from Chinese or California sources.

Cupressaceae Cypress family

Cupressaceae scale-like leaves or small leaf sprays were recovered uncarbonized from Feature 86-36/13 Layer 2 and carbonized from Feature 85-31/6 Layer 1 and Feature 85-31/13 Layers 2 and 3. The 2014 analysis of screen matrix samples identified similar uncharred leaves from Feature 86-36/18 Below Layer 3. These most like come from cypress (Cupressus sp.) or juniper (Juniperus sp.), Cypress family taxa that grow in the area. Seiter and Worthington (2013) identified Western red cedar wood (*Thuja plicata*) from the site, but it does not grow locally. The leaves, sap, bark, and fruits of some Cupressaceae plants are used in traditional Chinese medicine.

Cyperaceae Sedge family

An uncarbonized Cyperaceae seed was recovered from the Feature 86-36/13 Layer 2 flotation sample. Carbonized Cyperaceae seeds were recovered from Feature 85-31/18 Layer 2/3 (Popper 2014) and Feature 85-31/18 Layer 2 (Puseman et al. 2012). Puseman et al. (2012) also found Cyperaceae pollen in Feature 86-36/5. This identification to family encompasses a very large variety of plants, but many grow in wet open locations. It is likely that these represent the weedy vegetation growing around San Jose Chinatown.

Dimocarpus longan

Longan is widely cultivated in southern China for the sweet aril that encloses the seed. Besides being eaten fresh, the fruits are dried and canned. Dried fruits are considered a good omen and are thrown over the bride and groom at weddings. Longan has warm energy in the Chinese diet and various parts of the plant have medicinal properties. The leaves and flowers are brewed into a medicinal tea; the dried fruit is a tonic for a variety of ailments; and the ground seeds stop wounds from bleeding. Longan is a common *bupin* ("repair substance") in traditional Chinese medicine; a *bupin* is a homemade preparation made by simmering a number of ingredients and taken to repair an imbalance in the body and restore one's natural immunity (Hu 2005:161-162). Longan currently grows in southern California, but longan probably was one of the dried fruits imported from China in the mid-19th century (Spier 1958:80). Charred longan seeds were identified from the Feature 85-31/6 Layers 1 and 3 flotation samples. Additional seeds were identified in the macrobotanical specimens from this feature, Feature 85-31/13 (uncharred), as well as other features not included in the present study (Popper 2014). More were charred than uncharred.

Dimocarpus longan/Litchi chinensis Longan/Litchi

The Feature 85-31/6 Layers 1 and 3 flotation samples also contained carbonized and uncarbonized seedcoat fragments that could be from longan or the closely related litchi. Litchi is a native of China, and has a long history of cultivation there. The sweet aril that encloses the seed may be eaten fresh, dried, pickled, or preserved and the fruits may be dried or canned. While the Chinese often eat litchis for dessert, they also cook them in sweet-and-sour and other dishes. Chinese traditional medicine uses litchi fruit, seed, and other plant parts for remedies and they have warm energy in the Chinese diet. Litchi trees were not grown in California until 1897, when they were brought to California from Florida. Generally, litchis do not grow well in the United States (California Rare Fruit Growers 1996). Blasdale (1899:42) recorded that dried litchis and litchis preserved in sugar were available in the Chinese section of San Francisco. So the longan/litchi seeds in these samples certainly come from the dried fruits recorded as imported from China starting in the mid-19th century (Spier 1958:80). The 2014 analysis of screen matrix samples and macrobotanical specimens identified both carbonized and uncarbonized litchi seeds from Features 85-31/6, 86-36/6, and 86-36/13, as well as some other features. More of the litchi seeds in these samples were carbonized than uncarbonized. Wohgulmuth and Honneysett (Clevenger 2004:38) also identified a burnt litchi seed from Feature 85-31/20.

Ericaceae cf. Heath family (includes huckleberry)

One type of seed that resembles those in the heath family was recovered from the Feature 85-31/6 (Layers 1 and 3; charred), 85-31/13 (Layers 2 and 4; charred), and 86-36/13 (Layer 2; charred and uncharred) flotation samples. The seeds are relatively large, measuring up to 3.5 by 2.7 mm, and most likely come from an edible fruit. They are larger than California huckleberry (*Vaccinium ovatum*) and less angular than madrone (*Arbutus menziesii*), both of which grow in the area around San Jose. The seeds may be the same as the type identified by Puseman et al. (2012) as *Gaylussacia* sp.

(huckleberry) from Feature 85-31/6 (Layer 2). However, the seeds are a bit larger than *Gaylussacia* and there is no record of *Gaylussacia* growing in California. A fragmented uncarbonized seed from a plant in the Heath family was recovered from the Feature 86-36/13 Top Layer screen matrix sample, but it was a smaller type.

Erodium sp. Filaree

Most of the filaree types growing in California are introduced species that thrive in grasslands, dry open areas, or disturbed sites. Charred filaree seeds were identified from Feature 85-31/13 Layer 2. Puseman et al. (2012) recovered a large number of charred filaree seeds from Feature 85-31/11 and identified pollen in a few of the samples. These represent the local weedy vegetation.

Euphorbia sp. Spurge

One charred spurge seed was found in the Feature 85-31/6 Layer 3 flotation sample. An uncharred seed that most closely resembles *Euphorbia spathulata* (warty spurge) was found in Feature 86-36/13 (Popper 2014). This native California plant grows in open, generally disturbed places and probably was part of the local weedy vegetation. Puseman et al. (2012) identified *Euphorbia* pollen in Feature 85-31/6, supporting this interpretation. Several Chinese species of *Euphorbia* are used for medicinal remedies.

Fabaceae Legume family

The flotation samples contained a few types of wild Fabaceae that could not be identified more specifically given the large variety of species that grow in California: charred seeds from Feature 85-31/31 Layer 3 and uncharred seeds (two types) and pod fragments from Feature 86-36/13 Layer 2. The 2014 analysis found one charred legume seed fragment from Feature 86-36/18 Below Layer 3. Puseman et al. (2012) also recovered Fabaceae seeds (charred and uncharred from Features 86-36/5, 85-31/6, and 85-31/18) and pollen from Feature 86-36/5. And Wohgulmuth and Honneysett (Clevenger 2004:39) identified weedy types from Feature 85-31/18. A variety of Fabaceae plants thrive on disturbed soils, so this evidence reflects the local weedy vegetation.

Festuca/Vulpia sp. Fescue grass

The seeds of these two grass genera can be difficult to distinguish. A number of native and introduced species of both types grow in the San Jose area, some preferring dry, open or disturbed sites and others preferring moist habitats. They are a common component of annual grasslands. One charred probable *Festuca/Vulpia* seed was recovered from Feature 85-31/31 Layer 2. Puseman et al. (2012) note that their Poaceae B type from Feature 85-31/11 could be *Festuca*. The seed represents the local weed or nearby grassland vegetation.

Ficus carica Fig

Figs are native to the Near East and were introduced to China in the Tang Dynasty (618–907 A.D.). Today they are grown in the warmer region of China, but are rare. Chinese medicine uses fresh and dried figs, fig leaves, and fig roots to cure a variety of ailments and the fruits have a neutral energy in the Chinese diet. Uncarbonized fig seeds were recovered from the Feature 85-31/6 Layer 3, 85-31/13 (all layers), 86-36/8, 86-36/13 Layers 1 and 2, and 86-36/18 Layer 2 flotation samples and carbonized seeds from Feature 85-31/6 Layer 1. The fig seed densities in these flotation samples ranged from 0.25 to an estimated 451.33 seeds per liter. Most of the 2014 Market Street Chinatown matrix samples contained uncarbonized fig seeds; only a few of the macrobotanical batches had figs, in part because the rest were not collected in a manner to recover small seeds. But like the current samples, Feature 86-36/6 did not contain fig seeds. Wohgulmuth and Honneysett (Clevenger 2004: 38) noted hundreds of fig seeds in their Feature 85-31/20 sample. And Puseman et al. (2012) found hundreds of unburnt fig seeds in Feature 86-36/5 Layer 6 and smaller amounts in Feature 85-31/6 Layer 2, Feature 86-36/7 Layer 3, Feature 85-31/18 Layers 2 and 3, and Feature 85-31/28. Large numbers of unburnt figs usually indicate privy deposits, since the seeds pass through the digestive system relatively intact. Figs have been grown in California since Spanish-colonial times, so these figs probably came from local farms

Fragaria sp. Strawberry

Cultivated strawberries (*Fragaria* × *ananassa*) are a hybrid of a wild variety from eastern North America and another from Chile. Several *Fragaria* species are grown in China and the hybrid is widely cultivated. Strawberries have cooling energy in the Chinese diet and may be used to treat several illnesses. Anderson (1988:135) categorizes strawberry as a minor fruit in China, but it was an important crop for Chinese farmers in California. Chan (1986:124) describes "By the 1870s the cultivation of strawberries, raspberries, blackberries, and gooseberries had become one of the most important means of livelihood for Chinese residents in Santa Clara County."

Uncharred strawberry seeds were recovered from the Feature 85-31/13 Layer 2, 86-36/13 Layers 1 and 2, and 86-36/18 Layer 3 flotation samples and one carbonized seed from Feature 85-31/13 Layer 3. Their densities ranged from 0.025 to 6450 seeds per liter, with the highest amounts coming from the small Feature 86-36/13 Layer 1 sample. Only uncharred strawberry seeds were recovered in the 2014 analysis of screen matrix samples and macrobotanical specimens. While Feature 86-36/5 Layer 8 contained some seeds, Feature 86-36/13 (all layers) contained the most, totaling in the hundreds. Puseman et al. (2012) identified *Fragaria* pollen in Features 86-36/5, 86-36/7, 85-31/18, and 85-31/28 and recovered hundreds of uncharred seeds from Feature 86-36/5, with fewer from Features 86-36/7, 85-31/18, and 85-31/28. The only charred seeds came from Feature 85-31/11. As with figs, the strawberry seeds probably come from privy deposits. And their recovery depends on collecting archaeological deposits without screening or with very fine screens, which may explain their absence in some of the matrix and most of the macrobotanical samples.

Hordeum sp. Wild barley

Carbonized wild barley seeds were recovered from the Feature 85-31/13 Layers 2 and 3 flotation samples. One carbonized wild barley seed came from Feature 85-31/18 Layer 2/3 (Popper 2014). A number of native *Hordeum* species grow in the coastal grasslands, some of which can also be found in disturbed soils along streambanks and roads. So this seed most likely represents the weedy flora of the region. Puseman et al. (2012) identified carbonized *H. pusillum* in Feature 85-31/18 Layer 2, however I expect that it might be a different species since *H. pusillum* is rare in California.

Hordeum vulgare Barley

Early colonists introduced barley to California where it became one of the major cultivars at Spanish-colonial settlements. Barley, a native of Western Asia, is a staple grain in northern China and is widely cultivated in other parts of China, although not in the extreme south. In Chinese cuisine, barley usually is ground and prepared as a flat cake, as congee and cooked in other dishes. Barley leaves, stalks, grain and dried sprouted grain are used in traditional Chinese medicine. To prepare barley as a "cooling" tea the grains are fried until slightly browned, and as a poultice for burns, the grains are fried until charred and then ground up. One charred barley grain was found in the Feature 85-31/13 Layer 3 flotation sample. The 2014 analysis found charred barley grains in the Feature 85-31/18 Layer 2/3 samples. Puseman et al. (2012) found a charred rachilla fragment that may be from *Hordeum* in Feature 85-31/18 Layer 2, and cereal pollen and charred cereal grains in several samples, which may be from cultivated barley. These barley remains indicate that this easily available grain was used for food and possibly as medicine in San Jose Chinatown.

Juglans regia English walnut

Juglans regia is native to Asia and southeast Europe and has a long history of cultivation in China. In Chinese cuisine, the nuts are eaten raw, fried, roasted, and sugared, as well as prepared in a variety of savory dishes and desserts. They have a warm energy in the Chinese diet, and both the seeds and their oil have medicinal uses. Walnuts are a *bupin*, used in homemade preparations to promote health. *Juglans regia* cultivation in California dates to the Spanish-colonial period and walnut shells were recovered from Mission Santa Cruz (Allen 1998:46). Lelong (1896:8, 13) notes that climatic conditions favor walnut cultivation in Southern California, but adds "The largest walnut orchard of early planting in the northern part of the site is located near Los Gatos, in Santa Clara County; it is about thirty years old, and produces fair crops yearly." He also notes that Joseph Sexton, who is credited with introducing large-scale commercial walnut cultivation in California, purchased the sack of English walnuts that he used to develop new varieties in San Francisco, and that these supposedly were imported from South America (Lelong 1896:12). Consequently, the remains found here could be from local sources or imported. Uncharred nutshell was recovered from the Feature 86-36/13 Layer 2 flotation sample as well as the screen matrix samples and macrobotanical specimens from this feature (Popper 2014). The 2014 analysis of screen matrix samples and macrobotanical specimens identified uncharred nutshell from Features 86-36/5 and 86-36/6, among others, and charred nutshell from Feature 86-36/5 Layer 8. Wohgulmuth and Honneysett (Clevenger 2004:39) recovered uncharred nutshell in Feature 85-31/18. Puseman et al. (2012) found *Juglans* pollen, charred nutshell (Features 85-31/11 and 85-31/28), and wood (Features 86-36/5 and 85-31/18), but the remains could not be identified to species.

Lamiaceae cf. Mint family

Many varieties of mint plants grow in the San Jose area. The native species grow in moist or dry habitats, but the introduced species often grow in disturbed sites including cultivated or abandoned fields. Seeds that resemble Lamiaceae were found in Features 85-31/6 Layer 3, 85-31/13 Layer 2, and 86-36/13 Layer 2. Puseman et al. (2012) identified a charred Lamiaceae seed fragment from Feature 85/31-11. While many mint family plants are used as seasonings and herbal medicines, without a more specific identification of these seeds it seems prudent to interpret them as part of the natural vegetation.

Lilliaceae cf. Lily family

One uncarbonized seed from Feature 86-36/13 Layer 2 most closely resembles a seed from a lily family plant. A similar seed was recovered from the associated screen matrix sample (Popper 2104). A large variety of plants in this family grow in the San Jose region. Some are ornamental plants and others are crops. Dried lily bulbs are an important ingredient in Chinese cuisine, and lily seeds were recorded among the items listed on mid-19th century invoices from ships bringing food from China to San Francisco (Spier 1958:80).

Lycium chinense cf. Chinese boxthorn

Chinese boxthorn is a native Chinese plant that is grown in southern China for the leafy shoots, which can be harvested in winter, and for its medicinal berries and roots. The vine also grows in disturbed soils along roads and near houses, among other locations. The dried berries are a common *bupin* (“repair substance”) in traditional Chinese medicine (Hu 2005: 162, 222). Chinese boxthorn has naturalized in California although the closest location to San Jose that is recorded is in Solano County (Calfora 2014). Gary Crawford (personal communication 2014) noted that the uncharred seeds from Features 86-36/5 Layer 8, and 86-36/13 Layers Top, 2 and 3 recovered from the 2014 analysis of screen matrix samples and macrobotanical specimens look most closely like his Chinese boxthorn comparative material. Additional uncharred seeds were found in the 86-36/13 Layer 2 flotation sample.

Lycium sp. cf.

These small seeds from feature 86-36/13 Layer 2 closely resemble wild *Lycium*.

The most likely type is *L. barbarum* (matrimony vine), an introduced species that grows in waste places and fields.

Malus/Pyrus sp. Apple/pear

Native crab apples from northern and central China and native pears from northern and western China have long been eaten in China. Apples and pears have cooling energy in the Chinese diet and when eaten can cure several types of ailments. And while China is a major producer of commercial apples today, Simoons (1991:244) notes that Guangdong was not a favorable place to grow them. Some pears were also cultivated in the south. But the seeds recovered from Market Street Chinatown probably come from varieties of the common apple (*M. pumila*) and/or pear (*P. communis*) that were introduced to California from Europe. Apples and pears were growing at Mission Santa Clara as early as 1792, but beginning in the 1850s large numbers of apple and pear trees were imported from nurseries in the East to plant in orchards in the Santa Clara Valley (Jacobson 1984). Jacobson (1984:90, 96) reports that most pears were grown in the lowland areas north of San Jose and Santa Clara, and that apples, while common in kitchen gardens, were not a major commercial crop. Chinese laborers worked in fruit orchards, and began growing their own apple and pear trees in the late 1870s (Chan 1986:230). Unburnt apple/pear seeds were found in the Feature 86-36/13 Layers 1 and 2 flotation samples and less certain burnt seeds were found in Feature 85-31/6 Layer 1. The 2014 analysis of screen matrix samples and macrobotanical specimens identified unburnt, seed fragments from Feature 86-36/5 Layer 8 and Feature 86-36/13 Layers Top, 2, and 3. The burnt seed fragments came from Feature 85-31/18 Layer 2/3.

Malva sp. Mallow

A few types of mallow grow in China. *M. verticillata* roots, seeds, and leaves serve as medicinal remedies and its young leaves can be eaten. A number of native and introduced mallow species grow in the San Jose area, many of them common weeds in disturbed locations, such as house lots, along roadways, and in fallow gardens. Mallow is one of the most ubiquitous non-domesticated seeds in the flotation samples. Uncarbonized mallow seeds were found in the flotation samples from Features 85-31/6 (all layers), 85-31/13 (all layers), 86-36/5 Layer 3, 86-36/13 Layer 2, and carbonized seeds from Features 85-31/6 (Layer 1) and 85-31/13 (all layers). The 2014 analysis of screen matrix samples and macrobotanical specimens identified uncarbonized mallow in Feature 85-31/13, Feature 86-36/5 Layer 8, and Feature 86-36/18 Layers A and B, and one carbonized mallow seed in Feature 85-31/18 Layer 2/3. Puseman et al. (2012) identified Malvaceae pollen in the features, reflecting its growth in the area, and uncarbonized seeds in Feature 86-36/5 Layer 6, Feature 86-36/7, and Feature 85-31/11. The mallow seeds probably come from weeds growing in Market Street Chinatown, but some plants may have been protected or encouraged to provide a ready source of medicine.

Medicago sp. Burclover/alfalfa

Medicago growing in California includes alfalfa (*M. sativa*), a cultivated forage plant, and a number of wild and often-weedy species, all of which are introduced and some of which also grow in China. These weeds are abundant in disturbed and agricultural soils of the Santa Clara Valley. In China the young shoots of some *Medicago* species are eaten and the alfalfa plant and root serve medicinal purposes. Uncharred *Medicago* seeds were recovered from the flotation samples from Feature 86-36/13 Layer 2 and less securely identified charred seeds from Feature 85-31/13 Layers 2 and 3, and Feature 86-36/18 Layer 4. The 2014 analysis of screen matrix samples and macrobotanical specimens identified uncharred *Medicago* seeds from Feature 86-36/5 Layer 8 and Feature 86-36/13 Layer Top, and a pod resembling *M. polymorpha* (California burclover) was found in Feature 86-36/5 Layer 8. While the pod may be some other species of burclover, it was spiny, indicating that it was not alfalfa. This would suggest that the *Medicago* seeds in the sample also were not alfalfa. Puseman et al. (2012) identified charred *M. sativa* in Feature 86-36/5 Layer 4. Given the abundance of *Medicago* in the area, it seems likely that these seeds come from local weeds.

Melilotus sp. cf. Sweetclover

The *Melilotus* species that grow in California are native to Eurasia, and all also grow in China. Sweetclover is a common weed in open and disturbed area in California. Chinese traditional medicine uses the fruit, stalk, leaves, and root of *M. arvensis* to treat a variety of ailments. One uncharred seed from the Feature 85-31/6 Layer 1 flotation sample resembles sweetclover. The screen matrix sample from Feature 86-36/18 Layer Below 3 had uncarbonized sweetclover seeds. Puseman et al. (2012) recovered uncarbonized sweetclover seeds in Feature 86-36/7.

Momordica charantia Bitter gourd

Momordica charantia is a native cucurbit of southern Asia that has long been cultivated in southern China. It is generally eaten cooked as a vegetable. In addition, all parts of the plant have medicinal properties and cold energy. The seeds are ground into powder and taken to ameliorate fatigue and impotence. Blasdale (1899:30) reported that *Momordica charantia* was a major crop in Chinese gardens along the Sacramento River and commonly eaten by the Chinese in California. The flotation samples from Features 85-31/6 (all layers) and 85-31/13 (all layers), and 86-36/13 (all layers) contained primarily small fragments of the uncharred seeds. Bitter gourd seeds were one of the most ubiquitous remains in the Market Street Chinatown screen matrix samples and macrobotanical specimens, recovered in 14 of the features including Features 85-31/13, 86-36/5, 86-36/8, 86-36/13, and 86-36/18, but not from Feature 85-31/6. All of the seeds were uncarbonized except for one from Feature 85-31/18 Layer 2/3. Puseman et al. (2012) also record finding bitter gourd seeds in most of the features, with uncharred specimens from Feature 86-36/5 Layer 8, Feature 85-31/6 Layer 2, Feature 86-36/7 Layer 3, Feature 85-31/18 Layer 3, and Feature 85-31/28, and charred seeds from Feature 85-31/11. In addition, they identified *Momordica* pollen from Feature 86-36/5. Wohgulmuth and Honneysett (Clevenger 2004:38) found uncharred bitter gourd seeds in

Feature 85-31/20. Given the ease of obtaining locally grown bitter gourd, it seems unlikely that these seeds came from imported plants.

Opuntia sp. Prickly-pear

The Market Street Chinatown prickly-pear seeds probably are *Opuntia ficus-indica* (Mission prickly-pear), the only prickly-pear that grows in the San Jose area. This species originated in Mexico and has become naturalized in California where it grows in dry locations. Prickly-pear fruits and pads are popular Mexican foods and the cultivated species were brought to California in the Spanish-colonial era. *Opuntia* pulp and juice have been used medicinally in Mexico and China. *Opuntia* is native to the Americas, but a few species, including *Opuntia ficus-indica* (*li guo xian ren zhang*), were introduced to China in the 1600s and early 1700s. There they are cultivated as hedges and for their edible fruits. So the Chinese immigrants to California may well have been familiar with these plants. The Feature 86-36/13 Layer 2 flotation sample contained unburnt seeds. The 2014 analysis of screen matrix samples and macrobotanical specimens found unburnt seeds from Feature 85-31/18 Layer 2/3, Feature 86-36/5 Layers 6 and 8, Feature 86-36/13 Layers top, 2, and 3 and Feature 88-91/26. Puseman et al. (2012) recovered an unburnt endosperm fragments from Feature 85-31/18 Layer 3.

Oryza sativa Rice

Rice is the staple grain of southern China, so much so that the word for cooked rice and food (*fan*) are the same. For southern Chinese, food eaten without rice is considered a snack and not a meal. Simoons (1991:64) notes "in rural South China an adult male consumed 470 or 485 pounds of rice a year" and that much of the agricultural land was devoted to rice cultivation. The most common preparation of rice in southern China is boiled, but rice flour may be made into noodles and cakes, and rice is fermented to make vinegar. Rice has a neutral energy in the Chinese diet and can be cooked to cure a number of ailments. Rice florets (hulls made up of the lemma, palea, and callus) and straw served a variety of purposes including fuel, and packing material. Rice florets do not ignite or burn easily, and while they produce good heat, they also leave a large proportion of ash (International Rice Research Institute 2015).

Although rice is cultivated in California today, it was not grown there in the 19th century, because the growing conditions were not appropriate for long grain rice (Chan 1986:82, 269). Nonetheless, as Chan (1986:82) reports, rice and sweet potatoes were the primary foods of the early Chinese immigrants to California, and most of the rice was imported from China. It was commonly listed on mid-19th century shipping invoices recorded in San Francisco (Spier 1958:80). Although large quantities of rice were imported, it was relatively expensive, at least in the Chinese mining camps. Chan (1986:82-84) shows that in 1865, a sack of rice cost $6, four times the cost of a sack of flour.

This study recovered carbonized rice grains (caryopses) from Features 85-31/6 Layer 1, 85-31/13 Layers 2 and 3, 86-36/6, and 86-36/13 Layer 2. In addition uncharred floret parts (the lemma and palea - the hulls or structures surrounding the grain – and the callus – a hard projection at the base of the floret) were found in Features 85-31/6 (all layers), 85-31/13 Layers 2 and 3, 86-36/5 Layer 1A, and 86-36/13 Layer 2 and charred floret parts in Features 85-31/6 (all layers), 85-31/13 Layers 2 and 3, and 86-36/5 Layer 3. The 2014 analysis of screen matrix samples and macrobotanical specimens identified carbonized rice grains from Feature 85-31/13, Feature 85-31/18 Layer 2/3, and Feature 86-36/5 Layer 8. In addition, uncharred florets were found in Feature 86-36/5 Layers 6 and 8 and Feature 86-36/13 Layers 2 and 3. Wohgulmuth and Honneysett (Clevenger 2004:39) also recovered charred grains from Feature 85-31/18. Puseman et al. (2012) identified rice phytoliths and pollen in addition to grains and florets. Feature 85-31/6 contained many husk phytoliths and floret fragments (charred and uncharred), along with some pollen and charred seeds. Feature 85-31/11 had *Oryza* pollen and possible charred seeds. Feature 85-31/18 Layer 2 had some pollen, an uncharred awn and a charred seed, while Layer 3 had one charred and one uncharred floret. Feature 85-31/28 contained rice pollen, many leaf and stem phytoliths, and charred and uncharred florets. Feature 86-36/5 contained many *Oryza* glume, leaf, and stem phytoliths with most concentrated in Layer 8, fewer in Layer 6, and very few in Layer 4. The many leaf and stem phytoliths in Feature 86-36//6 were interpreted as packing material (Cummings et al. 2014). Feature 86-36/7 had *Oryza* pollen and a few phytoliths.

Panicum/Setaria sp. cf. Panic grass/bristle grass/millet

The lemma and palea are bracts that surround a grass floret as well as the ripe caryopsis (seed). Feature 86-36/13 Layer 2 contained a number of uncarbonized specimens that could be either a wild or cultivated type of *Panicum* sp.or *Setaria* sp. The 2014 analysis of screen matrix samples and macrobotanical specimens identified one uncarbonized example from Feature 86-36/13 Layer 3 that looked more like *Panicum* and three uncarbonized bracts from Feature 86-36/13 Layers 2 and 3 that looked more like *Setaria*. Many wild *Panicum* species grow in California, primarily in open areas, fields, roadsides, and moist habitats. *Panicum miliaceum*, broomcorn millet, has been and continues to be an important crop in northern China. It may be eaten as porridge or brewed for an alcoholic drink. A few native and naturalized *Setaria* species grow in the San Jose area, generally in moist, disturbed areas, including roadsides, fields, and streambanks. Given the uncertain identification of the remains, it seems prudent to consider them as coming from the local vegetation. Puseman et al. (2012) also recovered *Setaria* remains from Feature 85-31/6 that could not be specified as wild or cultivated. In their text, the charred remains are described as florets and in the tables as caryopses.

Phaseolus vulgaris/Glycine max Common bean/soybean

One cultivated common bean or soybean was recovered from the Feature 86-36/13 Layer 2 flotation sample. The 2014 analysis of screen matrix samples and macrobotanical specimens identified a number of cultivated bean seeds, some of which may be common beans (*Phaseolus vulgaris*) and others of which may be large soybeans (*Glycine max*). All are carbonized and most have a split texture, which I replicated when I carbonized some cooked soybeans. None have any seed coat left and few have traces of the embryo. If these came from a pot of burnt beans, one would expect to find the beans clumped together. But these cotyledons are separate, fairly flat, and quite thin. More research may indicate whether these could be cooked or fermented soybeans. Most of these were recovered from Feature 86-36/5 Layer 8, with one each in Feature 86-36/5 Layer 6, Feature 86-36/13 Layers 1 and 3, and Feature 88-91/26. Puseman et al. (2012) identified pollen from four types of cultivated beans in Feature 86-36/5: *Canavalia*, *Phaseolus*, *Pisum*-type, and *Vicia*-type. They suggest that the pollen came from buying fresh beans at a local market. They also recovered one whole and many fragments of charred *Phaseolus* seeds in Feature 85-31/1 along with a possible *Phaseolus* pod phytolith. Feature 85-31/6 had charred seed fragments identified as *Pisum/Glycine* (pea/soybean).

Phaseolus vulgaris is native to Mesoamerica and was brought to California with the Franciscan missionaries and colonial settlers. The dried beans (seeds) were an important part of the Spanish-colonial era diet. Current *Phaseolus vulgaris* cultivation in China is mainly for fresh green beans and is common in Guangdong.

Soybeans are native to eastern Asia and have long been cultivated in China. The many Chinese varieties are eaten cooked, roasted, fermented (beans and sauce), and prepared as tofu, soybean milk, soybean oil and other foods. *Dou-chi*, the fermented black soybean, is commonly used as a seasoning in southern China. To make it the beans are soaked with herbs, steamed, fermented, and mixed with salt and dried. Soybeans have a neutral energy in the Chinese diet. In traditional Chinese medicine, soybeans are used to cure a variety of ailments. A bill of sale from a Chinese mining camp in 1865 lists China beans and China peas showing that a variety of dried pulses were imported to California (Chan 1986:83-84). And the salt beans referred to on mid-19th century shipping invoices may refer to the importation of fermented soybeans from China to San Francisco (Spier 1958:80).

Physalis sp. Groundcherry

Two species of *Physalis* grow in the San Jose area. *P. lancifolia* is native to South America and grows in wet locations, fields, and disturbed soils. *P. philadelphica* (tomatillo) is native to Mexico, where is it a common cultivated food. In California it grows in disturbed area and fields. A number of *Physalis* species have been introduced to China, but *P. alkekengi* (*suan jiang*) is a native plant that is cultivated as an ornamental. Its fruit is used medicinally. The Feature 86-36/13 Layer 2 flotation sample contained an uncharred *Physalis* seed as did the macrobotanical specimens from this Layer. Puseman et al. (2012) also found uncharred *Physalis* seeds in Feature 86-36/5 Layers 6 and 8, and Feature 85-31/18 Layer 2.

Poaceae Grass family

Numerous grasses grow in California, and they probably were common weeds in San Jose and in the farms and orchards of the Santa Clara Valley. Many grass seeds are morphologically similar, so they are difficult to identify more specifically. Feature 85-31/6 Layer 1 had carbonized small type grasses and Layer 3 had a carbonized large type. Feature 85-31/13 Layer 2 had carbonized small type grasses and Layer 3 had carbonized large types. The 2014 analysis of screen matrix samples and macrobotanical specimens identified one carbonized fragment and two large Poaceae types, one carbonized and one uncarbonized from Feature 85-31/18 Layer 2/3, and one carbonized large type from Feature 86-36/5 Layer 8. This large type may be the same as the Poaceae A type identified by Puseman et al. (2012). Their pollen analysis identified grass pollen in all features, attesting to its prevalence in the local flora. They also identified charred grass seeds and other spikelet parts from Feature 86-36/5 Layers 6 and 8, Feature 86-36/6, Feature 85-31/11, and Feature 85-31/18 Layer 2.

Polygonum sp. Knotweed

Knotweed is a common wild and weedy plant in California. It grows in disturbed or moist soils and the fruits generally ripen in late spring and summer. A few native and introduced species grow in the San Jose area. In China many parts of knotweed plants are used medicinally and some knotweeds are steeped to prepare *liangsha* ((“cooling tea”), an herbal drink prepared in the summer to promote good health. The flotation samples from Features 85-31/6 Layer 3 and 86-36/13 Layer 2 contained uncarbonized knotweed seeds. The 2014 analysis of screen matrix samples and macrobotanical specimens identified one charred knotweed seed from Feature 85-31/18 Layer 2/3 and one uncharred seed each from Feature 86-36/13 Layers Top and 2. Puseman et al. (2012) also recovered an uncharred seed in 85-31/18 Layer 2. These seeds probably reflect the local weedy flora.

Portulaca sp. Purslane

The purslane seeds from Market Street Chinatown probably are *Portulaca oleracea*, the only species that grows in the San Jose area. This is a common introduced weed in California, which grows in disturbed habitats. A few species of purslane grow in China and some have medicinal uses. *Portulaca oleracea*, a weedy plant in fields, is used medicinally, but also is collected as a green vegetable. The young shoots and leaves are eaten fresh or cooked. Blasdale (1899:48) reported finding purslane on vegetable stands in the Chinese section of San Francisco, although not in large quantities. The flotation samples from Features 85-31/6 Layer 3, 85-31/13 (all layers), and 86-36/13(all layers) had uncarbonized purslane seeds, while the Feature 85-31/13 Layer 3 sample contained one carbonized seed. A clump of uncarbonized seeds was found in the Feature 86-36/13 Top Layer screen matrix sample. Puseman et al. (2012) found many uncharred *Portulaca* seeds in Feature 86-36/5 Layers 6 and 8, Feature 85-31/11, Feature 85-31/18 all layers, and Feature 85-31/28. This indicates that purslane was a common weed growing in the area and that it was easily available as a potherb.

Prunus armeniaca/ Prunus sp. Apricot /plum

A few *Prunus* pit fragments in the flotation samples were too small to identify beyond apricot or plum. Uncharred fragments were recovered from Feature 86-36/13 Layer 2 and charred fragments from Feature 85-31/6 Layer 1. The 2014 analysis of screen matrix samples and macrobotanical specimens identified carbonized apricot pits from Feature 85-31/18 Layer 2, uncharred plum pits from Feature 86-36/5 Layer 8, Feature 86-36/13 Layers 1 and 2, Feature 85-31/18 Layer 3, and Feature 86-36/19, and charred plum pits from Feature 85-31/2, Feature 85-31/13 Layer 3, Feature 85-31/20, Feature 86-36/6, and Feature 86-36/19. Apricot/plum types were found uncharred in Feature 85-31/1, Feature 86-36/13 (all layers), Feature 85-31/13, and Feature 86-36/15. The charred pits were found in Feature 85-31/1, Feature 85-31/13, Feature 85-31/10, Feature 85-31/18 Layer 2, Feature 86-36/6, Feature 86-36/9, and Feature 86-36/26. The preponderance of identified plum over apricot in the Market Street Chinatown samples would suggest that more of these are plum. Wohgulmuth and Honneysett (Clevenger 2004:38) also recovered charred plum pit fragments from Feature 85-31/20.

Apricots have been grown in China possibly as far back as the Han dynasty (B.C. 210- 220 A.D.). Currently the Chinese cultivate several varieties, some with juicier fruits than others and some with sweeter seed kernels. The fleshy part of the fruit may be eaten fresh or preserved and has a neutral energy in the Chinese diet. Seed kernels are used like almonds, added to savory or sweet dishes. The seed kernels have a warm energy and are a common *bupin* ("repair substance") in traditional Chinese medicine serving as a lubricant for the lungs and intestines and to promote longevity. Apricots were growing at Mission Santa Clara as early as 1792. In the 1850s improved apricot trees were imported from nurseries in the East to plant in Santa Clara Valley orchards, but they did not become a major crop there until the beginning of the 20th century (Jacobson 1984:96). Jacobson (1984:133) records that apricot harvesting began around the beginning of July, but drying apricots would have extended their availability.

Several different *Prunus* species are called plums. A few types are cultivated in China. Plums have a neutral energy in the Chinese diet and both the fruits and the seed kernels serve as herbal remedies. Plums have been grown in California since Spanish-colonial times, but in the 1850s improved stock was imported to plant in Santa Clara Valley orchards ((Jacobson 1984:90; Vallejo 1890). The two main types grown in California are *P. domestica* and *P. salicina*; prunes come from a variety of *P. domestica*. According to Chan (1986:230) plums were one of the main fruits raised by Chinese fruit growers starting in the late 1870s. So the seeds in these samples most likely came from local farms.

Prunus persica Peach

Peaches are native to northern China and were domesticated fairly early. In the north, they are eaten fresh or cooked as soup or dessert. They are less common in the south, generally eaten dried or pickled as a snack. Peaches are symbols of long life and fertility and bring luck, abundance, and protection (Anderson 1988:135). Peaches have warm energy in the Chinese diet and both the flesh and dried seed kernels are used in traditional Chinese medicine. Peach trees were grown at Mission Santa Clara as early as 1792, but beginning in the 1850s improved varieties were brought from the East to plant in the Santa Clara Valley (Jacobson 1984). Peaches were very popular with mid-19th century California miners (Chapman 2013:37). Chan (1986:230) notes that in the late 1870s, peaches were one of the main fruits raised by Chinese fruit growers. These samples contained uncarbonized peach pits from Feature 86-36/13 Layer 2, and carbonized peach pit fragments from Features 85-31/6 Layer 1, 85-31/13 Layer 2, and 86-36/13 Layer 2. The 2014 analysis of screen matrix samples and macrobotanical specimens identified uncarbonized pits from Feature 86-36/13 (all layers), Feature 85-31/18 Layer 2, Feature 85-31/20, Feature 85-31/24, Feature 85-31/28, Feature 86-36/5 Layer 6, Feature 86-36/18, and Feature 86-36/20, and carbonized pits from Features 85-31/13, among others. It seems likely that these would be local peaches since they were readily available, however they could be imported dried or pickled varieties.

Pulse fragment Cultivated bean fragment

A few cultivated bean fragments were too small to identify further. Most of these probably are *Phaseolus vulgaris* or *Gycine max*, types discussed above. However, Puseman et al. (2012) identified pollen from *Canavalia*, *Phaseolus*, *Pisum*-type, and *Vicia*-type in their analysis, so these could be fragments of other pulses. The fragments were found in the flotation samples from Features 85-31/13 Layer 4 and 86-36/13 Layer 2. The 2014 analysis of screen matrix samples and macrobotanical specimens identified pulse fragments from Feature 85-31/2, Feature 85-31/18 Layer 2/3, Feature 86-36/5 Layers 6 and 8, and Feature 86-36/13 (all layers).

Ribes sp. Currant/gooseberry

Several native and introduced *Ribes* species grow in China, although none seem to grow in Guangdong. The Chinese eat the fruits of some currant and gooseberry varieties and use some to make wine. A few wild types of *Ribes* grow in the San Jose area today. But Chan (1986:124) records that by the 1870s gooseberries were an important crop for the Chinese farmers of Santa Clara County. Cultivated gooseberries (*R. grossularia*) are native to Europe, northwestern Africa, and parts of Asia. Uncharred *Ribes* seeds were found in Feature 86-36/13 (all layers). Most of the *Ribes* seeds in the 2014 analysis of screen matrix samples and macrobotanical specimens were uncharred, and the great majority came from the seed-rich macrobotanical sample from Feature 86-36/13 Layer 2. Other uncharred seeds were found in Feature 86-36/5 Layer 8 and Feature 86-36/13 Layer 1, while charred seeds that probably come from this taxon were found in Feature 86-36/5 Layers 6 and 8 and Feature 86-36/18.

Rubus sp. Blackberry/raspberry

Many wild species of *Rubus* grow in China. The fruits are generally eaten fresh, but may be cooked or made into wine. Raspberries have a warm energy in the Chinese diet. Traditional Chinese medicine uses the dried fruits, seeds, and leaves to cure a variety of ailments and the Chinese raspberry fruit was found among medicines used by Ing Hay, a Chinese doctor who began practicing in eastern Oregon in the 1880s. Wild *Rubus* commonly grows in California as well, often in moist habitats, but by the 1870s the Chinese farmers of Santa Clara County were major growers of raspberries and blackberries (Chan 1986:124). The flotation samples from Features 85-31/6 (all layers), 85-31/13 (all Layers), 86-36/8, 86-36/13 (all layers), and 86-36/18 Layers 3 and 4 contained *Rubus* densities ranging from 0.59 to 2095.00 seeds per liter. Large numbers of unburnt *Rubus* usually indicate privy deposits, since the seeds pass through the digestive system relatively intact.

Rubus was by far the most abundant seed in the 2014 analysis of screen matrix samples and macrobotanical specimens, reaching totals in the thousands. Unburnt seeds were recovered from Feature 85-31/13, Feature 85-31/18 Layer 2/3, Feature 86-36/5 Layers 6 and 8**,** Feature 86-36/13 (all layers), Feature 86-36/18 (all layers), and Feature 86-36/15. The sole charred seed came from Feature 85-31/18 Layer 2/3. Wohgulmuth and Honneysett (Clevenger 2004:38-39) recovered hundreds of unburnt seeds in Feature 85-31/18 and Feature 85-31/20. Puseman et al. (2012) found unburnt seeds in Feature 86-36/5 (all layers), Feature 85-31/6, Feature 86-36/7, Feature 85-31/18 Layer 2/3, and Feature 85-31/28, and three charred examples in Feature 85-31/11. These berries would have come from nearby farms.

Rumex sp. Dock

A number of *Rumex* species grow in China. The Chinese eat the young leaves of sorrel (*R. acetosa*) and use the fruits and leaves for medicinal purposes. California also has a variety of *Rumex* species, some native and some introduced that grow in disturbed or moist habitats. The seeds ripen in late spring and summer. One uncharred *Rumex* seed was recovered from Feature 86-36/13 Layer 2 and one charred seed from Feature 85-31/13 Layer 3. The screen matrix sample from Feature 86-36/5 Layer 8 contained one uncharred *Rumex* seed. Puseman et al. (2012) found one charred seed fragment in Feature 85-31/11. While these seeds probably came from weedy plants growing in the area, they may have been encouraged or protected to provide this potherb and medicine.

Sagittaria sp. cf. Arrowhead, tule potato, wapato

One carbonized seed from Feature 85-31/13 Layer 3 resembles *Sagittaria* sp. Two *Sagittaria* species grow in the San Jose area, generally in ponds, ditches, and slow streams. Strike (1994) notes that many Native California groups baked and ate the tubers. *S. sagittifolia* is a plant cultivated in Chinese paddies for the edible corms, so the Chinese would have been familiar with this plant. The leaves are used in traditional Chinese medicine. Because the seed is not the part used medicinally or for food, it could just represent the local vegetation. But it does suggest that the tubers were locally available as well.

Sambucus sp. Elderberry

Four species of *Sambucus* grow in China but the ones Hu (2005) records as eaten come from Taiwan (fruit) and Inner Mongolia (leaves). Elderberry leaves, stems, and roots are used in traditional Chinese medicine. Two native species grow in the San Jose area, both preferring streambanks and moist places. Native California groups collected the fruits in summer and cooked or dried them before they were eaten. In Europe elderberry flowers and berries are prepared as drinks and the berries may be made into jam or pies. One uncharred *Sambucus* seed was recovered from Feature 85-31/13 Layer 4. The 2014 analysis of screen matrix samples and macrobotanical specimens identified uncharred *Sambucus* seeds from Feature 85-31/18 Layer 2/3, Feature 86-36/5 Layers 6 and 8, and Feature 86-36/13 (all layers). Puseman et al. (2012) also identified uncharred *Sambucus* seeds from Feature 86-36/5 Layers 6 and 8 and Feature 85-31/18 Layers 2 and 3, along with Feature 85-31/11 and Feature 85-31/28. One charred seed from Feature 85-31/6 could be *Sambucus*. Elderberry fruits were easily available in San Jose and their presence may indicate traditional uses as medicine or their uses as food and beverage ingredients.

Scirpus sp. Bulrush

A large number of bulrush species grow both in China and in the San Jose region. Bulrush prefers wet areas, such as marshes, stream banks, and meadows. These samples contained one unburnt *Scirpus* from Feature 86-36/13 Layer 2. The screen matrix samples also contained one unburnt seed from Feature 86-36/13 Top Layer and one burnt seed from Feature 86-36/5 Layer 8. Most likely they came from accidental inclusions of local weeds.

Sesamum indicum Sesame

Sesame is not native to China, but is mentioned in a Chinese agricultural manual dating to the 1st century B.C. Today China is a major producer of sesame seed and the seed is used for food, oil, and medicine. Sesame cultivation in California began in the early 20th century and still is not common (Yermanos et al. 1964). Blasdale (1899:48) recorded that black and white sesame seeds were available in the Chinese section of San Francisco, and though he does not directly say they were imported, he implies it. Two uncarbonized sesame seeds were recovered from Feature 86-36/13 Layer 1. Sesame seeds recovered in the screen matrix samples were uncarbonized and many were eroded, so they probably are more completely digested than other small seeds that pass through the digestive system intact. Seeds were found in Feature 85-31/18 Layer 2/3, Feature 86-36/5 Layers 6 and 8, Feature 86-36/13 (all layers), and Feature 86-36/18 (all layers).

Silene sp. Catchfly

Catchfly is a weedy plant that thrives in disturbed places. There are many native and introduced species in the San Jose area. The introduced species generally grow in fields, along roadsides, and in waste places. The native species grow in open areas, burns, coastal bluffs, chaparral, and woodland. The catchfly comes from Feature 85-31/13 Layer 2.

Siraitia grosvenorii Luo han guo

Siraitia grosvenorii is a cucurbit that is native to southern China, where it is widely cultivated. Its sweet fruit is usually dried and then made into soup, tea, sweets, or medicine. Hu (2005:169, 218-221) lists *luo han guo* as a *bupin*, or "repair substance," commonly found as a whole dried fruit in American stores. In China it would be prepared at home with other ingredients as a tea or soup to soothe the respiratory and digestive systems. Hu's recipe for *luo han guo* soup includes the seeds as well as the rind and pulp along with dried longan, jujube, apricot seed and some other ingredients. *Luo han guo* does not grow in California, so the recovered seeds would have been from imported fruits. One unburnt seed fragment was recovered from the Feature 85-31/13 flotation sample. Unburnt seeds were found in the macrobotanical specimens from Feature 85-31/2, Feature 85-31/13, Feature 86-36/5 Layer 8, and Feature 86-36/18. One burnt seed was found in Feature 85-31/2.

Solanaceae Nightshade family

Some seeds in the Market Street Chinatown flotation samples could only be identified as Solanaceae. A large number of plants from this family grow in the natural vegetation of the Santa Clara Valley and the seeds most likely come from one or more of them. These charred specimens came from Features 85-31/6 Layer 1 and 85-31/13 Layers 2 and 3. The 2014 analysis of screen matrix samples and macrobotanical specimens identified uncharred seeds in Feature 86-36/13 Layers 2 and 3, and charred seeds in Feature 85-31/18 Layer 2/3 and Feature 86-36/13 Layer 3.

Solanum lycopersicum Tomato

Tomatoes are native to Andean South America. According to Anderson (1988:131) tomatoes were recorded in China in the 1500s while Hu (2005:664) says they were introduced in the early 1920s. Now they are a widespread crop in China, generally eaten cooked. Tomatoes have slightly cold energy in the Chinese diet and are eaten raw or cooked to treat a number of illnesses. Tomatoes traveled from Mexico to California with the Spanish colonists and were recorded thriving at a farm near Mission San Jose in 1851 (Hedrick 1950:372). Uncharred tomato seeds were recovered from Features 85-31/6 Layer 3, 86-36/8, and 86-36/13 (all Layers). The 2014 analysis of screen matrix samples and macrobotanical specimens identified fairly large numbers of uncarbonized tomato seeds from Feature 85-31/18 Layer 2/3, Feature 86-36/5 Layers 6 and 8, Feature 86-36/15, and Feature 86-36/13 (all layers, with the largest amount from Layer 2). Puseman et al. (2012) identified uncarbonized tomato seeds from Feature 85-31/6, Feature 85-31/28, Feature 85-31/11, Feature 86-36/5 Layers 6 and 8, Feature 86-36/7, and Feature 85-31/18 Layer 2. One carbonized seed came from Feature 85-31/11. Most of the uncarbonized seeds probably come from privy deposits, since the seeds pass through the digestive system relatively intact.

Trifolium sp. cf. Clover

Many of the small weedy Fabaceae produce similar looking seeds, but the seeds from Feature 86-36/18 Layer 4 could be clover. The native clover species in the San Jose area tend to grow in moist meadows to woodlands while the introduced ones prefer disturbed habitats including agricultural fields. Puseman et al. (2012) recovered uncharred *Trifolium* seeds from Feature 86-36/5 Layer 6, charred seeds from Features 85-31/11 and 86-36/6 Layer 2, and possible charred *Trifolium* from Feature 86-36/5 Layer 4.

Triticum durum/aestivum Wheat

Durum and bread wheat were domesticated in Western Asia and bread wheat was introduced to China by 2500 BC (Flad et al. 2010). It soon became one of the major staples in northern China. Today bread wheat is grown primarily in north, central and western China, and durum wheat is not common. Wheat, ground into flour and then cooked as dumplings or noodles (rarely bread), is consumed throughout China, but is more important in the North. Wheat has cooling energy in the Chinese diet and has some medicinal uses. To make a balm for burns, wheat grains are fried until they are charred, and then ground and mixed with oil (Lu 1994:488). Wheat was brought to California by the Spanish colonists and was a major crop grown at the Pueblo of San José and Mission San José. During the 1850s and 1860s, wheat was the primary crop in the Santa Clara Valley (Jacobson 1984:66). It is difficult to distinguish between durum and bread wheat from the grains alone (Hillman et al. 1996). Today more bread wheat is grown in California than durum and this probably was true in the past as well. Carbonized wheat grains were recovered from Features 85-31/6 Layer 1, 85-31/13 Layers 2 and 3, and 86-36/13 Layer 2. The 2014 analysis of screen matrix samples and macrobotanical specimens identified carbonized wheat grains from Feature 85-31/13, Feature 85-31/18 Layer 2/3, Feature 86-36/5 Layers 6 and 8, Feature 86-36/13 Layer 3, and Feature 88-91/26. Wohgulmuth and Honneysett (Clevenger 2004:39) also found carbonized grains in their sample from Feature 85-31/18. Puseman et al. (2012) recorded carbonized wheat from Feature 85-31/28. Most cooks in Market Street Chinatown probably purchased flour rather than grinding their own grain. Thus, the presence of these grains may be related to animal feed, their use as medicine, or some other purpose.

Vitis vinifera Grape

Vitis vinifera was introduced to China in the 2nd century, but because alcoholic beverages in China were made from rice and other grains, grapes were not widely cultivated through the 19th century. Now European grapes are eaten fresh or dried and are made into wine. They have a neutral energy in the Chinese diet. In addition, the roots, leaves, and fruits are used medicinally. A couple of wild grape species with edible fruits grow in southern China. Grapes were brought to California by the Spanish colonists and vines were growing at Mission Santa Clara as early as 1792. Chan (1986:230) describes that by the 1880s grapes were an important crop for the Chinese farmers of Santa Clara County. Uncharred grape seeds were recovered from Features 85-31/6 Layer 3 and 86-36/13 Layers 1 and 2. Charred seeds were recovered from Features 85-31/6 Layer 1, 85-31/13 Layer 3, and 86-36/13 Layer 2. The 2014 analysis of screen matrix samples and macrobotanical specimens identified three carbonized fruits from Feature 85-31/20 and one carbonized seed each from Feature 85-31/6 and Feature 85-31/18 Layer 2/3. Uncarbonized seeds were recovered from Feature 85-31/6, Feature 85-31/18 Layer 2, 2/3, and 3, Feature 86-36/5 Layers 6 and 8, Feature 86-36/18, Feature 86-36/15, Feature 88-91/26, and particularly plentiful from Feature 86-36/13(all layers). Puseman et al. (2012) also found a carbonized seed from Feature 85-31/6 and uncarbonized seeds from Feature 86-36/5 Layer 8, Feature 85-31/6, Feature 85-31/18 Layer 2 and 3, and Feature 85-31/28. Wohgulmuth and Honneysett (Clevenger 2004:38-39) recorded uncarbonized seeds from Feature 85-31/18 and Feature 85-31/20. Most of the grape seeds probably come from privy deposits, since the seeds pass through the digestive system relatively intact.

Ziziphus sp. cf. Jujube

The *Ziziphus* seeds recovered in the Market Street Chinatown samples are probably *Ziziphus jujube*, a native of northern China. Jujubes are a key fruit in northern China, where they primarily grow, but are also used in southern China, where there are a large variety of other local fruits. Exported fruits are usually dried or preserved in sugar before shipping and may be used as a soup, sauce or dessert ingredient. Jujube fruit is another *bupin*, or healing ingredient, that is made into tea or broth at home. It is considered a heating food. Traditional Chinese medicine uses the fruits, pits and other plant parts to cure a variety of ailments. Hu (2005:87) reported that while the number of jujube trees increased in the California after 1900, all the jujube fruits and other products in American Chinese stores at that time were imported. One eroded charred seed from Feature 85-31/13 Layer 3 closely resembles jujube. The 2014 analysis of screen matrix samples and macrobotanical specimens identified uncharred jujube seeds from Feature 85-31/13 and Feature 86-36/13 Layers Top and 2, while charred seeds were found in Feature 86-36/5 Layer 8. Puseman et al. (2012) identified uncharred seeds from Feature 85-31/18 Layer 2 and charred seeds from Feature 85-31/6. These seeds are another example of an imported Chinese food.

Unknown types and plant parts

Unknown Type A is a small triangular seed with crosswise wrinkles from Feature 85-31/6 Layer 1. Unknown Type B from Feature 86-36/13 Layer 2 is a flat hooked seed, which may be from the Rosaceae family. Unknown Type C is uncharred fragments of a thick seedcoat or thin fruit rind from Feature 86-36/18 Layers 2 and 3. The tan structure has bumps and raised ridges on the surface. Feature 85-31/13 Layer 2 contained three unknown types. Unknown Type D is a carbonized fragment of a large flat seed; Unknown Type E is a carbonized small (2.9 x 2.3 mm) Fabaceae cotyledon; Unknown Type F is a striped seed fragment. Unknown Type G is a small (3.0 x 1.5 mm) ovoid seed with a yellow-brown finely reticulate surface from Feature 86-36/13 Layer 1. Additional examples were recovered in the macrobotanical specimens from this feature.

Features 85-31/6 Layer 2 and 85-31/13 Layer 3 contained carbonized fragments of fibrous tissue (Unknown Type H). Unknown Type I is a small round carbonized seed with a line running down the middle of one side from Feature 85-31/13 Layer 3. Feature 86-36/13 Layer 2 also contained Unknown Type J (a tan eroded seed), Unknown Type K (a flat seed kernel or immature seed with a reticulate edge), Unknown Type L (a tan seed), and Unknown Type M (a small dark brown to black seed that may be a Lamiaceae). Unknown Type 14A is a small spherical seed (1.5-3.0 mm diameter) with a tan surface, eroded in most places to reveal a black faintly striated surface. Unknown Type 14B is also an eroded spherical seed, 1.5 mm in diameter, with a smooth brown surface eroded to reveal long narrow cells. They were recovered in the Feature 86-36/13 Layer 2 flotation sample as well as the screen matrix samples from this feature (top layer). Their eroded natures suggest they were part of ingested foods that passed through the intestinal system.

Other plant parts that could not be identified to taxon included small buds from Feature 85-31/13 Layers 2 and 3 and Feature 86-36/13 Layer 2, and a possible root fragment from Feature 85-31/6 Layer 1. Unknown fruits (including charred pointed bases and charred and uncharred stems) were recovered from Features 85-31/6 Layers 1 and 3, 85-31/13 Layers 2 and 3, 86-36/13 Layer 2, and 86-36/18 Layer 3. Features 85-31/6 Layer 1, 85-31/13 Layer 2, 86-36/5 Layer 1, 86-36/13 Layer 2 had charred and uncharred dicotyledon leaves, while Feature 86-36/13 Layer 2 was characterized by clumps of matted monocotyledon leaves. Features85-31/6 Layer 1 also contained monocotyledon stem fragments and some charred monocotyledon tissue and Feature 85-31/13 Layer 2 had additional monocotyledon stem fragments. Unknown structures that could be thick seedcoats, nutshell, or thin fruit skins came from Features 85-31/6 Layer 1, 85-31/13 Layers 2, 3 and 4, and 86-36/13 Layer 2. Many features contained charred and uncharred unidentifiable seed fragments, unknown plant parts, wood, charcoal, and possible bark. Botanical material that lacked any diagnostic characteristics and could not be positively identified to a known taxa was placed in the Amorphous category. Amorphous material typically possesses minimal vessel structure and lacks a distinctive shape.

Feature Summaries

The seven features in this study were labeled by the ARS archaeologists as wood-lined trash pits (3), unlined trash pits (2), a bone pit (1), and a wooden structure (1). They suggested that several were used first as privies and later as trash pits. The results from Puseman et al. (2012), Popper (2014) and the taxa descriptions above confirm that the features were used as privies and trash dumps, and that they accumulated an array of wild and non-domesticated plants. Privies provide a remarkable window into the diet and plant exploitation activities of their users. Most plant remains from archaeological sites are by-products of food production, food preparation and other activities, and do not directly represent the diet of the site inhabitants. But plant foods that are completely consumed and pass through the digestive system relatively intact in human feces are often extremely well preserved by the moist anaerobic conditions of privies. These foods are rarely recovered from other garbage contexts, because they generally are eaten raw, so there are few cooking accidents to toss out, and if eaten whole, there are no by products to toss. Trash pits and privies serve as dump areas for kitchen waste, such as large pits or seeds that are not eaten, and other garbage. Periodically, privy deposits may be capped by a layer of fill to reduce the smell. If the fill is collected from an open area it could contain wild and weedy seeds and other plant parts. In addition, seeds or plant parts could accidentally blow into or be carried into pits and privies.

The following summaries of the feature contents describe the most significant, but not necessarily all the types recovered in each feature. The remains (items) discussed are seeds or pits unless otherwise mentioned, and do not include amorphous material, bark, charcoal, or wood. Tables 6 and 7 present most of the cited numbers. To be conservative in the interpretation, seeds from crops that could grow in California are considered local, although a number of them, such as peaches, and cucurbits, could well have been imported as dried fruits or seeds.

Feature 85-31/6

Feature 85-31/6 was a shallow unlined trash pit, located in an area of merchant/professional activity (Cummings et al. 2014:151). The 10 cm deposit was excavated in three layers. According to Kane (2011: Appendix D) "Layer 1 covered the whole feature and was a heavy concentration of artifacts within a mixed soil. Layer 2 was only found in the north half of the feature and was a 2.5 cm deep ash deposit. Layer 3 was a grey clay interspersed with iron and other artifacts that covered the entire area of the feature."

The two flotation samples from this analysis came from Layers 1 (sample 85-31/6-213) and 3 (sample 85-31/6-215). Layer 1 contained 33 plant types, with a total density of 225.25 items/liter, no wood and 6.9 g/liter of charcoal. While the sample contained no large material, there were some moderately large remains and many very small remains. The seeds and fruits were very fragmented. Carbonized rice (*Oryza sativa*) calluses dominated the assemblage, making up 73% of the remains, so that over 83% of the items were from the grain, fruit and vegetable categories and 89% were carbonized. The remaining items were an array of imported and locally grown foods, primarily carbonized rice, watermelon (*Citrullus lanatus*), apple/pear (*Malus*/Pyrus), exploded fruit fragments (some of which might be grape), and unidentified seedcoat/nutshell/thick fruit skin fragments. Other foods included wheat (*Triticum durum/aestivum*), Chinese olive (*Canarium* cf. *album*), longan (*Dimocarpus longan*), and peanut (*Arachis hypogaea*). There were few cucurbits or small seeds associated with privy deposits. The few fig (*Ficus carica*) and grape (*Vitis vinifera*) seeds were all carbonized, and these along with the carbonized watermelon seeds were unusual for Market Street Chinatown since figs and grapes were usually preserved unburnt in the privy deposits and watermelon seeds were rarely burnt. This indicates more burning of trash deposited in this Layer. The sample also contained fragments of charred burlap-like fabric adhering to charred amorphous material

Four of the bags of macrobotanical specimens from Feature 85-31/6 were labeled as coming from Layer 1S. They contained 5 large items: charred and uncharred Chinese olive, charred litchi (*Litchi chinensis*), and uncharred peanut shell. In total, 60% of the remains were charred.

Layer 3 contained 29 plant types, with a total density of 136.75 items/liter and 4.2 g/liter of charcoal, and a small amount of wood. The longan seed was the largest item recovered and some taxa, such as watermelon, were very fragmented. In contrast to Layer 1, *Rubus* (blackberry/raspberry) dominated the samples, comprising 65% and only 13% of the items were carbonized. This sample has more privy remains, with relatively high proportions of Ericaceae and fig, but also relatively high proportions of rice hull parts and *Benincasa hispida* seeds. 89% of the items were from the grain, fruit and vegetable categories.

Five of the bags of macrobotanical specimens from Feature 85-31/6 were labeled as coming from Layer 3. Uncharred *Benincasa hispida* var. *hispida* (*dong gua*, winter melon) dominated the specimens. The hairy gourd (*Benincasa hispida* var. *chiehqua*), Chinese olive, and peanut shell also were uncharred, but the longan, *Dracotomelon dupperreanum* (Asian pheasant tree), and walnut shell (*Juglans* sp.) were charred.

Puseman et al. (2012) analyzed macroremains, pollen, and phytoliths from Layer 2 of this feature (Sample 5), identifying some additional taxa such as maize (*Zea mays*), beans, possible common pea or soybean (*Pisum/Glycine*), and jujube (*Ziziphus* sp.). But again, the majority of the remains were carbonized rice florets and there were relatively few fig, tomato (*Solanum lycopersicum*), grape and other seeds one would associate with privy deposits. So this resembles Layer 1 more than Layer 3. Cerealia pollen dominated the pollen assemblage, and was interpreted as coming from wheat flour. What stands out most from this feature is the high number of cereal glume and stem remains, particularly of rice in the macroremains and rice, maize, and wheat in the phytoliths. These grain byproducts could indicate cereal processing in the area, the use of byproducts as animal feed, or some other use for the glumes and straw such as packing material. Many of these also were carbonized, suggesting they were burned for disposal or to produce heat for some activity.

The one Layer 2 bag of macrobotanical specimens had a charred Chinese olive seed. The seven bags without layer attribution contained items similar to the feature flotation samples, with charred longan the most abundant.

Feature 85-31/13

Feature 85-31/13 was a wood lined pit, measuring 1.22 by 0.97 m and 1.17 m in depth. The flotation samples from this feature come from Layers 2 (sample 85-31/13-427), 3 (sample 85-31/13-429), and 4 (sample 85-31/13-432). According to Kane (2011: Appendix D) "Layer 2 was indicated by grey soils that faded to yellow soils, and included a heavy concentration of porcine bone, large earthenware fragments and a variety of objects of Chinese origin. Layer 3 was described as clean sand containing very few artifacts. Layer 4 consisted of an organically rich soil, concentrated with fish bones and exhibiting a strong odor. This layer contained a wide variety of artifacts. "

Layer 2 contained 39 plant types, with a total density of 99 items/liter and 4.6 g/liter of charcoal and a small amount of wood. Half the remains were rice floret parts and 73% of the items were from the grain, fruit and vegetable categories. Nonetheless, the sample was unusual for the large variety of remains in the "other" category, 27 types, many of these non-domesticates or weedy plants. Most of the rice floret parts were burnt and, in total, 75% of the items were carbonized. The sample also contained small pieces of burnt fiber and possible burlap. The seeds were very fragmented, especially the unburnt bitter gourd (*Momordica charantia*), the burnt watermelon, and the many unidentified pieces of seedcoat/nutshell/thick fruit skin. Only two taxa were definite imported plants, excluding the possibility that the unknown or unidentified types could have been imported. The sample contained the highest density of rice grains in this study and two had floret parts adhering to the grain, showing they were imported unthreshed or incompletely threshed. Bamboo (*Bambusa* sp. cf.) is the other imported plant. The rest of the foods (wheat, cucurbits, and fruits) non-domesticates, and weeds could have grown in California. While there are seeds from some fruits associated with privy deposits, they are not very dense in this sample.

The Layer 3 flotation sample contained large quantities of bone, so it is unclear if it actually is from this Layer given Kane's (2011) description. Similar to Layer 2 it had a wide range of plants, 36 types, with a density of 69.5 items/liter and 4.6 g/liter of charcoal and a small amount of wood. Carbonized remains made up 70% of the sample, with most of these carbonized rice floret parts and some grains (barley, rice, wheat) and fruits. The grain, fruit and vegetable categories comprised 72% of the sample, but there were few small seeds related to privy activity. Rice and possible jujube were the only clearly imported foods.

Layer 4 was notable for the huge numbers of fish scales and beetle heads and the high density of charcoal (29.2g/liter). In contrast, the density of other plant items was relatively low (12.5 items/liter) and only 31% were carbonized. The grain, fruit and vegetable categories comprised 69% of the sample, but none were grain remains and most of these were Ericaceae, fig, and blackberry/raspberry. Overall this sample seems to contain a relatively low density of food trash, including fruits, cucurbits, and a pulse, and few wild or non-domesticated plants. It was the only sample with *Siraitia grosvenorii* (*luo han guo*) in these flotation samples.

Eight bags of macrobotanical specimens and two relatively small screen matrix samples were analyzed from Feature 85-31/13 (Popper 2014). The screen matrix samples had no level designations and contained few seeds and only 7 types. Wheat, probable wheat, and rice grains were the only carbonized remains (totaling 38%). The unburnt seeds were bitter gourd, blackberry/raspberry, jujube, and mallow (*Malva*). The 23 macrobotanical items consisted of 12 types and 39% were carbonized. Most of these were fruits, including from Layer 3 local peach (*Prunus persica*), apricot/plum (*Prunus* sp.), and watermelon along with imported Chinese olive and longan from Layers 3 and

4. There were few cucurbits (*kua*), but this feature was one of the few containing imported *luo han guo* from Level 4. And the macrobotanical specimens included an additional carbonized wheat caryopsis from Layer 3.

Feature 86-36/5

Feature 86-36/5 was a large wood-lined pit (measuring 3.25 by 1.25 meters and 2.2 meters in depth) located in an area of tenement housing (Cummings et al. 2014:151). The flotation samples analyzed in this study came from Layers1, 1A, and 3. Kane (2011: Appendix D) describes the layers as follows:

> Layer 1 – This was considered to be the first undisturbed strata within the feature. It contained historic and recent artifacts within a loose, gray/brown, medium-grained sandy silt. … Layer 1a – this layer was present only on the west side of the feature. It was a small deposit of very loose, fine-grained ash/silt containing a small quantity of Chinese artifacts and pig bones. … Layer 3 – A clayey silt containing a very high quantity of gravel, concrete and asphalt.

The analysis of the flotation samples from these three layers shows that the deposits were not significant areas of plant refuse or that preservation was extremely poor. Layer 1 had a density of 2.7 items/liter and 9.1 g/liter of charcoal (most of it from one huge fragment) and a small amount of wood. Only five types of plants were recovered and 29% of the items were carbonized. A small *Benincasa hispida* fragment and some charred peanut shell were the only identifiable food remains. The red maids and leaf represent the local vegetation. Layer 1A had a density of 2.5 items/liter and 0.4 g/liter of charcoal and no wood. Four types were present (rice floret, peanut shell, goosefoot, and unidentifiable) and 29% of the items were carbonized. Layer 3 had a density of 2.9 items/liter and 1.0 g/liter of charcoal and a small amount of wood. Four types of plants were present (rice floret, peanut shell, mallow, and unidentifiable) and 80% of the items were carbonized. These flotation samples are somewhat similar to the Layer 4 flotation sample, with relatively few remains, and a stark contrast to the screen matrix samples, macrobotanical specimens and flotation samples from Layers 6 and 8 of this feature (Popper 2014; Puseman et al. 2012). They provide a useful control to emphasize the extraordinary richness of the lower layers.

The screen matrix samples, macrobotanical specimens and flotation samples analyzed from Layers 6 and 8 show the use of the feature as a privy and trash pit (Popper 2014; Puseman et al. 2012). The size and quantities of remains in the three groups of samples suggest that most of the large plant remains from the feature were pulled out as macrobotanical specimens and that the screen matrix samples were collected with a screen small enough to collect most of the types of taxa recovered in the flotation samples, with the some underrepresentation of fig and strawberry (*Fragaria* sp.). Forty taxa were identified from the screen matrix samples (only 0.6% of the remains were carbonized) and 23 taxa were identified from the macrobotanical specimens (only 1% of the remains were carbonized). The high percentage of uncarbonized seeds reflects the preponderance of seeds from privy activity: 94% of the screen matrix sample seeds and 87% of the macrobotanical specimens were blackberry/raspberry. Other small privy-type seeds included grape (*Vitis vinifera*), currant/gooseberry (*Ribes*), fig, strawberry, and tomato (*Solanum lycopersicum*). The larger fruits included a variety of cucurbits, apple/pear, peach (*Prunus persica*), English walnut (*Juglans regia*) and imported Chinese olive and possible gingko (*Ginkgo biloba*). There were usually high numbers of carbonized grains (wheat and rice) and beans (common bean/soybean [*Phaseolus vulgaris*/*Glycine max*] and pulse fragments) in these samples. In addition this feature contained many wild and weedy taxa from local trees and herbs that grow in open lots, agricultural fields, or moist habitats. A number of potential medicinal plants were recovered, including the local mallow and sumac (*Rhus*) as well as velvet-leaf (*Abutilon theophrasti*), motherwort (*Leonurus*), and Chinese boxthorn (*Lycium chinense*), taxa that are rare or not known to grow in California.

Puseman et al. (2012) identified a reduced but similar range of plants in the Feature 86-36/5 Layers 6 and 8 flotation samples. The analysis of microremains provided a broader picture of the local environment and economic plants. For example, large amounts of Brassicaceae pollen showed that mustard family plants (e.g. radish, turnip, mustard) probably were eaten although these moist, fleshy roots and leaves have not preserved. In addition, they identified pollen from *Canavalia*, *Phaseolus*, *Pisum* -type, and *Vicia*–type beans, which might come from fresh legumes. The samples contained many rice glume, leaf, and stem phytoliths along with cereal grain and maize cob phytoliths.

Feature 86-36/6

Feature 86-36/6 was a small shallow circular unlined trash pit located in an area of merchant/professional activity (Cummings et al. 2014:151). According to Kane (2011: Appendix D) "Layer 2 was a thick deposit of ash and scattered charcoal that contained porcine remains and artifacts associated with the Chinese community. Layer 3 was described as a medium-grained silt interspersed with metal fragments, ash and charcoal, pebbles, and a large concentration of Chinese artifacts." Sample 86-36/6-304 from Layer 3 was full of rocks and had a density of 4.6 items/liter and 0.2 g/liter of charcoal. All of the items were small, carbonized seed fragments. The macrobotanical specimens from Layer 2 were Chinese olive, Asian pheasant tree, litchi, apricot/plum, plum, and English walnut. Most were carbonized (71%), which could indicate that large pits (i.e. trash) were burnt before disposal in pits.

The small flotation sample (Sample 4 Layer 2) analyzed by Puseman et al. (2012) recovered no cultigens, but a few carbonized wild seeds and more charcoal (5.9 g/liter) than the Layer 3 flotation sample. The Layer 2 macrobotanical specimens were similar to Layer 3 with charred litchi, apricot/plum, plum, and uncharred English walnut. The remains were not burnt in situ, but probably came from cleaning out an oven, roasting pit, above ground trash burn, or some other location of burning. The low pollen numbers confirm that this was a deposit of burnt material, since fire destroys pollen. However, there were large numbers of rice leaf and stem phytoliths in the ash, which raises the possibility some of the ash comes from material used as fuel or kindling, or that the stems and leaves was burned as trash (Puseman et al. 2012).

Feature 86-36/8

Feature 86-36/8 was a bone pit adjacent to a pork roasting furnace. Sample 86-36/8-103 had 7 types of remains with a density of 17.3 items/liter and 0.7 g/liter of charcoal. Only 5% of the items were carbonized. Almost half of the remains were tomato seeds, with the rest cucurbits, fig, blackberry/raspberry, and goosefoot. It seems that most of the larger plant remains in this feature were collected as macrobotanical specimens. The 36 macroremains from the pit were all cucurbits, primarily bitter gourd (69%) and the rest hairy gourd and winter melon. None were carbonized.

Feature 86-36/13

Feature 86-36/13 was a wooden structure in the vicinity of Feature 86-36/5. The flotation samples from this feature come from Layers 1 (sample 86-36/13-328), and 2 (sample 86-36/13-333). Kane (2011: Appendix D) describes the upper feature layers as follows:

> Layer 1 was deemed disturbed by the ARS excavators and was described as a loose dark brown silt with charcoal and wood fragments. The material recovered from this layer included various historical and "recent" artifacts and faunal remains. Layer 1 was sometimes referred to as the "Top Layer." … The Top Layer was also referred to as the "Burn Layer" though evidence for fire is minimal. A wooden floor was found at the base of Layer 1, about 10-20 cm down. Layer 1 appears to have extended over the full area of the feature. Layer 2 was an intrusion into Layer 1… It was located in the east portion of the feature. This layer was described as a coprolite matrix, very compact and green in color. Layer 3 was a firm, black silt with metal fragments and was located beneath Layer 2 in the eastern portion of Feature 13.

The Layer 1 flotation sample was small but dense with plant remains. It contained 19 plant types, with a total density of 9510 items/liter, and 8.2 g/liter of charcoal and 2.3 g/liter of wood (most twig or vine-like). (Because the sample was smaller than 1 liter, the density values are higher than the actual counts.) None of the remains were carbonized. The grain, fruit and vegetable categories comprised 98% of the remains, with strawberry 67%, blackberry/raspberry 22%, and relatively high densities of grape, tomato, and fig. This was the only sample in the current study with sesame seeds (*Sesamum indicum*). Almost all of the larger seeds (cucurbits, watermelon, and apple/pear) were fragmented, but some of the charcoal measured 1 cm. Consequently, while the vast majority of the remains came from a privy deposit, it is unclear if larger seeds are missing because they were pulled out during screening.

One screen matrix sample (86-36/13-337 Top Layer) and two samples of macrobotanical specimens (86-36/13-28 and 86-36/13-144 Layer 1) provide additional information about this feature layer (Popper 2012). The screen matrix sample was dominated by estimated thousands of blackberry/raspberry seeds. The second most abundant seed was grape, followed by tomato. While many fig and strawberry seeds were recovered, they were a far smaller proportion of the screen matrix sample than the flotation sample, suggesting that the smallest remains were not captured in the matrix sample screen. The sample contained many cucurbits and a variety of larger fruits. Local taxa included a lot of watermelon as well as apple/pear, peach, and apricot/plum. Jujube, Chinese "plum" (*Prunus mume*), and sesame seed were imported taxa. This was the only other sample besides the Layer 2 flotation sample where Unknown Types 14A and 14B were recovered. So it is possible that the two samples are actually from the same deposit. The macrobotanical specimens add coconut shell (*Cocos nucifera*), Chinese olive, peach, cherry, plum, common bean/soybean (*Phaseolus vulgaris*/*Glycine max*), and English walnut to the array of foods in the feature.

The Layer 2 flotation sample contained three types of deposits not found in the other samples: small clumps of clay with no plant remains, clumps of matted grass/reed stems with notable amounts of chili pepper (*Capsicum* sp.), and rock hard clumps made up primarily of soil, plant remains, and rusted metal. Some of the matted stems and hard clumps could not be broken up during flotation; they mainly contained chili pepper and charcoal, blackberry/raspberry, and strawberry seeds, respectively, so these are slightly underrepresented in the seed totals. This flotation sample also stood out for the largest variety of remains in this study with 59 plant types. The density of remains was also high, with a total density of 3991.3 items/liter, and 21.2 g/liter of charcoal and 13.3 g/liter of wood. Only 0.4% of the remains were carbonized. The grain, fruit and vegetable categories comprised 97% of the remains, with strawberry 68%, fig 11%, and blackberry/raspberry 8%. Much of the sample was made up of small privy-deposit seeds, but there were also some grains (rice and wheat), beans, cucurbits, and larger-seeded fruits (a small peach pit and apple/pear). In addition, there were 24 types of items in the “other” category. Some of these are unknowns or fragments that may have come from foods. But an array of them (e.g. Brassicaceae, mallow, groundcherry [*Physalis*], and knotweed [*Polygonum*]) probably reflects the local weedy vegetation, although parts of these plants could have been collected as potherbs or for medicinal purposes.

One screen matrix sample (86-36/13-338) and one sample of macrobotanical specimens (86-36/13-194) provide additional information about this feature layer, however the latter contained so many seeds that it is more accurate to treat it as another screen matrix sample (Popper 2012). Both samples were dominated by blackberry/raspberry seeds, with significant amounts of grape, currant/gooseberry, prickly pear, tomato, and watermelon. Fig and strawberry seeds, while abundant were far fewer than in the Level 2 flotation sample. The cucurbits included melon, possible cucumber and the only occurrence of possible *Cucurbita maxima* squash/pumpkin. The larger fruits are similar to those found in the other screen matrix samples from this feature, but also include imported Asian pheasant tree and litchi. High numbers of possible Chinese boxthorn support their being something ingested (be it for medicinal or subsistence purposes) rather than accidental inclusion.

The Feature 86-36/13 Layer 3 screen matrix samples and macrobotanical specimens in general contained the same taxa and proportions of remains as the other layers. Together all the samples show a huge diversity of plant types and that the majority of the Feature 86-36/13 seeds came from privy deposits. The quantities of small fruit seeds swamped the many cucurbits and the variety of larger fruits. Few grain and bean remains were recovered. Wild and non-domesticated plants were extremely diverse and could have come from open areas in town or humid habitats. Seiter and Worthington (2013) similarly found that this feature contained the most wood and the widest variety of wood species of all the features they analyzed.

Feature 86-36/18

Feature 86-36/18 was a large redwood-lined trash pit located at the far northwestern corner of Block 1. It measured 2.7 by 1.3 meters in extent and 1 meter deep. According to Kane (2011: Appendix D) the feature was excavated in three units, each with its own stratigraphy. The flotation samples came from Layers 2 (86-36/18-531), 3 (86-36/18-532) and 4 (86-36/18-533) of Cell 1. Kane (2011: Appendix D) describes them as follows:

> Layer 2 was a yellow-brown silty clay, well packed and containing faunal remains and a whole soy pot. Layer 3 was a small pocket of grey silt within the NE section of Layer 2. This loose matrix contained faunal remains. Layer 4 was a grey/blue/brown silt clay, loosely packed. This layer saw an increase in metal fragments and a decrease in the faunal remains recovered.

These samples flotation samples contained very few plant remains. Layer 2 had only four types of remains: winter melon, fig, Unknown Type C and unidentifiable seed fragments. Density values were low with a total density of 1.5 items/liter, 0.2 g/liter of charcoal and very little wood. Only 14% of the remains were carbonized. Layer 3 (86-36/18-532) had five plant types: winter melon, strawberry, blackberry/raspberry, charred fruit base fragments, and Unknown Type C. The total density of remains was 8.3 items/liter, 0.6 g/liter of charcoal and 0.7 g/liter of wood. Only 36% of the remains were carbonized. The deposit was noticeable its high coal content. Layer 4 (86-36/18-533) had four plant types: hairy gourd or winter melon, blackberry/raspberry, burclover (*Medicago* sp. cf.), and clover (*Trifolium* sp. cf.). Again the density of remains was low, with a total density of 1.76 seeds/liter, 0.5 g/liter of charcoal, and very little wood. Only 20% of the remains were carbonized.

Three screen matrix samples were analyzed from this feature, but only one (sample 86-36/18-555, Below Layer 3 to Floor) came from Cell 1 (Popper 2014). It contained relatively few (37) plant remains, with 73% blackberry/raspberry and the rest a cereal fragment, Fabaceae, bitter melon, sweetclover (*Melilotus* sp. cf.), sesame, and Cupressaceae leaves. The other two screen matrix samples (86-36/18-558 from Cell 2

Interior Level A and 86-36/18-592 from Cell 3 Layer B) were richer with more seeds (predominantly blackberry/raspberry), but only a few more types: Cucurbitaceae, fig, mallow, burclover, currant/gooseberry, a possible adzuki/mung bean (*Vigna* sp. cf.), grape and Szechuan pepper (*Zanthoxylum* sp.).

The sample of macrobotanical remains from Layer A (Cell unknown) had only two items, winter melon and *luo han guo* seeds. The Layer B sample (Cell unknown) had 30 items. Cucurbits were the largest portion of the remains, with high amounts of *luo han guo* compared to other features. This was also the only feature with spring bitter melon (*Momordica cochinchinensis*), an imported taxon whose seeds are used in traditional Chinese medicine. Since the fruit is eaten when young, and these seeds are mature, they seem likely to represent the medicinal use. Fruits and nuts include a variety of local taxa (grape, peach, cherry, watermelon, black walnut, and peanut) and a couple of imported taxa (Chinese olive and Asian pheasant tree). No grains or beans were recovered, but this feature contained one of only two maize cobs found in the screen matrix samples and macrobotanical specimens. No wild taxa were present, perhaps because very small items were not collected or pulled from the screens by the original excavators. Together the flotation samples, screen matrix samples and macrobotanical remains show a mix of privy deposits and kitchen trash.

Discussion

The Market Street Chinatown flotation samples, screen matrix samples and macrobotanical specimens from Features 85-31/6, 85-31/13, 86-36/5, 86-36/6, 86-36/8, 86-36/13, and 86-36/18 contained a mix of cultivated and non-domesticated, or wild/weedy taxa, but the most ubiquitous and abundant remains were cultivated plants, and the variety was impressive (Table 8). The distinct methods of collecting samples often favored different types of remains, with the smallest seeds (1mm >) generally coming from the flotation samples and the largest seeds often pulled out as macrobotanical specimens. Putting the three types of samples together gives a more complete picture of plant use at Market Street Chinatown. And a larger number of flotation samples let us begin to tease out different depositional events within the features.

In the current study, blackberry/raspberry was the most common food remain, recovered in 10 of the 15 samples and 5 of the 7 features, and its abundance (density) was surpassed only by strawberry, which was found in 5 samples from 3 features. Blackberry/raspberry seeds were also the most abundant, although not the most ubiquitous, remains in the screen matrix samples and macrobotanical specimen samples from these features. In those samples the most ubiquitous plants were winter melon and Chinese olive, found in 6 of the features, followed by hairy gourd and bitter gourd, found in 5 of the features. Other ubiquitous plants in the flotation samples included fig, peanut, watermelon, winter melon, hairy gourd, goosefoot, and mallow, each of which occurred in 7 or more samples and 4 or 5 features. Many of these taxa were not abundant, but their ubiquity attests to their widespread consumption, in the case of the foods, and their prevalence in the local vegetation, in the case of mallow and goosefoot.

The plants recovered from Market Street Chinatown represent a variety of activities at the site. Food was purchased from local farms and imported from China, sold at stores, and prepared for daily meals and festivities. Cooking and eating created trash from unused by-products, such as peach pits, cooking accidents that burned or spoiled food, fuel, and human waste. Chinatown residents also visited local doctors, drugstores, and grocery stores to obtain medicine, or may have gathered familiar medicinal herbs when they were in the countryside (Bowen 2002). Horses, pigs, and chickens required food and bedding material and produced soiled bedding and manure that needed to be removed. The movement of people and animals in and out of town was a means for the introduction of non-local wild plants. Some may have been collected on purpose for food or medicine, some may have been eaten by animals, and others probably were transported accidentally. Weeds growing in Chinatown may have blown in and been swept up for disposal. These and other activities created a large amount of waste and trash that needed to be removed.

The Market Street Chinatown features were filled with this trash and waste as well as accidental inclusions. Human waste, containing small seeds from fruits and vegetables, was deposited in privies. Some kitchen waste, such as cucurbit seed and large fruit pits, may have been tossed in privies or trash pits. Other kitchen waste was probably fed to the livestock. Henry (2012:68) found a large number of rat bones in Feature 86-36/5, perhaps representing disposal of carcasses from rat catching or other pest management tactics. However rats likely also entered the trash pits while alive, burrowing into trash pits and mixing the deposits; they probably ate a variety of discarded foods and jeopardized stored foodstuffs as well. If the privies/trash pits were covered by lids or structures, relatively few non-edible wild or weedy seeds would blow into or be carried into the pits, for example those carried on shoes or clothing when people opened the pits to dispose of human waste or trash. Therefore wild/weedy seeds in these deposits likely represent capping episodes, dumping of backyard sweepings or weeding, or seeds that entered when the pit was open to the elements (perhaps during periodic cleaning out). Privy and trash deposits may periodically have been capped with fill to reduce the smell. If the fill came from nearby open areas, it could contain local weeds. Some fill could have included trash from the occupants who lived in the area prior to the arrival of the Overseas Chinese, unearthed when digging pits. With the large Chinatown population it is possible that privies were periodically cleaned out as they were in other urban areas. Some human waste may have been collected to fertilize the crops in nearby truck gardens (Nordhoff as cited in Spier 1958:81). The Chinatown residents may also have burned some of the trash, throwing fruit pits and smaller items into ovens and hearths along with firewood and coal, and burning larger amounts outside. The resulting ash and embers may then have been dumped into trash pits and privies. With the variety of potential sources for trash in the pits, one would expect that different dumping episodes of trash within individual features would produce different arrays of plant remains among layers as well as features.

While the unusual wealth of uncarbonized remains from Market Street Chinatown provides information on many plants that are rarely preserved in archaeological sites, the carbonized remains also offer insights into Chinatown life. Twenty-four of the taxa recovered from Market Street were always or mainly burnt. These include all the cereal grains and beans, as well as longan, litchi, Asian pheasant tree, wild grasses, and a few other wild taxa. This study, Popper (2014), and Puseman et al. (2012) found only burnt wheat, rice, barley, sorghum, foxtail millet, and maize, although unburnt rice florets/spikelets were common. Similarly the common bean/soybeans, adzuki/mung beans, chickpea, and peas were all burnt. The grains and beans may have been accidentally burnt during cooking. Other activities that may have produced the burnt grains include charring barley and wheat to prepare medicines, burning the dung of grain-fed animals, and general burning of trash. Why would grains and beans only occur in a carbonized state? Since most are as dense as many of the uncarbonized taxa found in the same features, it is not a matter of preservation or decomposition. It seems likely that unburnt grains and beans were eaten by scavenging animals, such as the pigs, chickens, dogs, and rodents that also lived in Chinatown, leaving behind only the burnt ones. A comparison of the Market Street Chinatown feature contents reveals that the number of charred remains is one of several variables that distinguish one from another.

The seven Chinatown features in this study contained a mix of privy waste, kitchen garbage, general trash, and fill, but in different proportions and with different types dominating the non-privy remains. Feature 86-36/13 stood out from the others, containing the greatest variety of taxa (62 from the flotation sample and additional 21 types from the screen matrix and macrobotanical specimen samples) and highest quantity of remains. Small seeds from privy deposits, cucurbits, and seeds from large fruits were abundant and there were a large variety of non-domesticated seeds. In contrast, there were very few grains and beans and few burnt remains, other than charcoal. If these contents reflect the meals of tenement occupants, since it was located near Feature 86-36/5, it shows a broad diet with both local and imported foods. I would suggest that the lack of grains is more a result of the lack of burnt food remains rather than dietary choices.

Feature 85-31/6 Layer 1 (a merchant-associated feature) and Feature 85-31/13 Layers 2 and 3 (association unknown) contrast sharply with Feature 86-36/13. These deposits show evidence of significant burning, are full of rice hull fragments (florets and calluses), and have the highest densities of cereal grains in the current study. The features contained taxa that were rarely burnt (grape, fig, and watermelon) along with a fair number of burnt imported fruit seeds. The low densities of small fruit seeds evidence a mix of trash more than a privy deposit. Puseman et al. (2012) also recorded fairly high charcoal densities, high cereal grain and bean counts, and phytoliths from grain by-products from Feature 85-31/6. A similar phytolith assemblage came from Feature 86-36/6 Layer 2, which looked like an ash lens from a burn deposit, perhaps from cleaning out an oven. Puseman et al. (2012) found few small seeds, many large burnt seeds and pits, and many rice leaf and stem phytoliths, which may have been from kindling or may have been a way to get rid of packing material or soiled straw. The flotation sample from Layer 3 in this study contained no identifiable seeds and very little charcoal. But the macroremain specimens from Layers 2 and 3 were primarily carbonized fruit seeds and nutshell.

Feature 85-31/6 Layer 3 and Feature 85-31/13 Layer 4 contain far fewer carbonized remains than the upper levels of the features, a higher proportion of privy remains, and more cucurbits. They seem to contain more of an even mix of burned kitchen garbage and privy waste, but have fewer (Feature 85-31/6 Layer 3) or no (Feature 85-31/13 Layer 4) rice hull fragments.

Three flotation samples from three features contained relatively low densities of seeds, fruits and plant parts, indicating the mixing of plant trash with other disposed items and fill. Feature 86-36/8 mainly had small seeds (in particular tomato) and cucurbits, although the cucurbits were collected as macrobotanical specimens, so their density is uncertain. This concentration of the cucurbits could well reflect that they were an easily available vegetable or that the samples come from one dumping episode. The Feature 86-36/5 flotation samples in this study contained low plant remain densities, but this contrasts with the high seed densities in the lower layers (Popper 2014; Puseman et al. 2012). And although the Feature 86-36/18 flotation samples (from Cell1) were poor, the screen matrix and macrobotanical specimens from Cells 2 and had an unusual group of remains: a mix of privy and trash deposits, with relatively high amounts of atypical imported taxa, sesame and *luo han guo*, and the only spring bitter melon seed. There was little evidence of burning and very few cereal grain and bean, although a maize cob fragment was recovered.

The Market Street macroremains present a picture of Chinatown life with an ample and varied diet supplied by local farms and imported from China. Many of these products were grown by Overseas Chinese, who began farming traditional crops soon after arriving in California as share croppers and truck gardeners (Chan 1986; Spier 1958:81). They primarily grew vegetables and small fruits, and according to Nordhoff (cited in Spier 1958:81), by 1872 two thirds of the vegetables in California were grown by Chinese farmers. Other farmers worked in the fruit orchards that thrived in the Santa Clara Valley and beyond (Chan 1986; Jacobson 1984). Many of these vegetables and fruits and some of the non-domesticates recovered from the Chinatown features provided the balanced diet and other herbs that were needed to promote good health according to traditional Chinese cuisine and medicine.

Nonetheless, Puseman et al.'s (2012) pollen and phytolith research and documentary sources tell us that some important Chinese plant foods are missing from this assemblage. Anderson and Anderson (1977:328) describe the typical 20th century diet in southern China as primarily rice, soybeans, cabbages, mustards, and radishes. Hsu (2000:21) cites a report from an 1893 edition of The Taishan Gazetteer of southern Guangdong that "farming provided a varied diet; in addition to starches such as rice, taro, and sweet potatoes, crops included 24 types of vegetables, 12 kinds of melons, and 24 different fruits." The lists of foods typically imported from China included cabbage sprouts in brine, oranges, bamboo shoots, yams, ginger, and chestnut flour to name a few (Coe 2009: 118-119; Spier 1958:80). Prepared foods such as steamed dumpling and noodles would commonly have been eaten. And given the reports of extensive, perhaps daily, use of herbal teas, *liangsha*, and *bupin*, by the Overseas Chinese (Culin cited in Bowen 2002:176; Hu 2005) we probably are missing many traditional Chinese remedies.

Macroremains from Market Street Chinatown attest to the strong ties between the Overseas Chinese and traditional Chinese foodways as well as the active role the Overseas Chinese took in molding 19th century farming in California. They used their expertise in farming to supply the Chinese vegetables that were a major part of their diet and essential to their health, and to expand their consumption of familiar non-Chinese foods that were less commonly eaten in southern China.

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