

The Historical Linguistics of Uto-Aztecan Agriculture

William L. Merrill

Smithsonian Institution

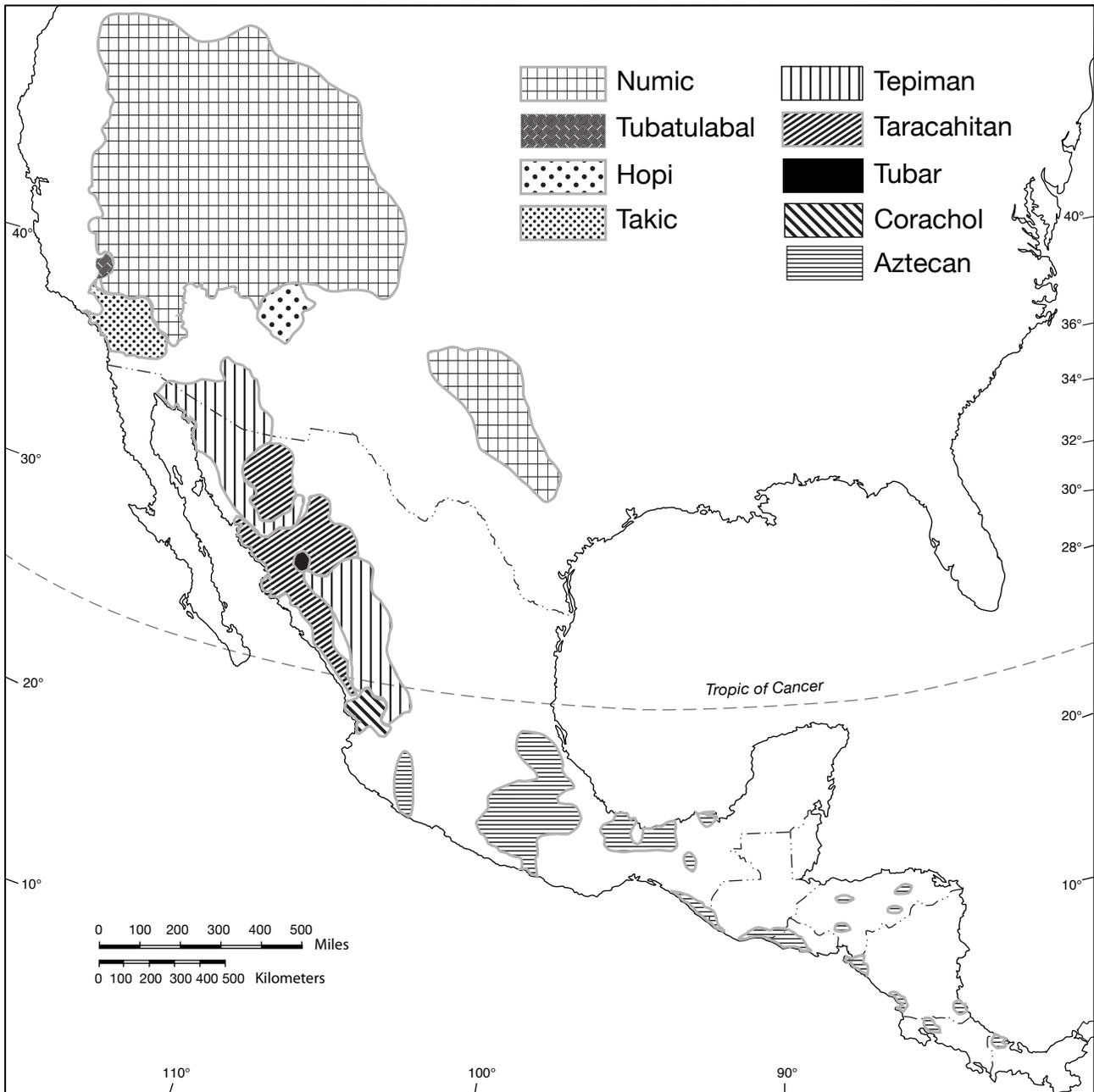
Abstract. Historical linguistics is a crucial component of contemporary research on the emergence and diffusion of agriculture in human history. For western North America, much of this research has focused on the Uto-Aztecan language family and the role that the members of the Proto-Uto-Aztecan speech community might have played in the diffusion of maize agriculture from Mesoamerica to the southwestern United States. Key to addressing this issue is determining whether an agricultural lexicon can be reconstructed for Proto-Uto-Aztecan, but despite several comparative studies of the agricultural lexica of the Uto-Aztecan languages, consensus remains elusive. A detailed re-analysis of these lexica indicates that an agriculture-related vocabulary can be reconstructed only for the ancestral language of the southern branch of the language family. Other lexical and biogeographical data suggest that the Proto-Southern Uto-Aztecan speech community was located near the modern Arizona-Sonora border when its members began to cultivate maize, which presumably diffused to them from societies farther south. These data and additional lexical evidence also support the perspective that some ancestors of the modern Hopi spoke a Southern Uto-Aztecan language or languages, migrating from the interior of Mexico to northeastern Arizona before European contact.

1. Introduction. The transition from food collecting to food production began on the North American continent some ten thousand years ago with the domestication of the pepo squash (*Cucurbita pepo*), followed at about four-thousand-year intervals first by the domestication of maize (*Zea mays*) and then the common bean (*Phaseolus vulgaris*) (Smith 1997a, 2001a; Kaplan and Lynch 1999; Piperno 2011; Brown 2006, 2010a). The earliest evidence for the cultivation of

these plants comes from archeological sites in southern and central Mexico. Data from sites in northeastern Mexico and the southwestern United States indicate that the northward diffusion of these tropical cultigens took place separately and gradually over the course of several millennia. Pepo squash is first documented in northeastern Mexico, just south of the Tropic of Cancer, around 6300 B.P., with maize appearing around 4400 B.P. and the common bean around 1300 B.P. (Smith 1997b:373–374; Kaplan and Lynch 1999: 269).¹ The earliest archaeological records of these domesticated plants north of the Tropic of Cancer come from Arizona and New Mexico. Multiple radiocarbon dates on samples of maize indicate that it was present in the American Southwest at least by 4100 B.P., while pepo squash arrived at approximately 3150 B.P. and common beans around 2300 B.P. (Merrill, et al. 2009: table S3).

The archaeological sites that document the inception of agriculture in the southwestern United States are located more than a thousand kilometers north of the Tropic of Cancer and about double that distance from the early agricultural sites in southern and central Mexico. The routes and timing of the diffusion of domesticated plants across the intervening area remain a mystery because no archaeological sites from the period when this diffusion would have occurred have been excavated there. However, a number of scholars have speculated that the ancestors of speakers of Uto-Aztecan languages may have been involved in the process, based primarily on the fact that at European contact these languages were spoken from Mesoamerica to what is today the western United States (Matson 1991:319–320; Bellwood 1993, 2001; Fowler 1994:453; Hill 2001a, 2001b, 2002a; Carpenter, Sánchez, and Mabry 2001; Carpenter, Sánchez, and Villalpando 2002, 2005; Diamond and Bellwood 2003; Bellwood and Oxenham 2008; LeBlanc 2008; Mabry, Carpenter, and Sanchez 2008; Wilcox, et al. 2008) (see figure 1).

Figure 1. The Distribution of the Uto-Aztecan Subfamilies at Initial European Contacts



Evaluating the role that Uto-Aztecs might have played in the diffusion of agriculture from Mesoamerica to the Southwest requires as an initial step establishing the place of agriculture in Uto-Aztec cultural history. Several scholars have addressed the issue of whether members of the Proto-Uto-Aztec (PUA) speech community were farmers by applying the methods of historical linguistics to an analysis of the agriculture-related vocabularies documented for the Uto-Aztec languages. The most significant of the studies are Romney (1957), Miller (1966), Fowler (1994), and Hill (2001b, 2002b, 2006), but no consensus has been reached: Romney and Hill concluded that an agricultural lexicon could be reconstructed for PUA while Miller and Fowler concluded that it could not.²

In a series of studies published between 2001 and 2012 (see “References”), Hill explores a variety of topics related to the cultural and linguistic history of Uto-Aztec agriculture. Basing her interpretations on a broader set of terms than had been considered previously, she identifies a subset these terms, all with maize-related meanings in some Uto-Aztec languages, as reflexes of PUA etyma and concludes that “it is highly likely that maize cultivation was present in the PUA community” (2001b:922). She (2012:65) further proposes that this ancestral community was located in the northwest quadrant or northwestern periphery of Mesoamerica when its members first adopted agriculture. Building upon Peter Bellwood’s perspectives (1997, 2001) regarding the distribution of the Uto-Aztec languages in relation to the farming/language dispersal hypothesis, Hill (2001b:913) argues that the northward migration of UA farmers was responsible for both the introduction of maize agriculture to the southwestern United States and the formation of a chain of Uto-Aztec dialects and languages that extended between Mesoamerica and the American Southwest.³

Despite the insights her contributions provide, the debate continues on whether the members of the PUA speech community were farmers. Campbell (2002) and Kaufman and Justeson (2009) have questioned Hill's reconstructions of some etyma in her proposed PUA maize vocabulary, as well as her identification of agriculture-related meanings as their original referents. Colleagues and I (Merrill, et al. 2009, 2010; cf. Hill 2010; Brown 2010b) have reiterated these concerns and have challenged her postulation of migrating farmers, Uto-Aztecan or not, as the mechanism for the diffusion of maize from Mesoamerica to the Southwest .

The purpose of this essay is present the results of my analysis of the historical relationships among the UA words that have been considered in previous studies and to offer my perspectives on the place of agriculture in Uto-Aztecan cultural history. In the next section, I provide a brief overview of the Uto-Aztecan language family and the distribution of farming and foraging strategies among speakers of its languages. In section 3, I argue that an agricultural lexicon definitely can be reconstructed for Proto-Southern Uto-Aztecan (PSUA). In separate subsections, I discuss each of the eight etyma that can be reconstructed as part of this lexicon and a few other PSUA etyma attested with maize-related referents in at least some SUA languages. Maize is the only cultigen for which a PSUA etymon is reconstructible but in sections 4 and 5, I discuss the terms for curcibits and beans that are attested in the SUA languages.

In section 6, I compare the agriculture-related lexica recorded for the Northern Uto-Aztecan (NUA) languages, interpreting their diversity as an indication of the absence of a Proto-Northern Uto-Aztecan (PNUA) agricultural lexicon. In Section 7, I focus on one NUA language, Hopi. Several words in the Hopi agricultural lexicon are definitely cognate with words in the SUA languages, but cognates are not attested in any other NUA language. I consider both linguistic and historical evidence to evaluate the hypothesis that some ancestors of the modern Hopi

originated in Mexico and spoke a language or languages affiliated with the southern branch of the language family.

The data and analyses presented in first seven sections of the essay support the conclusion is that members of the Proto-Southern Uto-Aztecan speech community were the first Uto-Aztecan farmers. In Section 8, I address the question of where this community might have been located when its members adopted maize agriculture. I suggest that it likely was located in an area along the modern Arizona-Sonoran border, near where the some of the oldest maize in the American Southwest has been recovered, and that the dispersal of the SUA languages probably began from there, making this area a likely candidate for the SUA homeland. I conclude the essay by offering four generalizations about the place of farming in Uto-Aztecan cultural history and by proposing that some of the speakers of NUA languages may have shifted between foraging and mixed foraging-farming strategies at different points in their histories.⁴

2. The Uto-Aztecan Language Family. The Uto-Aztecan (UA) language family comprises thirty languages organized into two major branches, Northern Uto-Aztecan (NUA) and Southern Uto-Aztecan (SUA) (see table 1) (Miller 1983a; Campbell 1997:133–138; Caballero 2011).⁵ The NUA subfamilies—Numic, Tubatulabal, Takic, and Hopi—are all located in the western United States. The northernmost of the SUA subfamilies, Tepiman, is found in both the southwestern United States and Mexico. The Tarachitan subfamily is situated in northwestern Mexico, the Corachol subfamily in western Mexico, and the Aztecan subfamily in western, central, and southern Mexico, with outliers in Central America. The Tubar language, spoken is northwestern

Table 1. The Uto-Aztecan Language Family

NORTHERN UTO-AZTECAN

Numic

Western Numic
Northern Paiute
Mono

Central Numic
Timbisha Shoshone
Shoshone
Comanche

Southern Numic
Kawaiisu
Colorado River Numic (Southern
Paiute, Chemehuevi, Ute)

Tubatulabal

Hopi

Takic

Cupan
Cahuilla
Cupeño
Luiseño

Gabrielino-Fernandeño

Serrano
Kitanemuk
Serrano

SOUTHERN UTO-AZTECAN

Tepiman

Upper Pima (Tohono Oʻodham, Akimel
Oʻodham and other variants)

Lower Pima (Néovome, Yepachi Pima, and
other variants)

Northern Tepehuan

Southern Tepehuan

Tarahitan

Cahitan
Yaqui
Mayo

Ópatan
Eudeve
Ópata

Tarahumaran
Warihó
Rarámuri

Tubar

Corachol
Cora
Huichol

Aztecan

Pochutec

General Aztecan
Nahuatl
Pipil

Mexico until the early twentieth century, is treated here as the sole member of a fifth subfamily of the SUA branch, but it is poorly documented and its classification is, in Stubbs's words, "enigmatic" (Stubbs 2003:6; cf. Stubbs 2000, Hill 2011) (see figure 1).

At the time of initial European contacts, Uto-Aztec societies varied dramatically in subsistence strategies, settlement patterns, and levels of social complexity. At one extreme were the small-scale, highly mobile egalitarian bands of Numic speakers who relied exclusively on the wild resources of the Great Basin for their survival. At the other were the urbanized state societies of Aztec speakers in Mesoamerica, who practiced various forms of intensive agriculture that supported populations estimated to have numbered in the millions (Santley and Rose 1979). In between were foraging and mixed foraging-farming societies that included both sedentary foragers and mobile agriculturalists and ranged in population size from hundreds to hundreds of thousands of people. The distribution of these diverse foraging and farming strategies tended to coincide with the two principal branches of the language family: all of the Southern Uto-Aztecs were farmers while the majority of the Northern Uto-Aztecs were foragers.

3. The Southern Uto-Aztec Agricultural Lexicon. The integration of farming into pre-existing foraging economies obviously involves the creation or borrowing of terminology for the plants that are cultivated, the practices that are associated with their cultivation and processing, and related items of material culture. There is no evidence that the agricultural lexicon of any Southern Uto-Aztec language was borrowed entirely from another language, Uto-Aztec or otherwise. Instead, each lexicon combines reflexes of Proto-Uto-Aztec and Proto-Southern Uto-Aztec etyma with loanwords from other Uto-Aztec languages or external sources, as well as innovations attested only in that language.

Table 2. The Proto-Southern Uto-Aztecan Agricultural Lexicon

Proto-SUA Etyma	Tep	TrC	CrC	Azt
1. *suhunu ‘maize (generic)’	x	x	—	x
2. *sita ‘immature maize ear’	—	x	x	x
3. *hora ~ *hori ‘to shell maize’	x	x	x	x
4. *saki ‘parched maize kernels’	x	x	x	x
5. *tīma ‘tamale’	x	x	x	x
6. *īca ‘to plant, to sow’	x	x	x	—
7. *wasa ‘field for cultivation’	x	x	x	—
8. *wika ‘planting stick’	x	x	x	x

ABBREVIATIONS: Tep = Tepiman; TrC = Taracahitan; CrC = Corachol; Azt = Aztecan

x = cognate present

— = cognate absent

An agricultural lexicon comprising eight etyma can be reconstructed for Proto-Southern Uto-Aztecan. These terms appear in table 2, which also indicates the presence or absence of reflexes in four of the five SUA subfamilies (see appendix 2 for the complete cognate sets). The Tubar subfamily is not included in the table because Tubar words were recorded for only three of the referents (‘maize’, ‘parched maize kernels’, ‘to plant, to sow’) and they are not cognate with the reflexes of the PSUA etyma with these referents in the other SUA languages.

The first etymon in table 2 is a generic label for ‘maize’. The next designates one stage in the development of the maize ear. It is followed by three etyma related to the processing of maize

for consumption. The final three etyma are associated with agriculture in general rather than specifically with maize cultivation. Each of these etyma is discussed in a separate subsection (3.1–3.8). The following five subsections (3.9–3.13) are devoted to PSUA etyma whose reconstructed referents extend beyond the domain of agriculture but have reflexes that are associated with maize. The final subsection (3.14) explores the possibility of reconstructing PSUA *kopi as a etymon that originally labelled a wild plant but whose reflexes acquired maize-related meanings in some SUA languages.

3.1. **suhunu ‘maize’. Cognates in the Tepiman, Taracahitan, and Aztecan subfamilies subdivisions indicate that *suhunu was the generic label for ‘maize’ in PSUA. Although many SUA cognates appear to reflect *sunu, the reconstruction of *suhunu is indicated by the identical vowel sequences in the initial syllables of the Rarámuri and Tepiman cognates, the occurrence of high tone on both vowels in this sequence in the Northern Tepehuan cognate, and the medial -ʔu- in the River Warihó cognate:

(1) Rr *suunú*

UP *húuñi*

LP *húun*

NT *úúnu*

ST *húun*

NT *úúnu*

Wr-R *suʔunú*

No Corachol or Tubar cognates for *suhunu are reported in the available sources. The generic terms for ‘maize’ in these languages are Cr(M) *yuuri*, Hc(MG) *ikú*, and Tbr *koí-t*. Given that Hc /u/ reflects */o/, the Huichol and Tubar terms could be related, with metathesis having

occurred in one language or the other (see section 3.14). A cognate for *suhunu also is lacking in Yaqui, but is attested in Mayo *súnnu*, the meaning of which has shifted to ‘maize field’. The generic terms for ‘maize’ in both Yaqui and Mayo reflect PSUA *paci ‘seed’ (see section 3.10).

NUA cognates may exist in two languages, Hopi and Gosiute, a variant of Western Shoshone, although the terms in question appear to reflect *suŋu rather than *suhuŋu (NUA -ŋ- regularly corresponds with SUA -n-).⁶ The Hopi term is *soŋowī* (PUA **u > Hopi /o/), which labels the giant sandreed (*Calamovilfa gigantea*), a tall wild grass whose reed-like stems are used by the Hopis as a raw material (Whiting 1966:65). The third syllable, -wī, probably derives from the PUA augmentative suffix **-wī, suggesting that the Hopi word should be glossed as ‘big *soŋo*’ or ‘tall *soŋo*’. However, it is impossible to identify what this “*soŋo*” might have been because *soŋo*, without the suffix, is not attested in the extensive literature on the Hopi language and ethnobotany (Hopi Dictionary Project 1998; Whiting 1966).

The Gosiute term is *suŋ* ~ *suno* was recorded by the early ethnobotanist Ralph Chamberlin (1911:52–53) as alternate forms of the label for *Atriplex confertifolia*, commonly known as ‘shadscale’ and ‘spiny saltbrush’. Linguistic research indicates that PUA**-ŋ- is reflected in Gosiute and other Western Shoshone languages as the consonant cluster [-ŋg-] and the geminate [-nn-], which are in free variation, and further that **-ŋ- is the only PUA consonant to have such alternating reflexes (Miller 1972:16).⁷ Presumably Chamberlin simply failed to note the phonetic details, but his recording of both -ŋ- and -n- in the Gosiute word confirms that it is cognate with the Hopi term.

Chamberlin (1911:52) reported that this and other species of *Atriplex* were “one of the most important sources of seed food” for the Gosiute, and Steward (1938:22) documented the dietary significance of the seeds of another saltbrush species, *Atriplex argentea*, among other Western

Shoshone bands located in north central Nevada. Steward recorded *sunu*, *suuna*, and *sinuʔu* as the labels for this plant in different bands and commented that *Atriplex argentea* probably was the species of *Atriplex* “that was frequently sown broadcast” by their members. Although [-ŋg-] ~ [-nn-] does not appear in any of Steward’s terms, the phonological similarities and shared referent of *Atriplex* suggest that they are cognate with Gosiute *suŋ* ~ *suno*.⁸

Because different plants are labelled by the Hopi and Numic cognates, the original referent of PNUA *suŋu cannot be determined. As a member of the grass family, the giant sandreed more closely resembles maize than saltbrush, a member of the chenopod family, but both saltbrush and maize are valued sources of seed food. In either case, the similarity of PNUA *suŋu and PSUA *suhunu raises the possibility that PSUA speakers adopted a PUA wild plant name as their term for ‘maize’ (Campbell 2002:52–53; Hill 2004).

3.2. *sita ‘immature maize ear’. The reconstruction of PSUA *sita is based on cognates in the Taracahitan and Corachol subfamilies, for example, Rarámuri *sitá* and Huichol *šíta*. No term for ‘immature maize ear’ was recorded for Tubar, and I have encountered only one Tepiman term that specifically designates the maize ear in its early stages of development: the Névome word *tutunopa* ‘tender maize ear before it forms kernels’, which is not a reflex of *sita and contrasts with *tunibo* ‘mature fresh maize ear’.

I suspect that *sita may also have existed in Proto-Aztecan, but the evidence is equivocal. The Proto-General Aztecan term for ‘immature maize ear’ can be reconstructed as *ši:lo:-, the first syllable of which is the expected reflex of PSUA *si-. However, the second second syllable *-lo:- cannot derive from *-ta. This element is attested in the Aztecan languages in a large number of terms for plants and animals, including two others associated with the maize ear specifically, *e:lo:- ‘mature fresh maize ear’ and *o:lo:- ‘maize cob’.⁹ Dakin (2001a:107–111)

suggests that *-lo: is attached to morphemes that designate features possessed by the entity being labelled and thus is a derivational suffix conveying the sense of ‘possession of feature’.

3.3. *hora ~ *hori ‘to shell maize’. Reflexes of this etymon are attested in the Taracahitan, Corachol, and Aztecan subfamilies. An initial /h-/ is reconstructed based on Eudeve *horan*. Reflexes of PSUA *h- were lost in the ancestral languages of the Tepiman, Corachol, and Aztecan subfamilies while ancestral Taracahitan and Tubar apparently retained *h-. Although /h-/ often disappears in Rarámuri and Sierra Warihó and sometimes in the other Taracahitan languages, it also is encountered as a regular correspondence in these languages, as well as Tubar (see section 3.11).

The original referent of PSUA*ora ~ *ori probably was ‘to shell maize’, which in some SUA languages was extended to include the shelling of the seeds of other plants. For example, the cognate in Classical Nahuatl, *ooya*, is glossed ‘to shell something (corn, peas, etc.)’, but the term for ‘shelled and dried maize kernels’ is *tlaoolli*. The first syllable, *tla-* is an indefinite object prefix that can be translated as ‘something’. The second syllable is the verb stem *-oo-* ‘to shell’, which is followed by the nominalizing suffix *-l-* and the absolutive suffix *-li* (Campbell and Langacker 1978: #33). It literally means ‘something that is shelled’, but that “something” in this case is always maize.

3.4. *saki ‘parched maize kernels’. PSUA *saki is reflected in words in languages belonging to all SUA subfamilies except Tubar, where the equivalent concept is labelled with *kumalit* probably derived from the verb *kumi-* ‘to eat small or ground up things’ (see section 3.13). That *saki also was a deverbal noun is suggested by the Cora reflex *šaščéři* ‘toasted maize’, derived from the verb *šaščé* ‘to toast maize’ by the addition of the nominalizing suffix *-ri*.¹⁰ However, in some other SUA languages, the nouns and verbs are homophones or differ only in showing

final nominal or verbal markers, for example

(2) Rr *saki* ‘to parch maize kernels’; *sakí* ‘parched maize kernels’

Ed *sakén* ‘to toast maize’; *sakít* ‘toasted maize’

The nominal and verbal reflexes of *saki in all the SUA languages are invariably associated with maize, but in the Tepiman subfamily they also are linked to the parching of other grains and seeds. For the Akimel O’odham, Rea (1997:69) notes, “Many kinds of seeds were prepared by being parched with live coals (*haak*), then ground into flour (*chuʔi*),” mentioning that amaranths, chia (*Salvia columbariae*), and wheat following its introduction by Europeans were among the plants whose seeds were processed in this fashion.

Evidence from the NUA languages Tubatulabal and Luiseño indicate that **saki can be reconstructed for PUA, forming part of a suite of verbs in both NUA and SUA languages that begin with *sa- and denote boiling, melting, and parching (Stubbs 2011:#266, #267, #524). The Tubatulabal verb *ʔašag-(it) ~ ša:k* ‘to roast it’ may have designated ‘to roast’ in general, but it clearly applied to the roasting of wild seeds. Erminie Voegelin (1938:31) recorded the deverbal noun “ša:gišt” as the term for ‘parching tray’, “used for parching small seeds, such as chia, with live embers.” She (1938:10) noted that chia (*Salvia columbariae*), wild oats, Eriogonum, and *Mentzelia* seeds were prepared for consumption by parching. An association of reflexes of *saki with tray parching also is seen in the Tohono O’odham verb *haak ~ haaki ~ hahakí* ‘to roast grain with coals in a basket’.

The Luiseño cognate is *šá:x-iš* ‘grain, wheat’.¹¹ The final syllable *-iš* a deverbalizer and *sax-* ‘to toast’ is anticipated but not attested as the source verb. Harrington collected *šá:ša* as the Luiseño verb ‘to toast’ but this word was not encountered in subsequent research by Elliott (1999:830, 1015), who recorded only *wá:lki ~ wálki* ‘to toast seeds, wheat’.

3.5. *tīma ‘tamale’. The consumption of maize in a form resembling a tamale by members of the PSUA speech community is suggested by the fact that reflexes of PSUA *tīma are attested in all SUA subfamilies except Tubar, for which no term for ‘tamal’ was recorded.¹² It is likely that *tīma is a deverbal noun, deriving originally from a verb that denoted a particular way of preparing maize, probably by roasting or baking small cakes of ground maize under ashes or in pit ovens. In most cases, terms for pit roasting in Tepiman, Taracahitan, and Corachol languages closely resemble the reflexes of *tīma. These verbs are listed here along with the reflexes of *tīma if they are attested.

(3) To(S) *čúama* ‘to roast in ashes’; *čīmait* ‘a tortilla

Nv(P) *tuamaha* ‘to pit roast things other than agave, like squash or pumpkins [“calabazas”];

tuamahi ‘something pit roasted’; *tumaita* ‘cake’ (?) [attested in *vivac tumaita*, glossed as

‘pan de piciete’, which perhaps can be translated as ‘tobacco cake’]

Eu(P) *temóson* ‘pit roast’; cf. Op *temâi* ‘to make bread or tortillas’.

Wr-S *wehtemáe-na* ‘to pit roast food’; *teméi* ‘tortilla’

Cr(M) *téʔimua* ‘to pit roast’; *temua* ‘tamal’

Assuming that these verbs are cognate, evidence from Névome suggests that the PSUA form of which they are reflexes was composed of two morphemes. Névome *maha* ‘to pit roast agave’ contrasts with *tua-maha* ‘to pit roast things other than agave’. The glottal stop in presumed cognates from three NUA languages also may indicate that two separate morphemes were involved.¹³

(4) Kw *tīʔma* ~ *tuʔma* ‘to roast, bake’

SP *tīʔma-* ‘to roast under ashes’

Kt *tīʔ* ‘to roast’; *tīʔa-c* ‘roasting pit’

However, the significance of the initial *tī-* and the comparable elements in the SUA verbs (*tua-*, *čua-* [the expected reflex of **tua*], and *te-*) is unknown.

Although some of the reflexes of PSUA **tīma* label ‘tortilla’ or both ‘tamale’ and ‘tortilla’, ‘tamale’ is assumed to be its original referent because this sense is encountered in all languages in the Aztecan and Corachol subfamilies and also in Rarámuri in the Taracahitan subfamily.¹⁴

In addition, in those SUA languages where distinct terms for ‘tamale’ and ‘tortilla’ exist and neither is clearly a loanword, the terms for ‘tamale’ consistently derive from **tīma* while those for ‘tortilla’ lack cognates in the other SUA languages, for example,

(5) Cr *temua* ‘tamale’; *hamuiʔi* ‘tortilla’,

Hc *temá* ‘tamale of beans and salt’; *paapá* ‘tortilla’

Na-Cl *tamalli* ‘tamale’; *tlaškali* ‘tortilla’¹⁵

The Nahuatl term for ‘tortilla’, *tlaškali* or in some variants *taškalli*, does appear in Tepiman and Taracahitan languages, but it presumably was borrowed during the Spanish colonial period directly from Nahuatl speakers who were involved in the colonization of the northern portions of New Spain (West 1949:49–52; Griffen 1969:134; Cramaussel 1998:24–25, 33).

(6) P-Yp *taskori*; *timit* ‘tortilla’; *nohica* ‘tamale’

NT(R) *taskali*

Yq *tahkaim* ‘tortilla’; *nóhim* ‘tamale’

My *tahkari*; *nóhchim* ‘tamales’

Ed *taskari*

Wr-R *takari* ~ *tahkari*

Tbr *tasekalit* ~ *tasikalit*

It seems that the Nahuatl loanwords replaced the reflexes of **tīma* in all of these languages

except the Yepachi variant of Lower Pima, in which terms derived from both sources are attested, *taskori* and *timit*, both glossed as ‘tortilla’. Also, excluding modern loans of Spanish *tamal*, terms for ‘tamale’ are not reported for any of these languages except Yepachi Pima, Yaqui, Mayo. These words clearly do not reflect PSUA *tīma, but they may derive from a distinct PUA verb meaning ‘to roast, to bake’ that is attested only in NUA languages, for example, Northern Paiute *noho/-* ‘to prepare in earthen oven on ashes, to roast, to bake’ (for additional NUA cognates, see Stubbs 2011:#523).

3.6. *īca ‘to plant, to sow’. Reflexes of this verb are attested in the Tepiman, Taracahitan, and Corachol subfamilies. The expected reflex in Tubar is *eca* or *ica* but *sa-* is attested instead. Perhaps the Tubar form is the result of interaction with Tepiman speakers. The shift of PSUA *c to *s occurred in Proto-Tepiman (Bascom 1965:13) and is seen in the Tepiman reflexes of *īca, e.g. Yepachi Pima *īsa*. Reflexes of *īca are absent in the Aztecan languages, where the verb ‘to plant’, reconstructed for Proto-Aztecan as **to:ka (Dakin 1982:#288), also means ‘to bury’. That the semantic scope of *to:ka was expanded from ‘to bury’ to include ‘to plant’ is suggested by the Rarámuri cognate *tó*, which designates ‘to bury’ only.

PSUA *īca is identical to the form of this verb that can be reconstructed for Proto-Uto-Aztecan. PUA *īca shifted to *īya in Proto-Northern Uto-Aztecan as part of general shift of medial *-c- to *-y- (Manaster Ramer 1992). Reflexes of PNUA *īya are encountered in Hopi and most Numic languages but are absent in Tubatulabal and the Takic languages (see section 6.4). PUA **īca probably was originally associated with the broadcast sowing of wild seeds rather than the cultivation of domesticated crops (Fowler 1972a: 221).¹⁶ This interpretation is supported by the fact that in Northern Paiute and Western Shoshone, nouns derived from **īca label various species of *Chenopodium* whose seeds were valued as food and broadcast sown

(Chamberlin 1911:55; Steward 1938:23; Liljeblad, Fowler, and Powell 2012:84-85) (see appendix 2, #4).

3.7. *wasa ‘field for cultivation’. Cognates in the Tepiman, Taracahitan, and Corachol subfamilies indicate the reconstruction of *wasa as the PSUA label for ‘field for cultivation’, for example,

(7) Rr wasá

Hc waša

No Tubar word for this referent was recorded. The Aztecan languages lack cognates, labelling this referent with terms derived from the Proto-Aztecan innovation *mil-li (Campbell and Langacker 1978:#36). Similar NUA words with ‘field for cultivation’ as their referent are Hopi *paasa* and Chemehuevi *pasa*, but SUA /w/ : NUA /p/ is not a regular correspondence (see section 6.4).

3.8. *wika ‘planting stick’. The final PSUA term in table 2 is *wika ‘planting stick’. No term for this concept is reported for Tubar but reflexes are attested in the other four SUA subfamilies. Although most indicate that *wika should be reconstructed for PSUA, there are anomalies in some Taracahitan reflexes.¹⁷

(8) My(C) *wiʔika*

Yq-Az *wiʔiki*

Wr-S *wika*

Rr(H) *wika*

Medial glottal stops in Yaqui or Mayo terms that reflect PSUA etyma usually are attested in the Sierra Warihó cognates, and the initial stress reported for Sierra Warihó and one variant of Rarámuri is unexpected. A possible explanation is that the initial syllable of the antecedent form

of these cognates was reduplicated as *wiwika. The medial glottal stop in Mayo and Yaqui could indicate the loss of medial -w- and the Warihó and Rarámuri cognates could result from the loss of the initial syllable and the retention of the antecedent stress placement.

The most intriguing aspect of this cognate set is that Hopi *wiik'a*, which labels not 'planting stick' but 'ancient wooden hoe', clearly is a reflex of PSUA *wika. Hopi is the only NUA language in which a cognate for the SUA reflexes of PSUA *wika is attested, and Hopi *wiik'a* does not appear to be a loan from any of the Tepiman languages, the SUA languages located in closest proximity to northeastern Arizona where the modern Hopi live. Although PUA **wika could be reconstructed based on the Hopi and SUA cognates, a consideration of both linguistic and historical evidence raises the alternative possibility, which I explore in section 7, that some ancestors of the modern Hopi were speakers of a SUA language or languages.

3.9. *murayawa 'inflorescence'. 'Maize tassel' is the referent of the reflexes of this PSUA etymon in all of the SUA subfamilies except Tubar, for which a reflex was not recorded. However, most designate the flowering or fruiting heads of other plants as well, suggesting that the PSUA etymon originally labelled the inflorescences of grasses and other kinds of wild plants that did not resemble blossoms and then was extended to the maize tassel following the introduction of this cultigen.

The reconstruction of the PSUA etymon as a polysyllabic is based on the reflexes documented for two Tepiman languages, Upper Pima *muḍaḍag* and Névome *muḗadaga*. These words show the shift of *y to *ḍ and *w to *g that occurred in Proto-Tepiman and the shift of Proto-Tepiman *r to Upper Pima /ḍ/ (Bascom 1965). Phonological and morphological changes in the reflexes of this etymon also occurred in the ancestral languages of the other SUA subfamilies. The final two syllables were lost in the Proto-Tarachitan reflex *mura, while Proto-Corachol (PCrC) *miayï

shows the loss of the final syllable and medial *-r-, as well as the shift of *u to PCrC *i (the final *i is unexpected). The interpretation of the changes that resulted in the Proto-Aztecan (PAzt) reflex *miyawa is complicated by the fact that PSUA *-r- sometimes but not always is replaced by PAzt *-y- and the reflexes of both PSUA *-r- and *-y- can also be lost.¹⁸

3.10. *paci ‘seed’. All SUA subfamilies have reflexes of this PSUA etymon except Tepiman, where the word for ‘seed’ is reconstructed for PTep as *kai- (Bascom 1965: #93). The referent ‘seed’ is attested for reflexes in the Tubar, Corachol, and Aztecan subfamilies, but in most Taracahitan languages, reflexes of *paci or words derived from these reflexes have acquired associations with both maize and squash.¹⁹

(9) Yq *báči* ‘maize’

My *bátči* ‘maize’

Ed *bacit* ‘squash seed’

Op(P) *vači* ‘maize with formed kernels’

Wr-S *ihpací* ‘mature fresh maize ear’²⁰

Rr *pači* ‘mature fresh maize ear’; *bači* ‘squash’; *bačira* ‘squash seed’

Rarámuri *bačira* ‘squash seed’ could be a reflex of PSUA *pacira, which is attested as the antecedent form for the words for ‘seed’ in River Warihó, Yaqui, and Mayo, as well as Tubar.

(10) Wr-R *pahcira*

Yq *báčia*

My *báčia*

Tbr *wacirán*

The function of the final syllable *-ra*, reduced to *-a* in Yaqui and Mayo through the common *r*-deletion process, is unknown but presumably it is a suffix. Suffixes with the form *-ra* have a

variety of grammatical functions in all four languages, which are not entirely understood and in fact differ among these languages (Miller 1996:249-259; Dedrick and Casad 1999:119-136; Lionnet 1978:32). Given that cognates are attested in Tubar but not all Taracahitan languages, *pacira* may not be a Proto-Taracahitan etymon but rather an innovation in one of these languages that diffused to the other three.

I interpret *paci ‘seed’ as a PSUA innovation, but some NUA words have been proposed as cognates for its SUA reflexes. One is Tubatulabal *pacist*, glossed by Carl Voegelin (1958:225) as ‘purple seed’ and identified by Erminie Voegelin (1938:15) as labelling the seeds of the thistle sage (*Salvia carduacea*). Kaufman (1981:133) and Manaster Ramer (1992:264) suggest that this word could be cognate, and they account for the unexpected *-c-* by proposing that an antecedent consonant cluster blocked the expected shift of *-c- to *-y- that occurred in PNUA. An alternative perspective, which I favor, is that *pacist* is a Tubatulabal innovation created after the *-c- to *-y- shift had taken place. No cognates for Tubatulabal *pacist* are attested in any other NUA languages, in contrast to Tubatulabal *pašiiil* ‘chia plant (*Salvia columbariae*)’, for which cognates are attested in languages in all NUA subfamilies except Hopi (Stubbs 2011:#1646).

Hill (2004:68–69) also proposed that these labels for ‘chia’, which reflect PNUA *pasi, as well as Tubatulabal *pacist* are cognate with the SUA reflexes of PSUA *paci, but in other publications she substituted different NUA words for them (2001b:920; 2012:3):

(11) Hp *pa:cama* ‘hominy’

Tb *paca:h-* ~ *apaca:h* ‘to hull’; *paca:hil* ‘hulled pine nuts’.

On the basis of these terms and the reflexes of PSUA *paci, she (2012:58) reconstructs **paʔci ~ **paʔca as a PUA etymon and assigns the referent ‘ear of corn, kernel of corn’ to it. Although a medial glottal stop is not attested in any of the SUA reflexes of *paci, she reconstructs it to

account for the retention of *-c-* in the NUA words.

I have found no cognates in other NUA languages for the Tubatulabal verb, and because of the phonological and semantic difference between them, the cognacy of the Tubatulabal and Hopi terms is uncertain. On the other hand, because soaking or boiling maize kernels in water mixed with lime is a stage in the process of preparing hominy that is intended in part to remove the seed coats of the maize kernels, a semantic link between hulling and hominy could be envisioned. Along these lines, Kaufman and Justeson (2009:226) suggest that Hopi *pa:cama* could be analyzed as a compound of *paa-* ‘water’ and *cama* ‘removed ashes’, ashes being one source of lime. The Hopi word also could be related to Numic verbs for ‘to wash’, for example Northern Paiute *paca* ~ *baca* (Liljeblad, Fowler, and Powell 2012:363; see Stubbs 2011:#2487). The initial syllable *pa-* ~ *ba-* in the Numic verbs reflect the PUA etymon for ‘water’, as does Hopi *pa:-*, the combining form of Hopi *pa:hï* ‘water’.

Another possibility, mentioned in section 3.8, is that the Hopi word is cognate with the reflexes of PSUA **paci*, representing one of several words in the modern Hopi lexicon that were introduced by Hopi ancestors who may have spoken a language or languages belonging to the southern branch of the Uto-Aztecan language family (see section 7). In this case, the appearance of *-c-* in Hopi *pa:ca* would not be a problem because PUA ***c-* was retained in PSUA. However, the vowel length in the first syllable of *pa:cama* is not attested in any of the SUA reflexes of **paci*, including Mayo *bátçi* ‘maize’. Initial-syllable vowel length is a regular correspondence in Hopi and Mayo reflexes of PUA etyma, so the irregular correspondence in this case suggests that the initial syllable of Hopi *pa:ca* does in fact represent *pa:-* ‘water’

3.11. *sona ‘body, stalk’. Reflexes of this PSUA etymon are attested in the Tepiman, Taracahitan, and Tubar subfamilies but absent in the Corachol and Aztecan subfamilies.

The Proto-Tepiman (PTep) reflex is *hona, showing the expected shift of PSUA *s to PTep

*h. All the Tepiman reflexes of PTep *hona include ‘body’ among their referents.

(12) TO *hon* ‘the body (excluding the head)’

PYp *hona* ‘the body, stalk, trunk of a plant’

NT(R) *honna* ‘the body’

Reflexes of PTep *hona also serve as the stems of terms for ‘rib(s)’ in several Tepiman languages. The same morphology is encountered in Yaqui and Mayo words for ‘ribs’, but the Yaqui-Mayo reflex of PSUA *sona is *sána-*, which shows vowel harmonization.

(13) PYp(S) *hona-mar*

To(S) *hoʎonma* [< *hoʎhon-ma*]

Yq-S *sánaʎim*

My(C) *sánaʎarim*

A specific association between reflexes of *sona and the maize plant is encountered only in the Taracahitan languages and perhaps Tubar, but the Tubar and Mayo cognates are glossed only as ‘caña’, which can be translated as ‘cane’ or ‘stalk’; no word for ‘maize stalk’ specifically is attested in either language. Vowel harmonization also has occurred in the Tubar, Eudeve, Sierra Warihó, and Rarámuri reflexes, but in this case from *sona to *sono*.

(14) Yq *sánaba* ‘corn husk’

Yq-Az *sana* ‘sugarcane’²¹

My *sánaba* ‘corn husk’; *sánna* ‘caña’

Ed *sonó* ‘corn husk or maize leaf’ [the gloss in the original source is ‘hoja de maíz’]

Rr *sonó* ‘maize stalk’

Wr-S *sonó* ‘corn stubble’

Tbr *sono-* ‘caña’²²

Hill (2012:58) identifies Hopi *sö:ŋö* ‘corn cob’ and several Numic words for ‘hay’ or ‘grass’ as cognates with the SUA reflexes of *sona, on the basis of which she reconstructs PUA **sono ‘parts of the maize plant not eaten by human beings’. However, the medial *-n- in PSUA *sona and the medial -ŋ- in Hopi *sö:ŋö* ‘corn cob’ both reflect PUA **-ŋ-, not **-n- (Kaufman and Justeson 2009:225). Also, the only possible NUA cognate that I have encountered for Hopi *sö:ŋö* is Luiseño *šé:ŋa* ‘bedrock’. The first three segments of these words are regular correspondences and, if the words are cognate, they reflect PNUA *soonja. The Numic words are not reflexes of PNUA *soonja but of Proto-Numic *soni (see Stubbs 2011:#1061), which would reflect PUA **suni if this etyma were reconstructed. The PSUA reflex of **suni would be *suri because NUA -n- and SUA -r- also is a regular correspondence.

It is thus possible that PSUA *soŋa reflects PUA **soŋa but unlikely that it reflects PUA **soonja. As noted in section 3.10, vowel length in the first syllables of reflexes of PUA etyma is a regular correspondence in Hopi and Mayo. It also is a regular correspondence of both languages and Luiseño. The expected Mayo reflex of PUA **soonja is *soóna* or, with vowel harmonization, *saána*, but *sánna* is attested instead. The geminate *-nn-* indicates no vowel length in the first syllable of the antecedent PSUA etymon.

If such irregular correspondences are ignored and PUA **soŋa or **soonja are reconstructed, then vowel lengthening in PNUA or vowel shortening in PSUA must have occurred. If either secondary development took place, the divergent referents of the Hopi and Luiseño words, as well as the diversity of referents of the SUA reflexes of PSUA *sona, suggest that the original referent of the PUA etymon was something on the order of ‘foundation’ or ‘supporting structure’.

The Tepiman referents of ‘body’ and ‘rib(s)’ are consistent with these concepts, as are the

referents of ‘stalk’, ‘maize stalk’, ‘cane’ and ‘stubble’ in the other SUA languages. Only the Yaqui-Mayo referents of ‘corn husk’ and the Eudeve referent ‘corn husk or maize leaf’ seem out of place. The Luiseño referent ‘bedrock’ also fits with the concept of ‘foundation’, and the Hopi referent ‘corn cob’ is understandable in light of the association of ‘maize cob’ with ‘stalk’ or ‘trunk’ in other SUA and NUA languages:

(15) Nv *vaoka* ‘maize cob, maize stalk’

Cm *haniwoʔora* ‘maize cob’

The Comanche word combines *hani* ‘maize’ with *woʔora*, which is identical to Timbisha Shoshone [*woʔora*] ‘tree trunk’ and, except for the absence of the glottal stop, Goshiute [*woora*] ‘tree trunk, waist’. These cognates, from the three subdivisions of Central Numic, indicate that **woʔota* ‘tree trunk’ can be reconstructed for Proto-Central Numic (Stubbs 2011:#2157).²³

Hill (2012:58) offers a different analysis of *-woʔora* in Comanche *hani-woʔora*. She regards it as a reflex of a PUA etymon that she reconstructs as **oʔra* ~ **oʔri*, to which she assigns the referent ‘ear of corn, corn cob’. In addition to the Comanche word, she lists six words, three from NUA languages and three from SUA languages, as definite cognates that support this reconstruction. The words are presented in (16) as attested in the original sources and in the orthography used in this essay.

(16) Kw *ono-ci* ‘hooked stick used to pull down pinyon cones’

TSh *onnocci* ‘pine cone hook’

Hp *qa:ʔö* ‘maize, dry husked ear of maize’

Wr-S *woʔná* ‘maize cob’

Rr *ooná* ~ *kooná* ‘maize cob’; Rr(H) *koʔná* ‘maize cob’

Na-Cl *o:lo:-tl* ‘maize cob’

The Kawaiisu and Timbisha words are cognate with one another but with none of the other terms. The Hopi word is a reflex of PNUA *kaaʔo ‘pine cone’ (see section 6.1). Dakin (1982:#60, #229a) interprets the Nahuatl word as a reflex of Proto-Aztecan *o: ‘bone’, and the Proto-Aztecan etymon as a reflex of PUA **ʔoho ~ **ʔo ‘bone’.

The analysis of the Warihó and Rarámuri words is a bit more complicated, but the River Warihó cognate, also with the referent ‘maize cob’, shows features that allow the reconstruction of their antecedent form as *ʔoʔna or *ʔoʔona

(17) Wr-R *hóʔoná* ‘maize cob’

Wr-S *woʔná* ‘maize cob’

Rr *ooná* ~ *kooná* ‘maize cob’; Rr(H) *koʔná* ‘maize cob’

The three words obviously are cognate, but the River Warihó cognate indicates that the initial consonants in Sierra Warihó and Rarámuri cognates are epenthetic. A consonant, usually /k/ or /w/, often occurs in Rarámuri words that have initial vowels in their first syllables, and alternate forms like *ooná* ~ *kooná* are common. Also, if the antecedent form had initial /w-/, /w-/ would be expected in the River Warihó cognate. PSUA word-initial *w- is reflected in both Sierra and River Warihó as /w-/, which is not lost in their reflexes of PSUA or PUA etyma with word-initial *w- (Merrill 2007). The initial *h-* in River Warihó *hóʔoná* is the reflex of PSUA word-initial *ʔ-, which is reconstructed before first-syllable vowels.²⁴

The reconstruction of *ʔoʔna or *ʔoʔona reflects the fact that either form is possible because River Warihó sometimes inserts -ʔV- to create -V₁ʔV₁- sequences.²⁵ Such insertion has occurred in its word for ‘salt’, *hoʔoná*, which reflects PSUA *oona (see table 3). Also seen in table 3 is initial *h-* in the Eudeve and River Warihó words for ‘bone’ but not the Eudeve word for ‘salt’. These correspondences indicate that initial *h- should not be reconstructed in the etymon

Table 3. Words for ‘salt’, ‘maize cob’, and ‘bone’

Language	‘salt’	‘maize cob’	‘bone’
Proto-SUA	*ʔoona	—	*ho
River Warihó	hoʔoná	hóʔoná	hóʔowa
Sierra Warihó	woná	woʔná	oʔá
Rarámuri	oná ~ koná	ooná ~ kooná	oʔčí
Eudeve	onát	néhro	hógwa
Sonoran Yaqui	oóna	naáo	óta
Mayo	oóna	naágwo	óttá
Timbisha Shoshone	oŋwapi	—	cuhmippih ~cuhnippih
Kawaiisu	owa-vi	—	oho-vi

reflected in the Warihó and Rarámuri words for ‘maize cob’, and thus eliminates PSUA *ho‘bone’ as their antecedent form. The Timbisha and Kawaiisu words for ‘pine cone hook’ cannot be cognate either, because *-n-* in Warihó and Rarámuri regular corresponds with Timbisha *-ŋʷ-* and Kawaiisu *-w-* following reflexes of PUA **o. This correspondence is documented in the words for ‘salt’ in these languages shown in table 3.

3.12. *tusi ‘something ground up’. The PSUA noun *tusi is derived from the verb *tusa ‘to grind’. Both the nominal and verbal etyma are reflected in all five SUA subfamilies, and cognates in all NUA subfamilies indicate that PUA **tusi and **tusa should be reconstructed (appendix 2, #19, #20)

In a few SUA languages, the deverbal nouns are associated primarily if not exclusively with

maize.

(18) Ed *tusít* ‘ground parched maize’,

Wr-R *tusí* ~ *tuusí* ‘ground parched maize, maize dough’

Pp *tiš-ti* ‘dough, corn dough’.

In most, however, the nominal forms have the general sense of ‘something that is ground up’, with more specific, maize-related senses created by prefixing a morpheme linked to maize to the stem *-tusi*. These morphemes vary considerably, as the following four examples, all glossed as “*pinole*” (‘ground parched maize’), illustrate.²⁶

(19) My *sák tússi*

Tbr *ma-tusít*

Cr(V) *m^wa-tüüsiš*

Rr *kobí-rusi*

Mayo *sák* comes from *saáki* ‘parched maize kernels’, with *sák tússi* literally meaning ‘ground parched maize kernels’. Tubar *ma-* and Cora *m^wa-* may represent the initial syllables of their terms for ‘metate’, which reflect PUA ****mata** (appendix 2, #9). The source of Rr *kobí-* is discussed in section 3.14.

3.13. *kumi ‘to nibble, to chew’. Reflexes of this PSUA verb are encountered in all SUA subfamilies except Aztecan.²⁷ The glosses assigned to these reflexes suggest that the PSUA etymon designated a form of eating that involved nibbling or chewing foods that were small in size and hard or crunchy (see appendix 2, #8). Examples given of these foods include fresh, parched, or dried maize kernels and other grains, as well as squash seeds, hard fruits, and pieces of candy.

Although **kumi* probably did not refer to the consumption of maize exclusively, a specific

association with maize is found in nouns derived from reflexes of *kumi in the Tubar and Tepiman subfamilies. Lionnet (1978:59) identifies Tubar *kumalít* ‘parched maize kernels’ as a derivation from the verb *kumi-* ‘to eat small or ground up things’.²⁸ In the majority of Tepiman languages, another deverbal noun labels ‘maize cob’. In Tohono O’odham, the form of this noun is *kuumikuḍ*, which Mathiot (1973, vol. 2:5) glosses as ‘something on which one chews’. She indicates that ‘corn cob (without kernels)’ is created by the addition of the term for ‘maize’ (*huuñ-kuumikuḍ*), which corresponds to the form recorded for Akimel O’odham by Rea (1997:352). Other sources on the Tepiman languages report that ‘maize cob’ is labelled by *kuumikuḍ* and related forms alone, without the maize term (Saxton, Saxton, and Enos 1983:35; Valiñas Coalla 2000:198).

The verb *kumi appears to be a PSUA innovation. I do not reconstruct **kumi as a PUA etymon because verbs cognate with the reflexes of PSUA *kumi are not attested in any of the NUA languages. However, several scholars have noted that some NUA societies cultivated a variety of maize labelled with terms that closely resemble *kumi (Voegelin, Voegelin, and Hale 1962:#88; Fowler 1994:454, n. 5; Hill 2001b:918, 922; Hill 2012:58) (see section 6.1)

The *ku-* element also appears in several additional maize-related words in SUA languages. It represents the second syllable of the Corachol words for ‘mature fresh maize ear’: Cora *ikīiri* and Huichol *hiikīri* (Corachol /i/ is the reflex of PSUA */u/). In Warihó and Rarámuri, similar terms label ‘roasted corn on the cob’: *ihkusúri* in Sierra Warihó, *kusíri* and *kúsari* in Rarámuri. The Rarámuri nouns derive from the verb *kúsa* ‘to pit roast, mainly corn on the cob’, which contrasts with the verb *mihí*, used primarily in reference to the pit roasting of agave. The Warihó cognate for the latter is *mahi-ná* ‘to bury, to cook something in the ground’, but a distinct verb denoting the pit roasting of maize ears is not reported for Warihó.

The fact that languages belonging to two SUA subfamilies have maize-related words that share the element *-ku-* raises the possibility that this element existed with the same association in PSUA. Given its presence in NUA words for both wild and cultivated plants that yield edible seeds, it can be speculated that ***ku-* may have been a PUA stem linked to the concept of ‘valued seed plant’ (see section 6.1).

3.14. *kopi. The only maize-related word in a SUA language that could reflect PSUA **kopi* is the Rarámuri term for ‘ground parched maize kernels’. This word was recorded in the eighteenth century as *kuvirusi* (Steffel 1809:356) and in the twentieth as *kobirusi* ~ *kobisi* (Brambila 1976:257). It can be analyzed as combining *kobi-* ‘parched maize’ and *-rusi* ‘something that is ground up’, the latter reflecting PSUA **tusi* (see section 3.12).

The *kobi-* element is not attested in other Rarámuri words, but the second syllable of Huichol *ikú* ‘maize’ reflects an antecedent **-ko* and *ko-* is the first syllable of Tubar *koít* ‘maize, maize kernel’. An apparent cognate is Akimel O’odham *kovi*. This term probably labelled the domesticated *Chenopodium berlandieri* spp. *nuttalliae*, cultivated in the southwestern United States by around 1000 B.P. but no longer an Akimel O’odham crop (Rea 1997:297–98; Gasser and Kwiatkowski 1991).

NUA cognates may exist in the names for various wild species of *Chenopodium* valued as sources of edible seeds and greens, for example, Southern Paiute *kovi*, identified as the label for *C. fremontii* (see appendix 2, #5). The NUA words, attested in both Numic and Tadic languages, support reconstructing PNUA **ko* with ‘*Chenopodium*’ as its referent. If Akimel O’odham *kovi* is not a loanword, PUA ***ko-* perhaps can also be reconstructed with the same referent, which later acquired maize-related meanings in some of the SUA languages.

4. Squash, Pumpkins, and Gourds in Southern Uto-Aztecan. Generic terms for

‘domesticated squash’ or ‘domesticated gourd’ cannot be reconstructed for PSUA, but PSUA *hari ‘wild squash’ probably can be reconstructed. Recognizing the cognates that support this reconstruction is difficult because of the permutations that the reflexes of this etymon underwent during the diversification of the PSUA languages. A series of new terms were derived from these reflexes to provide labels for domesticated squash, pumpkins, and gourds and for implements made from them, as well as wild squash. Further complicating the analysis is the fact that the reflexes of PSUA initial *h- are lost in most SUA languages and the reflexes PSUA medial *-r- are either lost or undergo sound shifts in some.

To illustrate these phonological and semantic changes, I provide here a sample of the reflexes of PSUA *hari, organized into three groups by phonological similarity. The complete set of cognates is found in appendix 2, #1.

(20) *hari > *hari* ~ *ari* ~ *ara* ~ *arapi*

Wr-R *haari* ‘gourd canteen, gourd dipper’

Rr *ari* ‘gourd, bottle gourd’

PYp(R) *ara* ‘wild squash’

Nv *arabi* ‘wild squash’

(21) *hari > *haripa* ~ *halapa*

Tbr *halipat* ‘a kind of gourd, gourd dipper’.

Wr-S *alapa* ‘gourd, gourd dipper’

Rr *laba* ‘gourd dipper cut breadthwise’.

(22) *hari > *haraʔ-wi ~ araʔ-wi ~ ayaʔa-wi ~ ayoʔ-

Wr-R *harawe* ‘squash or pumpkin’.

Yq *ayaʔawim* ‘squash, pumpkin (*Cucurbita moschata*)’

Na-Cl *ayoʔ-tli* ‘squash, pumpkin, gourd’

The *-wī that appears in (22) is interpreted as reflecting the PUA augmentative suffix **-*wī, suggesting that the term for ‘domesticated cucurbit’ may have literally meant ‘big wild squash’ (see section 6.2). This set shows three phonological changes that occur in both Yaqui-Mayo and the Aztecan languages: optional r-deletion, optional y-insertion to separate the resulting vowel cluster, and h-deletion, which is optional in Yaqui-Mayo but a sound change that occurred in Proto-Aztecan (Dakin 1982:65-67). The -wī suffix is absent in the Nahuatl cognate but its former presence is indicated by the shift in the sound of the preceding vowel (presumably *a) to /o/ and the retention of the glottal stop at the morpheme boundary (Kaufman 1981:225-26; Dakin 2001a:108).

The Tepiman, Taracahitan, Tubar, and Aztecan subfamilies are represented sets (21) to (23). I have encountered only one possible Corachol reflex of *hari: Huichol *īari*, identified by Grimes (1980:272) as the name for a domesticated squash variety (*Cucurbita pepo* var. *ovifera*) and by Kindl (2000:37) as the name for the domesticated bottle gourd (*Lagenaria siceraria*). A single SUA cognate for *īari* has been identified, Tubar *huali* ‘a kind of gourd used as a canteen’. The correspondences of all segments are regular, including the loss in Huichol of the initial /h/. The first syllable, reflecting *hu-, suggests that the original etymon was a compound, but it is unexplained. The generic term for ‘domesticated squash’ in Corachol is *suci, presumably a loan from an Aztecan language. It shows regular correspondences with the terms for ‘flower’ in the Aztecan languages, reconstructed for Proto-Aztecan as *šooči (Campbell and Langacker 1978: #63). Tubar *vipót* ~ *wipót* is glossed only as “calabaza” (‘squash’ or ‘pumpkin’) and could have labelled a specific variety of “calabaza” rather than serving as a general label.

No generic term for ‘squash’ or ‘pumpkin’ can be reconstructed for the Taracahitan or

Aztecan subfamilies. Bascom (1965:156, #311) reconstructs *imai as the Proto-Tepiman generic for ‘squash’ based on cognates in Northern and Southern Tepehuan and Lower Pima. The Upper Pimans have a different term, *haal*, which probably derives from PSUA *hari but entered Upper Piman as a loan from another SUA language, like Eudeve or River Warihó, that usually retained /h-/ as the reflex of initial *h- (see sections 3.3 and 3.11). The identification of *haal* as a loanword is based on the fact that initial /h-/ in the Tepiman languages is the reflex of PSUA *s-, not *h-, which shifted to the glottal stop in Proto-Tepiman (Bascom 1965:13). If this interpretation is correct, Upper Piman retained a term derived from PSUA *hari to label ‘wild squash’ while later borrowing another word derived from the same PSUA etymon as the generic for domesticated ‘squash’ and ‘pumpkin’.

6. The Common Bean in Southern-Uto-Aztecan Languages. The third major domesticate cultivated by SUA societies is the common bean (*Phaseolus vulgaris*). No PSUA etymon for ‘bean’ can be reconstructed, and the lexical evidence indicates that the common bean entered the agricultural complexes of the SUA societies after the emergence of the five subfamilies.

The Proto-Aztecan term for ‘common bean’ likely was *e- or *e:-, based on Classical Nahuatl *e-tl* and Pipil *e:-t*, but this form can be reconstructed only for Proto-General Aztecan. No term for ‘bean’ was recorded for the other branch of the subfamily, Pochutec, before it became extinct (Boas 1917). The label for ‘beans’ reported for Tubar, *vupusí-t*, is completely different. It could be a reflex of PSUA *pusi ‘eye’, but it is not derived from the Tubar term for ‘eye’, recorded as *tulú-r ~ tilú-r*.

The Taracahitan labels for different varieties of the common bean could be interpreted as reflecting *muni (see appendix 2, #11), but this etymon clearly is not a Proto-Taracahitan innovation. Similar terms for beans are attested in several different languages families in North

America, as well as in the NUA languages of Hopi and Colorado River Numic (Wolff 1950:175; Hill 2001b:923–24; Rankin 2006:571–72). The Colorado River Numic terms likely are derived from a term having the form *muri*, which in Hopi has become *mori* (see section 6.3). These terms do not display the regular correspondence of NUA *-ŋ- to SUA *-n- and thus cannot be reflexes of a PUA etymon.

Given the fact that the Taracahitan labels for ‘bean’ are basically identical, the antecedent form could have been integrated into the Taracahitan agricultural lexicon while the Proto-Taracahitan speech community was still intact and perhaps loaned to some Tepiman communities. The same term is recorded in Upper Piman and the Yepachi variant of Lower Pima but not in Névome, another Lower Pima variant, or any of the variants of Northern and Southern Tepehuan. This pattern suggests separate loans of the same term that occurred after the breakup of the Proto-Tepiman speech community. Prior to this time, reflexes of Proto-Tepiman *bavi may have served as a generic term for ‘beans’, presumably labelling the tepary bean (*Phaseolus acutifolius*) (Nabhan and Felger 1978; Rea 1997:321-325; Muñoz, et al. 2006). Reflexes of *bavi are attested in all four Tepiman divisions (Bascom 1965:#4a).

In the Corachol languages, the labels for ‘bean’ are Cora *muhume* and Huichol *muume*. Although these words and Taracahitan *muni* have *mu-* as their initial syllables, they cannot be reflexes of the same PSUA etymon, because Corachol /i/ regularly corresponds with TrC /u/, and Corachol /u/ regularly corresponds with TrC /o/. A separate introduction of beans to the Corachol is likely. Given the widespread distribution of *mu-* in the labels for ‘bean’, this introduction probably occurred after PSUA *u and *o had shifted to Corachol /i/ and /u/.

6. The Northern Uto-Aztecan Agricultural Lexica. The NUA societies whose members engaged in farming included the Hopi, the Cahuilla, the Timbisha Shoshone, some Western

Shoshone bands, one Southern Ute band, and most Southern Paiute bands, including the Chemehuevi (Bradfield 1971; Lawton and Bean 1968; Steward 1938, 1941; O. Stewart 1942; Fowler and Fowler 1981; K. Stewart 1968).

Agriculture was a major component of the Hopi economic strategy (Forde 1931; Hack 1942). It also appears to have been significant among Southern Paiutes living in the Virgin River drainage of southwestern Utah and southeastern Nevada, who are reported to have cultivated maize and other crops in irrigated fields (Stoffle and Dobyns 1983:50–55; Fowler 1995:110–12). Farming definitely was secondary to foraging elsewhere and appears to have been entirely absent among all other NUA societies (Bean 1978; Bean and Shipek 1978; Bean and Smith 1978a, 1978b, 1978c; Blackburn and Bean 1978; C.R. Smith 1978; Zigmond 1978; Fowler 1986; Kelly and Fowler 1986:370–71).

One possible exception is the Comanches, who are known to have acquired agricultural products through trading and raiding but are not reported to have farmed themselves (Kavanagh 2001:889–891). Nonetheless, as Hill (2001b:338) notes, the Comanche agricultural lexicon is sufficiently extensive to suggest that, before European contact, farming may have formed part of their economic strategy. The Comanches acquired horses in the early 18th century and may have abandoned farming to become specialized bison hunters and horse pastoralists like several other post-European contact Plains societies (Shimkin 1986:517; Oliver 1962).

The Hopi agricultural lexicon is exceptionally well documented while those recorded for other NUA languages are full of gaps. Nonetheless, sufficient data exist to conclude that an agricultural lexicon cannot be reconstructed for PNUA. Instead, as seen in the comparison of the agricultural lexica of Hopi, Southern Paiute, Comanche, and Cahuilla presented in table 4, each of these languages has a distinct agricultural lexicon that appears to have developed independently

of the others, although some borrowing has occurred.

Table 4. Northern Uto-Aztecan Agriculture-Related Words

Referent	Hopi	Southern Paiute	Comanche	Cahuilla
1. ‘maize (generic)’	<i>qaaʔö</i>	<i>hawivĩ, kumi</i>	<i>haniibi</i>	<i>mays</i>
2. ‘pumpkin or squash’	<i>patŋa</i>	<i>paraŋwara</i>	<i>nakwisiʔ</i>	<i>nehwet</i>
3. ‘beans’	<i>mori</i>	<i>muri</i>	<i>pihuraa</i>	<i>xuulʔ</i>
4. ‘to shell maize’	<i>hümi</i>	—	—	<i>čilʔay</i>
5. ‘parched maize kernels’	<i>kitiki</i>	—	<i>kukimepi</i>	—
6. ‘tortilla’	<i>piqaviki</i>	—	—	<i>sawiš</i>
7. ‘to sow, to plant’	<i>üya</i>	<i>ia</i>	<i>tahnaari</i>	<i>weš</i>
8. ‘field for cultivation’	<i>paasa</i>	<i>pasa</i>	—	<i>pawisusal</i>
9. ‘planting or digging stick’	<i>sooya</i>	<i>poroc</i>	—	—

NOTE: — = no data

6.1. ‘Maize’ in Northern Uto-Aztecan Languages.

The generic labels for ‘maize’

presented in table 4 include four different native terms and Cahuilla *mays*, derived from Spanish *maíz*.

The Hopi term *qaaʔö* ‘maize, dry husked ear of maize’ is cognate with terms for ‘pine cone’ in Southern Paiute (*kaʔo*) and Kitanemuk (*-kaʔ*), and ‘pine cone’ presumably was its original referent. Hill (2002a:338; 2008:161) reports that in Hopi the possessed form *qaaʔö-at* has the secondary meaning of ‘green cone of pine’ or literally ‘its corn ear’. This association is reversed

in the Chemehuevi term for ‘maize cob’, *hawí kaʔó* (Lawlor 1995:523), the literal gloss of which is ‘maize pine cone’.

The two Southern Paiute terms for ‘maize’ appear to have been the names for distinct varieties of maize. Kelly (1964:39) reports that in the Kaibab variant of Southern Paiute, *hawiví* labelled an earlier short-eared variety while *kumi* labelled an introduced, long-eared variety. Both terms also are recorded for the Shivwits variant but other Southern Paiute variants apparently included only one term or the other, *hawiví* in the more westerly variants (Moapa and Chemehuevi) and *kumi* in the more easterly San Juan variant, as well as in Southern Ute (Fowler and Fowler 1981:134, 136).²⁹

No data exist regarding the source of the introduced maize variety or its label *kumi*. The obvious similarities to PSUA *kumi ‘to nibble, to chew’ suggest diffusion from the south, perhaps from the Upper Pima (Fowler 1994:454, n. 5). Except for Tubar *kumalít* ‘parched maize kernels’, the Tepiman terms for ‘maize cob’, reconstructed for Proto-Tepiman as *kumikur, are the only SUA nouns with a maize-related meaning that are phonologically similar to Southern Paiute *kumi* (see section 3.13). Diffusion from the east or southeast also is a possibility. A similar term is found in the Comanche word for ‘popcorn’, *kuhmitoʔaiʔ*, for which Robinson and Armagost (1990:30) offer the literal translation of ‘heated turns inside out’.

The word *kumi* also could be a Southern Paiute innovation. It has the same three initial segments as *kumutí*, the Southern Paiute label for cultivated and wild amaranth species (*Amaranthus caudatus*, *A. palmeri*) (Bunte and Franklin 1987:25, 28). The presumed Hopi cognate of *kumutí* is *komo* [< *kumu], the name for a cultivated amaranth (*Amaranthus cruentus*). Hopi *komo* may have been the source of the term *kokoma* [< *kukuma] ‘dark red, almost purple maize’, the link between them being their shared use as a red food coloring (Whiting 1966:15;

Hopi Dictionary Project 1998:146, 148).

These words provide additional support for the possibility, mentioned in section 3.13, that PUA **ku- served as a stem in the creation of names for valued seed plants. Another significant example are the names for various species of *Mentzelia* (blazing star), which is attested in the San Juan variant of Southern Paiute as *kuʔu* (see appendix 2, #7). Zigmund (1941:212–23) and Steward (1933:243; 1938:103–4) report that *Mentzelia* seeds were an important staple for several Numic-speaking societies and were broadcast sown by some Central Numic bands in the Great Basin.

The final generic term for ‘maize’ in table 4 is Comanche *haniibi*. The only related words attested in other Numic languages are Northern Shoshone *haʔniibi* and Northern Paiute *hanibi*. This uneven distribution suggests that it was a loanword, either from one of these Numic languages to the others or from an external source.

Hill (2002a:338) notes a similarity between *hani-*, the combining form of *haniibi*, and the Hopi word *haani* ‘maize flour ground to the desired consistency’, but whether a loan occurred and, if so, in which direction cannot be determined. The possibility exists that both words derive from the same maize-related morpheme. The initial syllable *ha-* also is encountered in Southern Paiute *hawi* ‘maize’, and Fowler (1994:466, #1.11) reports that terms for ‘corn, grain’ and ‘parched corn’ in Zia, a Keresan language, have *h’a-* as their initial syllable.

Hill (2002a:336) also points out a resemblance between Hopi *hooma* ‘ceremonial corn meal’ and Comanche *homopi* ‘powder, flour’. Because Comanche /o/ reflects PNUA *o and Hopi /o/ reflects PNUA *u, the two terms cannot be cognates, but they could be the result of a loan, perhaps from Central Numic into Hopi. Comanche *homopi* is derived from the Proto-Central Numic (PCN) etymon **hoŋopi* ‘powder, flour’. Medial *-m-* is the expected Comanche reflex of

PCN -ŋ- in the context /o_o/, as seen in the Comanche term for ‘lungs’, *soomo*, which derives from PCN *soŋo.

6.2. ‘Squash’ and ‘Pumpkin’ in Northern Uto-Aztecan Languages. Hopi *patŋa* is the generic label for ‘squash’ and ‘pumpkin’, although Whiting (1966:93) reported that it labelled a single species, the domesticated *Cucurbita moschata*. The label combines two morphemes, *pa-* ‘water’ and *-taŋa* ‘thing(s) in a container’, suggesting considerable antiquity for the use of cucurbits as water containers. The Hopi word for ‘wild squash’ (*Cucurbita foetidissima*) is *mösiptaŋa*, a compound of *mösi* ‘food packet’ and *-ptaŋa*, one of the combining forms of *patŋa* (Hopi Dictionary Project 1998:257). The bottle gourd (*Lagenaria siceraria*) is labelled with a completely different term, *tawiya*, for which I have found no cognates in other UA languages.³⁰

It is unclear if the first Southern Paiute term for ‘squash’ or ‘pumpkin’ in table 4 is a generic term or labelled a specific species or variety of ‘squash’ or ‘pumpkin’, but there is no question that it is a Hopi loan. The forms attested in different Southern Paiute variants are [paraŋwara] and [paraŋara] (Fowler and Fowler 1981:136). The phonemic representation of the first is /*paŋawata*/. This word corresponds to the Hopi word *paŋawta*, which can be glossed as ‘water is inside’.

A second Southern Paiute term for ‘squash or pumpkin’, reported only from the San Juan band, was recorded as *naxiŋis* by Bunte and Franklin (1987:28) and as *naŋgütis* by Kelly (1964:170). These alternate forms suggest that the antecedent form was /*nakütis*/, which resembles Comanche *nakwisi?* ‘squash’. A loan may be involved but the original source of the term is unclear.

An unlikely possibility is Cahuilla. Cahuilla *nehwet* ‘pumpkin’ reflects an antecedent /*nihwüt*/ and appears to be a Cahuilla innovation, derived from the Cahuilla *nekhiš* ‘wild squash’

(*Cucurbita foetidissima*).³¹ It combines the stem *neh-* ‘wild squash’ with the augmentative suffix *-wet*, literally meaning ‘big wild squash’. The same etymology is proposed in section 4 for the generic word for ‘squash, pumpkin’ in some SUA languages, also formed with reflexes of the PUA augmentative suffix ***-wĩ* but with a unrelated stem.

6.3. The Northern Uto-Aztecan Bean Vocabulary. The terms for ‘beans’ in the four lexica represented in table 4 derive from sources external to the UA language family. The Comanche and Cahuilla labels are distinct transformations of the Spanish word *frijol* ‘bean(s)’, while the original source of Hopi *mori* and Colorado River Numic *muri* is unknown (see section 5). The /o/ in the Hopi word may indicate that it was introduced before the general shift of PNUA *u to Hopi /o/, but it could also have been introduced after this shift occurred. Because /o/ is the only back rounded vowel in Hopi, Hopi speakers may simply have integrated the loanword “muri” as *mori*, just as they replaced an original /u/ by /o/ in the word *moola* ‘mule’, from Spanish *mula*.

The medial *-r-* also is found in the Yuman term for bean, which has the basic form of *marik* (Jöel 1978:83–86), but the difference in the vowels in the initial syllable precludes determining if the Hopi and Southern Paiute acquired the common bean and their terms for it from Yuman speakers. Jöel (1978:86–87) identified the Yuman term as a likely loan from Hopi. She eliminated Colorado River Numic (CRN) as a possible source because she assumed that the medial consonant in the CRN term was [t] rather than [r], based on the “phonemic” form /*muutii*/ presented by Miller (1967: #29) rather than [muurii], the “phonetic” realization recorded by Sapir (1931:574), which presumably represents the form of the word when it was loaned into Southern Numic. If the Yuman term was a loan from a northern Uto-Aztecan language, the Chemehuevi variant of Southern Paiute is the most likely source because the Chemehuevi were in close contact with the Yuman-speaking Mohave. It is possible, however, that the loan occurred in the opposite

direction. Chemehuevi terms for ‘pumpkin’, ‘muskmelon’, ‘cotton’ and ‘wheat’ are all Mohave loans (Stewart 1968; Fowler and Fowler 1981:136–37).

6.4. Other Agricultural Terms. The absence of documented terms in Southern Paiute, Comanche, and Cahuilla for many of the remaining six referents in table 4 obviously precludes an evaluation of the relationships among them. However, the forms that are attested in these languages appear to be unrelated to the Hopi terms for the same referents, with two exceptions.

The first involves the Hopi and Southern Paiute words for ‘to plant, to sow’. These terms reflect PNUA *i_ya and, as discussed in section 3.6, derive ultimately from PUA **ica, which likely had the broadcast sowing of wild seeds as its original referent. In addition to Hopi and Southern Paiute, reflexes of PNUA *i_ya with the meaning ‘to plant’ or ‘to sow’ are attested in Southern Ute and Kawaiisu (Southern Numic) and in Timbisha Shoshone (Central Numic). Nouns derived from the reflexes of *i_ya but not the verbal reflexes themselves are attested in Western Shoshoni (Central Numic) and Northern Paiute (Western Numic), where they label *Chenopodium* species that were broadcast sown (Steward 1938:23; Kelly and Fowler 1986:371) (see appendix 2, #4).

The absence of reflexes of PNUA *i_ya in Comanche and Cahuilla is unexpected, but none is attested in the available sources. Because other Central Numic languages retain reflexes, the Comanche reflex may have been lost late in the diversification of the Central Numic subdivision. In contrast, terms deriving from **ica are not recorded for any of the Takic languages, suggesting that the loss of the reflex predated the emergence of Cahuilla as a distinct language.

The second exception is *paasa* or *pasa*, shared by Hopi and Chemehuevi as the term for ‘field for cultivation’. Lowie (1924:200) recorded the similar word “*passāu^u*” as the Shivwits Southern Paiute label for an implement that they used to dig irrigation ditches. The association with

irrigation suggests that the initial syllable in the Hopi and Chemehuevi words is the combining forms of their terms for ‘water’, *paa-* in Hopi, *pa-* in Chemehuevi. The same morpheme may appear in the equivalent Cahuilla term *pawisisual*, glossed as ‘place where you can plant things’ (Bean and Saubel 1972:206). Seiler and Hioki (1979:139, 143) recorded *pa-* ‘water’ and *paw-* ‘to get water’ as the combining forms of these Cahuilla words, but *pawisisual* does not appear in their work.

The relationship between the Hopi and Chemehuevi terms cannot be determined, in part because terms for ‘field for cultivation’ are not reported for any other Southern Paiute variants. However, if a loan was involved, a loan from Hopi to Chemehuevi is suggested by the existence of an alternative Southern Numic term for the same referent, derived from PNUA **iya* ‘to plant, to sow’ and recorded in Southern Ute as *ïapi* and in Kawaiisu as *i?api*.

7. A Hopi Link to Southern Uto-Aztecan. In section 3.8, I noted that Hopi is the only NUA language with a cognate for the SUA terms reflecting PSUA **wika* ‘planting stick’. Drawing on Stubbs’s (2011) extensive compilation of Uto-Aztecan cognate and resemblant sets, I have compiled a list of ten other words from SUA languages for which possible cognates only exist in Hopi or, if cognates or resemblants are attested in other NUA languages, only the SUA and Hopi words share referents.

All eleven words are presented in table 5. The first five have cognates in more than one SUA subfamily, which allow PSUA etyma to be reconstructed. I include these etyma and the Hopi cognates in table 5, together with the numbers of the cognate sets in appendix 2 where the cognates in the SUA languages are listed. PSUA etyma cannot be reconstructed for the other six words. For them, I present in table 5 the SUA words that most closely resemble the Hopi words and, in the last four sets, I include the glosses because they differ. The numbers preceded by “S-”

that appear in brackets correspond to the numbers of the sets compiled by Stubbs (2011) in which these words appear. Stubbs's set numbers for the first six items in table 5 appear with those sets in appendix 2. He does not have cognate or resemblant sets for the words in items 6 and 8, but he (2011:402) provides a list of the words for 'wolf' in all of the Uto-Aztecan subfamilies.

Table 5. Southern Uto-Aztecan and Hopi Cognates and Resemblants

1. 'planting stick'. *wika. Hp wiikya. [#22]
 2. 'to prepare land for cultivation'. *mawe. Hp maalama. [#10]
 3. 'to rain'. *yuki. Hp yooyoki. [#24]
 4. 'nose'. *yaka. Hp yaqa. [#23]
 5. 'macaw'. *haro. Hp *k'aro* 'parrot'. [#2]
 6. 'wolf'. Hp kwewi. Na-Cl k^wetla:čtli.
 7. 'neck'. Hp kwàapi(?at). Tbr kwaí-r. [SS-1510]
 8. 'water deity. Hp Paalölöqanqw 'Water Serpent, believed to be the deity of water'. Rr walúluwi 'malevolent water deity'.
 9. Hp piikya(?at) 'immature maize ear'. Hc *hiikiri* [< piikuri] and Cr *iküri* 'mature fresh maize ear' [SS-545].
 10. Hp yoowi(?at)- 'corn silk' [< yuwi]. Cr(M) yuuri 'maíz ~ mazorca' [< yoori]. [SS-549]
 11. Hp pööca 'a type of fuzzy caterpillar or worm found in cottonwood trees, possibly the tent caterpillar'. Na-Cl poočoo-tl 'silk-cotton tree'. [SS-557]
-

Definite cognates in NUA languages other than Hopi exist only for set 5, 'nose'. Reflexes of

*yaka- are attested in Tubatulabal *yahaawit* ~ *yahaawil* ‘summit, point’ and in Southern Numic words for ‘side, edge’ (Stubbs 2011: #1546), but only the Hopi and SUA words share the referent ‘nose’. Takic words for ‘snow’ reflect Proto-Takic *yuyi. They perhaps are related to the Hopi and SUA words that reflect *yuku ‘to rain’, but again the referents are different (Stubbs 2011:#1763, #2076).

Four of the sets in table 5 are associated with agriculture or maize. Set 1, ‘planting stick’, has cognates in all the SUA subfamilies except Tubar, while cognates for set 2, ‘to prepare land for cultivation’, are attested in the Taracahitan, Corachol, and Aztecan subfamilies. For the two maize-related sets (sets 10 and 11), only Hopi and Corachol words have been found. The Hopi and Cora correspondences in set 11 are irregular, but the initial syllable of the postulated antecedent form for each is the form attested in the other language.

The similarities between the Hopi and Cora words in set 6, ‘macaw’, are intriguing. Reflexes of PSUA *haro are found in all five SUA subfamilies, with the initial *h- lost in most and replaced by another consonant in some, for example, Tubar *walo*. Only in Hopi and Cora does an initial /k-/ appear instead: Hp *k'aro* and Cr *kara*. The final /a/ in the Cora word is due to vowel harmonization, and the Hopi word shows the palatalization of /k/ expected before /a/ and /e/ (Hopi Dictionary Project 1998:866). In neither language is /k/ the reflex of *h. This shared irregularity makes the two words exact phonological cognates with one another but not with the other SUA words for ‘macaw’.

Given the geographical proximity of Hopi and Tepiman speakers, the loan of SUA words from Tepiman to Hopi cannot be discounted, but in the case of three words in table 5, the loans would have had to have taken place before two phonological shifts in Proto-Tepiman (PTep) consonants occurred: PSUA *w > PTep *g and PSUA *y > PTep *ǰ (Bascom 1965:13).³²

(23) *wika ‘planting stick’ > PTep *giika

*yuki ‘to rain’ > PTep *duuki

*yaka ‘nose’ > PTep *daaka

Shaul and Hill (1998:380) estimate that the Proto-Tepiman phonological innovations occurred “early in the first millennium A.D.,” indicating considerable antiquity for the loans if the Hopi words are from Tepiman.

An alternative possibility consistent with modern Hopi perspectives is that some of their ancestors spoke a language or languages affiliated with the southern branch of the Uto-Aztecan language family.³³ Ferguson and Colwell-Chanthaphonh (2006:115) report that “Some Hopis suggest that the Tsu’u (Snake Dance) and Powamuy (Bean Dance) ceremonies have linguistic associations with languages spoken in the southern Uto-Aztecan area.” In addition, according to Hopi history (summarized in Ferguson and Colwell-Chanthaphonh 2006:95–149), their ancestors included people known as the *Hoopoqʔyaqam*, who originated far to the south and later migrated northward to a place or region named *Palatkwapi*. After residing for a period in the *Palatkwapi* area, they resumed their migrations until they reached the Hopi mesas in northeastern Arizona.

A growing body of archaeological and ethnographic evidence indicates that some Hopi ancestors participated in the cultural traditions like Hohokam and Salado that developed in the first and second millennia A.D. south of the Mogollon Rim, in central and southern Arizona (Ferguson and Colwell-Chanthaphonh 2006:120–48; Teague 1993; Webster and Loma’omvaya 2004; Hays-Gilpen 2008:74–75). This area may correspond to the location of *Palatkwapi*, and it may have been during this period in their history that they acquired the wooden hoe labelled with the reflex of PSUA *wika ‘planting stick’, shifting the referent to ‘wooden hoe’, a shift that also occurred in Akimel Oʔodham (see appendix 2, #22}. Remains of these hoes were recovered from

the ruins of Casa Grande, a major Hohokam center constructed around A.D. 1300 (Fewkes 1912:146; Crown 1991:150–152).³⁴

Following their arrival at the Hopi mesas, the Hopis' southern ancestors introduced new agricultural and religious practices, including some associated particularly with water and rain. Given these associations, the fact that Hopi cognates or resemblants exist for four sets in table 5 related to agriculture (sets 1, 2, 10, 11), as well as set 3, 'to rain', appears less than coincidental. Moreover, the similarities between the Hopi and Rarámuri words for 'water deity' suggests some interaction in the past between speakers of these languages.³⁵ Hopi ceremonies linked to the Hopi deity *Paalölöqanqw* are also linked to the Water Clan, one of the Hopi clans that migrated from the south. Two other southern clans are the Parrot Clan, *Kʷar-nyam*, and the Young Corn Clan, *Piikʷas-nyam*. The stem of the name of the first clan is the combining form of the Hopi reflex of the PSUA etymon that I have glossed as 'macaw'. The stem of the second is the combining form of the word for which Corachol resemblants exist (set 10).

Cora cognates or resemblants are attested for five of the eleven sets in table 5 (numbers 1, 2, 5, 9, and 10). If the Hopis' southern ancestors originated in the interior of Mexico, they might have had contact with the ancestral Cora, and their language or languages could have been related to those of the Corachol subfamily.³⁶ The Coras have lived in west-central Mexico from the time of European contact and presumably were located in the same area for centuries before (Weigand 1992:182–88; cf. Weigand and García de Weigand 2000). The northward migrations of the Hopis' southern ancestors might have begun from wherever the ancestral Coras were living at the time of their departure, either where the Coras currently reside or somewhere between there and the southwestern United States. Such a long-distance migration is not entirely far-fetched given the fact that speakers of Tepiman languages expanded across the same area, from southern

Arizona to near the current Cora territory, at some point prior to European contact (Shaul and Hill 1998:388–89; Wilcox, et al. 2008). In this scenario, the ancestral Hopi would have come in contact with speakers of languages belonging to at least some of the other SUA subfamilies.

On the other hand, except for the agriculture-related terms discussed here, there is little evidence of SUA influence in the Hopi agricultural lexicon. The Hopi and PSUA lexica are quite different, as demonstrated in table 6, where the PSUA terms presented in table 2 and the Hopi terms with the same referents are juxtaposed. Only the Hopi word for ‘immature maize ear’ may be related exclusively to words in SUA languages (set 10). The Hopi verb *iiya* ‘to sow, to plant’ reflects PNUA **iya*, showing the shared NUA innovation of ***c-* > **y-* (see sections 3.6, 6.4). In addition, Hopi *sööŋo* ‘maize cob’, which may be cognate with SUA terms that reflect PSUA **sona* ‘body, stalk’, fails to show the shared PSUA innovation of **-ŋ-* to **-n-*. It also must be identified as reflecting a NUA etymon, probably PNUA **sooŋa* (see section 3.11).

Table 6. Proto-Southern Uto-Aztecan and Hopi Agricultural Lexica

Referent	Proto-SUA	Hopi
1. ‘maize (generic)’	<i>*suhunu</i>	<i>qaaʔö</i>
2. ‘immature maize ear’	<i>*sita</i>	<i>piikʔa</i>
3. ‘to shell maize’	<i>*hora ~ *hori</i>	<i>hiiimi</i>
4. ‘parched maize kernels’	<i>*saki</i>	<i>kitiki</i>
5. ‘tamale’	<i>*tima</i>	<i>somiviki</i>
6. ‘field for cultivation’	<i>*wasa</i>	<i>paasa</i>
7. ‘planting stick’	<i>*wika</i>	<i>sooya</i>

8. Agriculture and the Proto-Southern Uto-Aztecan Homeland. The linguistic evidence presented in section 3 indicates that the PSUA speech community was intact when its members adopted maize agriculture. Evaluating the degree to which they could have been involved in the initial diffusion of agriculture and specifically maize agriculture between Mesoamerica and the southwestern United States depends upon determining their location during the period when this diffusion occurred. A consideration of additional linguistic evidence and biogeographical data suggests that the PSUA speech community most likely was located in northeastern Sonora and southeastern Arizona when maize agriculture was introduced to the region.³⁷

The identification of this area as the PSUA homeland is based on the geographical distribution of four wild plant and animal taxa labelled with etyma that are PSUA innovations: ‘wild chile’, two kinds of ‘palm’, and ‘macaw’ (see table 7 and appendix 2). The ranges of these taxa overlap in northeastern Sonora and regions to the south. The wild chile (*Capsicum annuum* var. *glabriusculum*) also is found in southern Arizona up to 32° north latitude (Tewksbury, et al. 1999:99–100; Kraft 2009). Based on the botanical identifications of the palm species labelled by terms in SUA languages derived from PSUA *taku and *soyawa (see appendix 2), the original referents of these terms likely were *Sabal uresana* and one or more species of *Brahea*, the ranges of which extend northward to near the 31st parallel (Joyal 1995:146; Felger and Joyal 1999:3). Macaws (*Ara militaris*) also reach the northern limits of their distribution at about 30° north latitude (CONABIO n.d.; Íñigo-Elías 2000).³⁸

Table 7. Proto-Southern Uto-Aztecan Innovations in Names for Flora and Fauna

Proto-SUA Etyma	Tep	TrC	CrC	Tbr	Azt
1. *haro ‘macaw’	x	x	x	x	x
2. *koʔori ‘wild chile’	x	x	x	x	—
3. *taku ‘palm’	x	x	x	x	—
4. *soyawa ‘palm’	—	x	—	x	x

ABBREVIATIONS: Tep = Tepiman; TrC = Taracahitan; Tbr = Tubar; CrC = Corachol; Azt = Aztecan

x = cognate present

— = cognate absent

It thus can be argued that the PSUA foraging bands were exploiting the wild resources of an area that was located between the 30th and 32nd parallels. Although wild chiles, palms, and macaws occur south of the 30th parallel, a more southerly location for the SUA homeland is unlikely. No PSUA terms can be reconstructed for any species associated exclusively with tropical zones, including those encountered in the tropical deciduous forests that occur in Sonora as far north as the 29th parallel (Búrquez, et al. 2002:54, fig. 2.6; Robichaux and Yetman 2000).

If the PSUA speech community had been located farther south, a likely candidate for a label reconstructible to PSUA would be the ‘silk-cotton tree’ (*Ceiba* spp.), a morphologically quite distinctive and economically useful genus, distributed in tropical areas from Sonora to South America. However, the SUA terms for this tree are not cognates, even in SUA languages spoken

in Sonora, where they label *Ceiba acuminata*.

(24) Nv *aupukama*

My(Y) *baogua*

Ed *sávur*

Wr-S *wahkapi*

The location proposed for the SUA homeland includes the northern half of the Serrana region of northeastern Sonora, situated along the upper drainages of the Río Sonora and Río Yaqui and at the time of European contact one of the most productive agricultural zones in the entire region (Doolittle 1980, 1984a, 1984b, 1988). Given the proximity of this postulated SUA homeland to the early agricultural sites in southern Arizona, the inception of maize agriculture among PSUA speakers presumably would have occurred at roughly the same time. If so, then it can be hypothesized that the PSUA speech community was intact at least until around 4100 B.P.

If the PSUA speech community was located north of the 29th parallel, it is doubtful that its members would have been responsible for diffusing maize agriculture across the thousand kilometers separating them from Mesoamerica. It is, of course, reasonable to suppose that they could have played a role in the introduction of maize agriculture to foraging societies farther north (Carpenter, Sánchez, and Mabry 2001; Carpenter, Sánchez, and Villalpando 2002). In addition, the movement of PSUA farmers into new areas suitable for farming presumably would have been one of the factors contributing to the dispersal of the PSUA speech community. Given the distribution of the SUA languages at the time of European contact, movements appear to have been primarily to the east, west, and south, where seasonal rainfall and temperature regimes were more amenable to maize agriculture than areas to the north. Expansion southward toward Mesoamerica could have created a corridor through which domesticated cucurbits and beans later

diffused northward.

9. Conclusions. Four generalizations about the place of agriculture in Uto-Aztecan cultural history can be proposed, based on the comparative analysis of the agricultural lexica of the Uto-Aztecan languages presented here:

1. The members of the Proto-Uto-Aztecan speech community were foragers who engaged in some forms of wild plant husbandry that included the broadcast sowing of wild seeds. They also developed vocabulary, practices, and material culture linked to the procurement and processing of wild plants that were later applied to domesticated plants and their cultivation by speakers of both Southern and Northern Uto-Aztecan languages.

2. Prior to the adoption of agriculture by any Uto-Aztecan speakers, the PUA speech community divided into two separate speech communities, resulting in the emergence of the first-level daughter languages, Proto-Southern Uto-Aztecan and Proto-Northern Uto-Aztecan. Following this split, interaction between the speakers of these intermediate proto-languages was minimal, and their subsequent engagements with agriculture occurred for the most part independently of one another.

3. The Proto-Southern Uto-Aztecan speech community was intact when its members adopted maize agriculture. Their dispersal and the diversification of PSUA into distinct dialects and languages began before the introduction of domesticated cucurbits and was well advanced by the time that they integrated domesticated beans into their crop complexes. The interaction of Tepiman and Taracahitan speakers after the emergence of the ancestral languages of the SUA subfamilies is indicated by loans of agriculture-related terms between them. Proto-Corachol and Proto-Aztecan speakers appear not to have formed part of this interaction sphere.

4. The members of the Proto-Northern Uto-Aztecan speech community were foragers, not

farmers, and foraging continued to be the sole or primary component of the economic strategies of most Northern Uto-Aztecans societies. The shift from foraging to a mixed foraging-farming strategy occurred late in the diversification of the NUA branch of the language family and involved only some NUA societies.

The third generalization regarding the cultural history of maize, cucurbits, and beans among the Southern Uto-Aztecans corresponds to the perspective advocated by Hill (2001a:346), but the fourth, regarding the cultural history of agriculture among the Northern Uto-Aztecans, is quite different from the position that she has advocated. She (2001b:916-917; 2012) proposes instead that the members of the PUA speech community were farmers located within or on the borders of Mesoamerica and, as demand for new arable land increased, began spreading northward, leading to the emergence of a separate PNUA speech community whose members eventually reached the southwestern United States, where they introduced maize agriculture. To account for the absence of evidence for an agricultural lexicon reconstructible to PNUA, she (2001b:927; 2002a) suggests that reflexes of PNUA etyma related to agriculture existed in all of the ancestral languages of the NUA subfamilies but either were never recorded or were lost when some NUA societies ceased farming to rely exclusively on foraging for their survival.

Lexical loss or the failure to record agriculture-related words in some NUA languages definitely must have occurred in the case of the reflexes of the PUA verb ‘to plant, to sow’. This etymon can be reconstructed to PUA as **ica*, but reflexes of it are not attested in Tubatulabal or the Takic languages, nor in a few of the Numic languages (see section 6.4). I also agree that some of the NUA societies documented ethnohistorically or ethnographically as fulltime foragers practiced some farming earlier in their histories, but I do not interpret the available evidence as supporting the conclusion that the members of the ancestral Proto-Northern Uto-Aztecans speech

community as a whole were farmers.

From my perspective, the first NUA farmers could have integrated farming into their foraging economies during the period, roughly 3000–2150 B.P., when maize agriculture was initially spreading across the American Southwest and into adjacent areas of the Northern Colorado Plateau (Wilde and Newman 1989:714; Lyneis 1995:207–208; Madsen and Simms 1998:293; Matson 2002; Kohler and Glaude 2008:82-83). Later, other speakers of ancestral NUA languages could have developed mixed foraging-farming strategies, but some probably never adopted maize agriculture because they were located in areas, like southern California, where reliable wild food resources were abundant, or farther north, where local environmental conditions rendered maize production unreliable.

I also suspect that climatic fluctuations in western North America were responsible for shifts between foraging and mixed foraging-farming strategies that likely occurred on multiple occasions during the history of the region. Although a number of factors have been proposed to account for the disappearance of farming by around 700 B.P. in areas of the Great Basin and Colorado Plateau associated with the Fremont archaeological tradition, increasing aridity during the maize growing season must have been involved (Madsen and Simms 1998:313–320). Similarly, decreasing temperatures during the Little Ice Age, dated for western North America to roughly 550-100 B.P. (A.D. 1400-1850), may be responsible for another abandonment of farming in the same area later on (Koerper, Killingley, and Taylor 1985; Matthews and Briffa 2005; Stine 2004:53–54).

In fact, I interpret reports from the 19th and early 20th centuries that some Numic speakers who lived in the Great Basin and on the Northern Colorado Plateau had recently “begun” small-scale farming as evidence that they were actually resuming a mixed foraging-farming strategy

that they had abandoned during the Little Ice Age (Steward 1938:122, 137; Kelly and Fowler 1986:371; Fowler and Fowler 1981:132–138). The ensuing warming trend that began around 150 B.P. (1800 A.D.) allowed Numic farmer-foragers to expand northward into areas of the Great Basin that may have been farmed prior to 550 B.P. (A.D. 1400), but this expansion (or re-expansion) was cut short by the arrival of Euro-American settlers, who appropriated the best and in some cases only arable lands (Matthews and Briffa 2005:23; Stoffle and Dobyns 1983:49; Stoffle and Zedeño 2001). A mixed foraging-farming strategy persisted, however, in a few Numic communities farther to the south, where ethnographers like Isabel Kelly (1964; Fowler 1995) were able to observe its pursuit.

Appendix 1

Language Abbreviations and Sources

AO = Akimel Oʼodham: Rea 1997

Ca = Cahuilla: Seiler and Hioko 1979

Ca(B) = Cahuilla: Bean and Saubel 1972

Ch = Chemehuevi: Press 1979

Cm = Comanche: Robinson and Armagost 1990

Cp = Cupeño: Hill and Nolasquez 1973

Cr = Cora: McMahon and McMahon 1959

Cr(O) = Cora: Ortega 1860 [1732]

Cr(P) = Cora: Preuss 1934

Cr(V) = Cora: Valiñas Coalla 2000

Ed = Eudeve: Pennington, ed. 1981

Hc = Huichol: McIntosh and Grimes 1954

Hc(G) = Grimes, et al. 1981

Hc(Gm) = Gómez 1999

Hp = Hopi: Hopi Dictionary Project 1998

Kt = Kitanemuk: Anderton 1988

Kw = Kawaiisu: Zigmond, Booth, and Munro 1991

LP = Lower Pima: Bascom 1965

Ls = Luiseño: Elliott 1999

Ls(B) = Luiseño: Bright 1968

My = Mayo: Collard and Collard 1962

My(Y) = Yetman and Van Devender 2002
Na-CI = Classical Nahuatl: Karttunen 1992
Na-CI(M) = Classical Nahuatl: Molina 1970
NP = Northern Paiute: Liljeblad, Fowler, and Powell 2012
NT = Northern Tepehuan: Bascom 1965
NT(R) = Northern Tepehuan: Rinaldini 1994
Nv = Névome: Pennington, ed., 1979
Op = Ópata: Lombardo 1702
Op(P) = Ópata: Pimentel 1863
Po = Pochutec: Boas 1917
Pp = Pipil: Campbell 1985
PYp = Pima, Yepachi, Chihuahua: Shaul 1994
PYp(R) = Pima, Yepachi, Chihuahua: Rea 1997
Rr = Rarámuri: Brambila 1976
Rr(H) = Rarámuri: Hilton 1959
SP = Southern Paiute (Kaibab variant): Sapir 1931
SP-K = Southern Paiute (Kaibab variant): Kelly 1964
SP-SJ = Southern Paiute (San Juan variant): Kelly 1964
ST = Southern Tepehuan: Bascom 1965
SUt = Southern Ute: Givón, ed., 1979
Tb = Tubatulabal: Munro and Mace 1995
Tb(EV) = Tubatulabal: E. Voegelin 1938
Tbr = Tubar: Lionnet 1978

TO = Tohono Oʼodham: Saxton, et al. 1983

To(M) = Tohono Oʼodham: Mathiot 1973

TSh = Timbisha Shoshone: Dayley 1989

UP = Upper Pima: Bascom 1965

Wr-R = River Warihó: Medina Murillo 2002

Wr-S = Sierra Warihó: Miller 1996

WSh-G = Western Shoshone, Gosiute: Miller 1972

WSh-G(C) = Western Shoshone, Gosiute: Chamberlin 1911

Yq = Yaqui, Sonora: Estrada Fernández, et al. 2004

Yq-Az = Yaqui, Arizona: Molina, Valenzuela, and Shaul 1999

Appendix 2

Cognate Sets

The cognate sets are organized in alphabetical order by the reconstructed etyma, which should be regarded as approximations. Many regular phonological correspondences among the UA languages remain unidentified, especially in second-syllable vowels in reflexes of disyllabic etyma, where sound changes and loss are common. The etyma are marked with ** for Proto-Uto-Aztecan (PUA) and * for Proto-Northern-Uto-Aztecan (PNUA), Proto-Southern-Uto-Aztecan (PSUA), and the other intermediary proto-languages. The numbers in brackets with the “S-” prefix correspond to those in Stubbs (2011), the most comprehensive compilation of UA cognate and resemblant sets available.

The words included in each set show expected correspondences in the initial syllable plus the initial segment of the second syllable. Deviations relevant to the analysis are noted in the “Comment(s).” The sets do not include cognates from all UA languages and variants. The principal source of data for each language is the first source listed in appendix 1. Data from the other sources are included only when cognates are not attested in the principal sources or sometimes when the attested forms in them differ from those of the principal source.

The cognates in each set are organized by subfamilies in the following order: (1) Numic, (2) Tubatulabal, (3) Hopi, (4) Takic, (5) Tepiman, (6) Taracahitan, (7) Tubar, (8) Corachol, and (9) Aztecan. Most sets lack cognates from several subfamilies, but the order and numbering are retained. The abbreviations for all of the languages are found in appendix 1.

My orthography corresponds in most regards to the Americanist phonetic notation, in which <c> represents the voiceless alveolar affricate, <č> the voiceless post-alveolar and alveopalatal affricates, and <š> the voiceless alveopalatal fricative. Vowel length in Tubatulabal, Hopi,

Luiseño, Nahuatl, and Pipil is denoted by a colon following the lengthened vowel: <-V:->. Identical vowel sequences in the other SUA languages are presented as -VV-, with stress indicated for Yaqui and Mayo and high tone for Northern Tepehuan. Falling tone in Hopi is marked by a grave accent.

I retain the modern technical orthographies developed for each of the languages considered with a few exceptions. I use <ş> to represent a voiceless retroflex sibilant and <î> instead of <ï> as the grapheme for a high, central or back unrounded vowel. In Southern Ute words, <î> is the grapheme for the high, central unrounded vowel, and <ü> the grapheme for the high back unrounded vowel. I have adopted <ŗ> as the grapheme for the Névome sound represented in the original source with the digraph <rh>. For Tubar, <o> represents the phoneme interpreted by Lionnet (1978) as /ɔ/ and <u> represents the allophone of /u/ that he interpreted as [o]. I use <ɭ> as a phonemic representation of sounds that Lionnet interpreted as allophones of /r/ and represented as <ɭ> and <ɭ̣>.

I use the citation forms of the original sources, but I eliminate initial glottal stops before vowels except when they are relevant to the analysis. I also omit the hyphen used in some sources to separate noun stems from the “absolute” suffix that typically marks nouns in a non-possessed state in the languages that have retained this suffix. Glosses for individual cognates are presented only when they deviate from the referents assigned to the reconstructed terms. When a cognate has multiple referents and one corresponds to that of the reconstructed etyma, the other referents are not included.

1. PSUA *hari ‘wild squash’. [S-2141]. (5) TO *aḍawi* ‘wild squash (*Cucurbita digitata*)’. TO *haal* ‘squash, pumpkin’ [loanword]. Nv *aari* ‘rainy-season squash or pumpkins’ [probable loanword]. Nv *aḗabi* ‘wild squash’. PYP(R) *ara* ‘wild squash’. PYP *ara* ‘small squash’. (6) Yq

ayaʔawim ‘squash, pumpkin (*Cucurbita moschata*)’. My *aayau* (sg), *ayáʔawim* (pl) ‘squash, pumpkin’. Ed *arí* ‘gourd dipper’. Ed *haris* ‘wild squash’. Wr-R *haarí* ~ *arí* ‘gourd canteen, gourd dipper’. Wr-R *haláwe* ~ *haráwe* ~ *aláwe* ~ *aráwe* ‘squash, pumpkin’. Wr-R *maharáwe* ‘wild squash’. Wr-R *halapá* ~ *alapá* ~ *arapá* ‘gourd, gourd dipper’. Wr-S *arí* ‘gourd canteen, gourd dipper’. Wr-S *aláwe* ‘pepo squash (*Cucurbita pepo*)’. Wr-S *alapá* ‘gourd, gourd dipper’. Wr-S *alóci* ‘gourd, gourd dipper’. Rr *arí* ‘bottle gourd’. Rr *arisi* ‘wild squash’. Rr *labá* ‘gourd dipper cut breadthwise’. Rr *lóci* ‘gourd dipper cut lengthwise’. (7) Tbr *halipát* ‘a kind of gourd, gourd dipper’. Tbr *hualít* ‘a kind of gourd used to transport water’. (8) Hc *ïari* ‘calabash, bottle gourd’. (9) Na-Cl *ayoʔtli* ‘gourd, squash, pumpkin’. Pp *ayuh* ‘a variety of squash or pumpkin’. Po *eyut* ‘squash or pumpkin’. **Comment:** Pennington (1963:44–45, 164) identifies Rr *arí* and *arisi* as the labels for *Lagenaria siceraria* and *Cucurbita foetidissima* respectively.

2. PSUA *haro ‘macaw’. [S-217]. (3) Hp *kʷaro*. (5) To *aaḏho* ‘peafowl’. Nv *aḥo*. (6) Ed *háro*. Wr-S *walá*. Rr *walá* ~ *wará*. (7) Tbr *waló*. (8) Cr(P) *kara(s)*. (9) Na-Cl(M) *alo*. **Comment:** The Classical Nahuatl reflex of *haro clearly served as a generic label. Molina (1970) glossed *alo* as ‘large parrot’, *kʷauʔ alo* as ‘large green parrot’, and *čičiltik alo* as ‘large red parrot’.

3. PSUA *hora ~ *hori. ‘to shell maize’. [S-552]. (6) Ed *hóran*. Wr-S *ola-*. Rr *orá* ~ *orí* ‘to shell (generic)’. (8) Hc *urika*. (9) Na-Cl *o:ya* ‘to shell (generic)’. Pp *u:ya* ‘to shell (generic)’. Pp *tau:ya* ‘to shell maize’. Po *teyul* ‘maize’. **Comment:** Nv *hoḥa* ‘to harvest maize’ closely resembles Ed *hóran*, but /h/ in the Tepiman languages is the reflex of PSUA *s, not *h. If Nv *hoḥa* and its TO cognate *ooʔoḏa* ~ *oḏ* ~ *oo* ‘to harvest, to gather fruit’ are linked to this set, they likely are loans.

4. PUA **ica. ‘to plant, to sow’. [S-1635]. (1) NP *ïapi* ‘pigweed’. TSh *ïah*. WSh-G *ïappih* ‘pigweed (?)’. Kw *ĩʔa-*. SP *ïa-*. Ch *ĩga*. SUt *ïay*. (3) Hp *ĩ:ya*. (5) TO *ĩʔiša*. Nv *ĩsa*. PYp *ĩsa*. NT *ĩši*. ST *ĩši*. (6) Yq *eéča*. My *eéča*. Ed *eca*. Wr-S *eca-*. Rr *ičí*. (8) Cr(O) *aca*. Hc *ecarika*.

5. PNUA **ko ‘chenopod’. [S-1655]. (1) WSh-G *kokax*. Kw *koovi*. SP-K *kovi*. (4) Ca(B) *kiʔawet*. Cp *qit*. Ls(B) *qet*. Kt *kokt*. **Comment:** The referents of the Cp and Kt terms are given as

“*Chenopodium* spp.” The species of *Chenopodium* associated with the others terms are: a) *C. humile* = Kw; b) *C. album* = Kw, Ls(B); c) *C. fremontii* = SP-K, Ca(B); and d) *C. californicum*, *C. humile*, *C. fremontii*, *C. murale* = Ca(B).

6. PSUA *koʔkori ‘(wild) chile’. [S-1597]. (5) TO *koʔokol* ‘a chili pod; chili powder’. TO *aʔal koʔokol* ~ *uʔus koʔokol* ‘wild chile’. Nv *kokori*. PYp *kokoli* ~ *koʔokil*. NT *kóókoli*. ST *kóʔokolʔ*.

(6) Yq *kóʔokoi*. Wr-S *koʔkóri*. Rr *kori*. (7) Tbr *kokól*. (8) Cr *kuʔukuri*. Hc *kuukuri*. **Comments:** a)

Except in TO, these cognates apparently serve as generic labels for both wild and domesticated chiles. b) Na-Cl *čilli* is an innovation and the source of the word ‘chile’. c) Na-Cl *kokoa*: ‘to be sick, to hurt; to hurt someone’ is a reflex of PSUA *koʔoko ‘to be sick, to hurt’ from which the label for ‘chile’ is derived. Takic cognates are attested for the verb but not for the words for ‘chile’ (Stubbs 2011:#1597).

7. PNumic *kuha ‘blazing star’ (*Mentzelia* spp.)’. (1) NP *kuha* ‘blazing star seeds’. TSh *kuha*.

TSh *kuhwa* ‘blazing star seeds’. WSh-G(C) *kuhwa* ‘*Mentzelia* spp.’ Kw *kuʔuvi*. SP-SJ *kuʔu*. (2)

Tb(EV) *ku:l*. **Comments:** a) Vowel harmonization and the loss of the medial *-h-* could account for the Kw, SP, and Tb words, but they also could reflect a etymon or etyma distinct from *kuha.

b) Zigmond (1941:213), Kelly (1964:passim), and Lawlor (1995:483-485) provide additional labels for *Mentzelia* species from other Southern Paiute variants. c) The Hp label for *Mentzelia* spp. is the innovation *sililitaqa*, formed from the root *sili-* ‘to crackle’ apparently in reference to the rattling sound made by the ripe seed pod (Whiting 1966:85; Hopi Dictionary Project 1998:502). The Havasupai word *selé*, which labels *Mentzelia albicaulis* (C.G. Smith 1973), presumably is a Hopi loan.

8. PSUA *kumi. ‘to chew, to crunch, to nibble’. [S-777] (5) TO *kuum* ‘to chew, to crunch’. To(M) *kuum* ‘to eat, chew on something that comes in little pieces, such as corn, popcorn, and pieces of candy’. PYP *kuum* ‘to chew’. (6) Yq *kuúme* ‘to chew’. My *kuúme* ‘to chew’. Wr-S *kuʔmi-* ‘to chew something hard and crunchy like parched maize kernels or squash seeds’. Rr *kumí* ‘to eat maize kernels (parched, fresh, or dried)’. (7) Tbr *kumi-* ‘to eat small or ground up things, to eat maize’. (8) Hc(G) *kimi* ‘to nibble’. **Comment:** The medial glottal stop in the Wr reflex and the correspondence of identical vowel sequences in the Tepiman, Yaqui, and Mayo reflexes suggest that the PSUA etymon should be reconstructed as *kuhumi.
9. PUA **mata. ‘metate’. [S-1082]. (1) NP *mata*. Kw *maraci*. SP *maraci*. SUt *maraci*. (2) Tb *manaal*. (3) Hp *mata*. (4) Ca *malal*. Cp *malal*. Ls *malaal*. (5) TO *maččuq*. PYP *maatur*. NT *mauturai*. ST *mattur*. (6) Yq *máta*. My *mátta*. Eu *matát*. Wr-S *mahtá*. Rr *maʔtá*. (7) Tbr *matát*. (8) Cr *mwaata*. Hc *maataa*. (9) Na-Cl *metlatl*. Pp *metat*. Po *mot*. **Comments:** a) The medial *-r-* in the Southern Numic reflexes is the result of lenition of *-t-. b) Tb *-l-* rather than *-n-* is expected.
10. PSUA *mawe ‘to prepare land for cultivation’. [S-1639]. 3) Hp *maalama*. (6) Yq *máohte*. My *mag^wohte*. Ed *máwan* ‘to plow’. Wr-S *mawe-*. Rr *mawé*. (8) Cr *muaʔire*. Hc *imayaari*. (9) Na-Cl *zacamoaa*. Pp(C) *me:wa*. **Comments:** a) Hp *-l-* is the expected reflex of *-w- between low vowels (Voegelin, Voegelin, and Hale 1962:53). b) The medial *-w-* has been lost in the Yq, Cr, Hc, and Na-Cl reflexes, and the Pp reflex shows vowel metathesis. [S-1639]
11. “mu-” [loanword] ‘bean’. [S-131]. (1) SP *muurii*. SP-SJ *muruis*. (3) Hp *mori*. (5) TO *muuni*. PYP *müina*. (6) Yq *múni*. My *muúnim* ‘beans’. Eu *mun*. Wr-S *muní*. Rr *muní*. (8) Cr *muhume*. Hc *muume*. **Comments:** a) In the PYP reflex, *-uu-* has shifted to the unrounded *-ü-*. b) The identical vowel sequences in several reflexes suggest that the first two syllables of the loanword from which they derive may have been “muhu-”, as attested in the Cr word.

12. PSUA *mura ‘inflorescence’. [S-536]. (5) TO *muḍaḍag*. Nv *muḗadaga*. PYP *murat* ‘maize spike’ (6) Yq *móa* ‘wheat tassel’. My *mougwa* ‘to produce spike(s)’. Ed *murát*. Wr-S *mulá* ‘maize tassel’. Rr *murá*. (8) Hc *imiaye* ‘to produce spike(s)’. (9) Na-Cl *miya:watl* ‘maize tassel and flower’

13. PSUA *paci ‘seed’. [S-1916]. (6) Yq *báči* ‘maize’. My *bátči* ‘maize’. Ed *suváci*. Op(P) *vači* ‘maize with formed kernels’ Wr-S *pahcí*. Rr *pačí* ‘mature fresh maize ear’. (7) Tbr *wacirán*. (8) Cr *haci*. Hc *haci*. (9) Na-Cl *ačtli*. Po *ašt*. Comments: a) Words that derive from reflexes of *paci are discussed in section 3.10. b) The Op reflex is attested in Pimentel (1863:311), glossed as “el maiz ya granado.” I have been unable to find this gloss in Lombardo (1702), Pimentel’s principal source of Ópata lexical items. Lombardo (1702:151v) does include *vačit*, glossed as ‘squash seeds or a similar thing’ (“las pepitas de las calabazas o cosa semejante”), essentially the same gloss assigned to the Eudeve cognate, *bacit* ‘squash seed’. This gloss does not appear anywhere in Pimentel’s work, suggesting that he may have altered the original gloss. However, Pimentel’s *vači* lacks the final *-t*, presumably the absolutive suffix, and Pimentel appears to include the absolutive suffix and other word-final consonants if they are attested in Lombardo’s work. Perhaps two different words are involved. Valiñas Coalla (2000:197-198) glosses Ópata paci as both ‘seed’ and ‘fresh mature maize ear’.

14. PSUA *saki. ‘parched maize kernels’. [S-524]. (5) TO *haaki*. PYP *haahaki*. NT *ááki*. ST *haak*. (6) trc: Yq-Az *saakim*. My *saáki*. Ed *sakít*. Wr-S *sakí*. Rr *sakí*. (8) Hc *şaki*. (9) Na-Cl *i:skitl*. Pp *i:seki* ‘to toast’. **Comment:** The Tepiman terms label ‘parched grains’ in general.

15. PSUA *sita ‘immature maize ear’. [S-538]. (6) Yq-Az *sita*. My(V) *sitawa*. Ed *sítven* ‘to sprout an ear of maize’. Wr-S *sitá* ‘corn silk’. Rr *sitá*. (8) Cr(O) *sitati*. Hc *şiita*. (9) Na-Cl *ši:lo:tl*. Pp *ši:lut*. **Comments:** a) Miller (1993:150) glosses Wr-S *sitá* as ‘immature maize ear’. b) Tbr

solit ‘mature fresh maize ear’ could be a Nahuatl loanword if vowel metathesis occurred.

16. PSUA *soyawa ‘a kind of palm’. [S-1607]. (6) Wr-S *saó* ‘*Sabal uresana*’. Rr *sowá*. (7) Tbr *saywát*. (9) azt: Na-Cl *so:ya:tl*. **Comments:** The PSUA etymon is reconstructed as trisyllabic based primarily on Tbr *saywat*, which presumably lost a second-syllable vowel. The reworking that is evidenced in all the reflexes includes vowel harmonization and the loss and metathesis of both vowels and consonants.

17. PSUA *suhunu ‘maize (generic)’. [S-535]. (5) TO *huuni*. UP *huuñi*. Nv *hunu*. PYP *huun* ~ *huuno*. NT *úúnui*. ST *huun*. (6) My *súnnu* ‘maize field’. Ed *sunút*. Wr-S *sunú*. Wr-R *suʔunú*. Rr *suunú*. Rr(H) *sunú*. (9) Na-Cl *sintli* ~ *sentli* ‘dried maize ear’. Pp *sinti* ‘maize, dried maize ear’. Po *son* ‘dried maize ear’. **Comment:** Hill (2005:2; 2008:164; 2012:58) indicates that the Gabrielino term for ‘tortilla’ is *ʃoŋaaxeŋ*, which she analyzes as *ʃoŋ*- ‘corn’ + *-aaxe-* ‘put in mouth’ + *-y* ‘non-possessed noun suffix’, citing John P. Harrington’s unpublished fieldnotes as her source for the Gabrielino data (Hill 2008:159, n. 6). I did not encounter this word in my review of the microfilm of these field notes (Mills 1981-1988), but these notes do include a similar word, which was transcribed and glossed by Harrington as “šajahaj, bread” (Roll 102, Frame 0672). The Gabrielino word may derive from Proto-Takic *sawa (Stubbs 2011:#266c) ‘to make tortillas or bread’, with the velar nasal resulting from a shift of *-w- to -ŋ- that Munro (1973) reports to occur in some Luiseño words, another Takic language.

18. PSUA *taku ‘a kind of palm’. [S-1606]. (5) TO *takui* ‘soaptree yucca’. (6) Yq *táko* ‘*Washingtonia robusta*’. My(Y) *taʔako* ‘*Brahea aculeata*, *Sabal uresana*’. Ed *takút*. Wr-S *tahkú* ‘*Brahea aculeata*’. Rr *rakú*. (7) Tbr *takút*. (8) Cr *taki*. Hc(Gm) *taki*. **Comment:** Rea (1997:284-285) identifies the soaptree yucca in the Akimel O’odham area as *Yucca elata*, the referent of the TO reflex of *taku. A shift in referent presumably occurred because the palm taxa labelled with

terms derived from *taku in other SUA languages do not occur in the Upper Piman area and the leaves of at least some of these taxa and *Yucca elata* are used in weaving (cf. Joyal 1996a, 1996b).

19. PUA **tusa. ‘to grind’. [S-1081]. (1) NP *tusu*. TSh *tusu*. Cm *tusuri*. Kw *tusu*. SP *tusu*. SUT *tūsui*. (2) Tb *tusut*. (3) Hp *tosta*. (4) Ca *tus*. Ls *tu:ɣ* ‘to crumble’. Kt *tuh*. (5) TO *čuʔa* ~ *čua* ~ *čuʔi*. Nv *tuha*. PYP *tuʔia*. (6) Yq *tuíse*. My *tuíse*. Ed *tusán*. Wr-S *tusu-*. Rr *rusú*. (7) Tbr *tusí*. (8) Cr *tíʔisih*. Hc *tīšiya*. (9) Na-Cl *tesí*. Pp *tisi*. Po *toso*.

20. PUA **tusi ‘something ground up’. (1) NP *nadussupí* ‘meal’. NP *hanibinnadussupe* ‘ground maize kernels’. Cm *tusupí* ‘pulverized or grated object’. Cm *hanitusupí* ‘ground corn, cornmeal’. Ch *tusupí* ‘flour, something ground up’. SUT *tisupí* ‘flour’. (3) Hp *toosi* ‘roasted sweet corn that is dried and ground to a fine texture’. (4) Ca *tus* ‘something ground up’. (5) TO *čuʔi* ‘flour, ground food, pollen’. Nv *tuhi* ~ *tusi* ‘anything ground up, ground parched maize’. PYP *tuʔi* ‘meal, flour’. NT *túi* ‘flour’. NT *túšapi* ‘maize flour’. ST *tui* ‘flour’. ST *tuišəp* ‘maize flour’. (6) Yq *saktúsi* ‘ground parched maize’. My *sák tússi* ‘ground parched maize’. My *tuúsi* ‘dough’. Ed *tusít* ‘ground parched maize’. Wr-R *tusí* ~ *tuúsi* ‘ground parched maize, maize dough’. Rr *rusí* ‘finely ground grain’. Rr *kobirusi* ~ *kobísi* ‘ground parched maize’. (7) *matusít* ‘ground parched maize’. (8) Cr(V) *m^watišisiš* ‘ground parched maize’. (9) Na-Cl *teštli* ‘flour, meal’. Pp *tīšti* ‘dough, maize dough’. Po *tošt* ‘dough’.

21. PSUA *wasa ‘field for cultivation’. [S-1636]. (5) TO *gagka* ‘a clearing’. TO *gagkat* ‘to clear land’. Nv *gaga*. PYP *gaha*. (6) Yq *waása*. Ed *gwasát*. Wr-S *wasá*. Rr *wasá*. (8) Cr *wastiʔi* ‘planted (adj)’. Hc *waša*. **Comments:** a) The initial syllable in To *gag-* apparently involves reduplication, as seen in the Nv reflex. The PYP cognate shows the expected Tepiman reflexes /g/ and /h/ of PSUA *w and *s. b) Grimes (1980: 272) reports that Hc *waša* also designates ‘maize

plant’.

22. PSUA *wika ‘planting stick’. [S-672]. (3) *wiikʷa* ‘ancient wooden hoe’. (5) AO *giiki* ‘wooden hoe’. TO *giiki*. Nv *gika*. PYP *giika* ‘plow (n)’. NT *giikai*. ST *giik*. (6) My *wiʔika*. Wr-S *wika*. Rr *wiká*. Rr(H) *wika*. (8) Cr(O) *vikati*. Hc(G) *wika*. (9) Na-Cl *wiktli*.

23. PSUA *yaka ‘nose’. [S-1546]. (3) Hp *yaqa*. (5) TO *daak*. PYP *daaka*. NT *daáka*. ST *daak*. (6) Ed *dakát*. Yq *yéka*. My *yékka*. Wr-S *yahká*. Rr *aʔká*. (9) Na-Cl *yakatl*. Pp *yak*. PO *yeket*.

24. PSUA *yuki ‘to rain’. [S-1763]. 3) Hp *yooyoki* ‘to be raining’. (5) TO *juuk*. NT *duúki* ‘rain (n)’. (6) Yq *yúke*. My *yúkke*. Ed *dúkun*. Wr-S *yuʔku-*. Rr *ukú*.

Notes

Acknowledgments. [To Be Added]

1. The B.P. (“before present”) dates are calculated using 1950 as the point of reference for the “present.”
2. Valiñas Coalla (2000) also is a major contribution that focuses on the SUA languages.
3. The farming/language dispersal hypothesis, originally proposed by Bellwood (1993, 2001; cf. Diamond and Bellwood 2003), has been examined in a large number of publications, some supportive of it, others critical. A sample of both perspectives are found in the essays compiled in Bellwood and Renfrew (2002). A more recent global-scale evaluation of the hypothesis is Hammarström (2010). Studies that relate specifically to Hill’s proposals for the the place of agriculture in Uto-Aztecan cultural history include Wichmann (2002), Matson (2002), Carpenter, Sánchez, and Villalpando (2002), Mabry 2005, Mabry, Carpenter, and Sanchez (2008), LeBlanc (2008), Wilcox, et al. (2008), and Brown 2010.
4. The abbreviations and sources of data for each of the Uto-Aztecan languages considered in this essay are listed in appendix 1. Cognates sets not included in the main body of the essay are presented in appendix 2. In the introduction to appendix 2, I explain my orthographic conventions and the criteria I have used in identifying cognates.
5. A number of additional languages, now extinct, may have belonged to the Uto-Aztecan language family, but their affiliation cannot be determined because they are undocumented (Miller 1983b; Campbell 1997:133-135).
6. Hill (2005:2; 2008:164; 2012:58) identifies Gabrielino *soŋ-* as cognate with Hopi *soŋowi* and the SUA terms for ‘maize’ (see appendix 2, #17).
7. The square brackets in [-ŋg-] and [-nn-] indicate that these consonant clusters are the

phonetic realizations of phonemic /nk/ and /nn/.

8. Steward (1933:244; 1938:22) also encountered the use of *Atriplex argentea* among the Owens Valley Northern Paiute, reporting that they called this plant *sunuva*, a term that presumably is the same as *sunúpi* reported by Liljeblad, Fowler, and Powell (2012:470), who identify it as the name for ‘saltbrush (*Atriplex rosea*)’. Because Northern Paiute tends to retain the -ŋ- as the reflex of PNUA *-ŋ-, the /-n-/ in these labels may indicate that the Western Shoshone labels for *Atriplex* species are not cognate with Hopi *soŋowī*, unless the Northern Paiute terms are loans from Western Shoshone.

9. The reconstructions *o:lo:- and *ši:-lo: are from Dakin (1982:#229, #269). Terms for ‘immature maize ear’ and ‘maize cob’ probably existed in the Proto-Aztec agricultural lexicon, but the reconstruction of Proto-Aztec forms for them is precluded by the fact Pochutec words for these referents were not recorded (Boas 1917).

10. Both terms are attested in the Cora vocabulary originally published in 1732 (Ortega 1860). Cora /č/ is a reflex of PSUA *k. The final /e/, which reflects *i, is unexpected although both /i/ and /i/ are attested in alternate forms of the Tohono Oʔodham cognate *hahakī ~ haaki* ‘to roast grain with coals in a basket’ (/h/ is the Tepiman reflex of PSUA *s). The closed first syllable in the *šašče* is the result of antecedent reduplication followed by vowel loss.

11. In a previous publication, colleagues and I (Merrill, et al. 2010:E35) questioned Hill’s (2010:E33) identification of the Luiseño term for ‘grain, wheat’ as cognate with the SUA reflexes of *saki, based on the assumption that the -i- formed part of the Luiseño stem, as reported by Bright (1968:39): *šá:xi-š*. The correct form is *šá:x-iš*, as reported by Elliott (1999:832; cf. Hill 2012:58).

12. The SUA cognates and some possible NUA cognates are presented in this section

rather than in appendix 2. These words also appear in Stubbs (2011:#284, #527; cf. #285).

13. Hopi *tīma* ‘the polished piki stone, the griddle for making piki’ may be cognate with the Numic terms in (4) and by extension the PSUA reflexes of **tīma*. In a 2001 article, Hill (2001b:921–2) suggests that the word is cognate but later concluded that it was not cognate “since Hopi shows no reflex of the glottal stop” (Hill 2004:73–74). However, Hopi seldom retains an original preconsonantal glottal stop. In her most recent essay on the subject, she (2012:58) does not include the cognates in her “PUA maize vocabulary,” only the reconstructed form **tīma*, which she glosses as ‘tortilla, tamale’, even though none of the potential NUA cognates has this referent.

14. In Rejogochi, the Rarámuri community where I have conducted most of my research, the word *remé* labels both ‘tortilla’ and ‘tamale’. Brambila (1976:464) and Hilton (1959:67) gloss this term only as ‘tortilla’.

15. In Pipil, no word for ‘tamale’ is attested, only a word for ‘meat tamale’, *nakatamal*, a compound of *naka* ‘meat’ and *tamal*. Pipil *taškal* designates a ‘tortilla made of younger, tender ears of corn’, while *tamal* is glossed as ‘tortilla’.

16. Downs (1966) and Winter and Hogan (1986) discuss the sowing of wild seeds and other ways in which Indigenous people in the Great Basin and on the northern Colorado Plateau manipulated wild plants to increase their productivity. Doolittle (2000) and Smith (2001b, 2011) provide general overviews of such practices.

17. The words for ‘planting stick’ reported for Eudeve and Ópata, both Taracahitan languages, are *naakát* and *nät* respectively. They do not reflect PSUA **wika*, but they are cognate with terms in three NUA languages: Tubatulabal *nahat* ‘cane’, Luiseño *ná:xut* ‘walking stick’, and Kitanemuk *nakat* ‘digging stick or any kind of stick’.

18. PAzt *i reflects both PSUA *u and *i (Campbell and Langacker 1978:85). Dakin (2001b:328-33) and Stubbs (2011:29-30) discuss the loss of PSUA *-r- or its replacement by -y- in the SUA languages.

19. Classical Nahuatl *ačtli* and Pochutec *ašt* show the expected correspondences of *paci and share the referent ‘seed’, but a Pipil cognate is not attested. Instead, the concept of ‘seed’, as well as ‘grain’, ‘pit’, ‘face’, and ‘eye’, is conveyed by *i:š*, the Pipil reflex of PSUA *pusi ‘eye’. The same range of meanings is encountered in the cognates of *i:š* in NUA languages, but the reflexes of *pusi in most SUA languages designate only ‘eye’ (Stubbs 2011:#824, #1917).

20. Sierra Warihó *ihpaci* is derived from *pahcí* ‘seed, pit’, which shows the expected phonological reflexes of PSUA *paci and retains the referent reconstructed for this etymon. In fact, ‘maize kernels’, as well as ‘seeds for planting’, are two meanings excluded from the semantic scope of *pahcí*. These referents are conveyed by *sunú oríla* (combining *sunú* ‘maize’ with the deverbal noun *oríla*, derived from *olaní* ‘to shell corn’; see section 3.3.) and *ihotári* respectively. The prefix *-ih* is attested in *ihotári* and *ihkusúri* ‘roasted corn on the cob’ as well as a variety of other words not related to maize, but its significance is unclear (Miller 1996:273-274).

21. The Sonoran Yaqui word for ‘sugarcane’ is *yói-sana*, a compound of *yói* ~ *yóri* ‘mestizo’ and *sána* ‘cane’, literally ‘mestizo cane’. The first word also appears in River Warihó *yóri-homá* ‘sugarcane’, but the second element in the compound reflects Proto-Tarachitan *ʔoma ‘cane’ (Lionnet 1985:#15).

22. Tubar [hona-í-t] ‘stubble’ is not cognate. It appears to be loan from a Tepiman language, most likely Mountain Pima, e.g. Yepachi Pima *hona* ‘stalk, trunk of a plant, body’.

23. The non-combining form of the Comanche word for ‘tree trunk’ is *owoora*, also without a medial glottal stop. It is possible that *hani-woʔora* ‘maize cob’ is a loan from another

Numic language, but the data are insufficient to reach a conclusion. Timbisha is an unlikely source because its word for ‘maize’ is *maisi*, from Spanish *maíz*. No word for ‘maize cob’ is attested in Timbisha, nor in Northern Shoshone and the Northern Paiute, the only Numic languages that have words for ‘maize’ that resemble Comanche *hani* ‘maize’ (see section 6.1).

24. Sierra Warihó and Rarámuri have both lost the glottal stop in word-initial position (Miller 1996:39; Burgess 1970:51; Caballero 2008:65). I think that this loss either took place independently or resulted from the interaction of speakers of the two languages after the split of the Sierra and River dialects. However, the loss could have occurred in ancestral Rarámuri-Warihó, in which case the initial /h-/ in the Sierra Warihó would be epenthetic, but the reconstruction of *ʔoʔna or *ʔoʔona would not be affected.

25. The Yaqui and Mayo words for ‘maize cob’, presented in table 3, reflect antecedent *naáwo, which could not be a reflex of either *ʔoʔna or *ʔoʔona. It could, however, derive by metathesis from *woʔná*, the form attested in Sierra Warihó. Although an initial *w cannot be reconstructed for the antecedent form reflected in the Warihó and Rarámuri cognates, the word could have entered Cahitan as a loan from the variant of Warihó that gave rise to Sierra Warihó. Eudeve *néhro* ‘maize cob’ could be a loan from Yaqui-Mayo, but only the initial /n/ and final /o/ are regular correspondences (Stubbs 2011:#540, #546).

26. The Spanish word *pinole* is a loanword derived from Classical Nahuatl *pinolli*, which apparently designated flour made from both maize and chia (Molina 1970:82r). The Nahuatl noun probably derives from the PUA verb **piŋa ‘to pulverize’, but a reflex of the verb is not attested in Nahuatl (Stubbs 2011:#1080).

27. Dakin (1982:#174) suggests that Classical Nahuatl *kimičīn* ‘mouse, rat’ may be a deverbal noun deriving from *kumi, but the verb is not attested in Nahuatl.

28. The exact form of the noun reported in Lionnet's work is "koma-ł-t". Lionnet (1978:19–20) analyzes Tubar [o] and [ł] as allophones of /u/ and /r/ respectively, but I change only the vowel and remove the bar from [ł] because the phoneme could also be represented as //l/. In the Spanish-Tubar vocabulary list, he (1978:73) provides the gloss 'to eat maize' for *kumi-*, which is attested only in its present tense form *kumi-nyá-t*.

29. Sapir (1931:641) gives *kummia* as the Kaibab Southern Paiute form of this word, which appears in Southern Ute as *kümiy* (Givón, ed., 1979:126). These attestations suggest that the antecedent form was trisyllabic, perhaps *kumiya*.

30. All correspondences of Hopi *tawiya* and Pipil *tawiya-l* are regular, but the Pipil word labels 'dried shelled maize kernels'. It is derived from the verb *tawiya* 'to shell maize', not attested in Hopi. Hill (2001b:921) discusses some possible cognates in NUA languages but notes the irregular correspondences.

31. Bean and Saubel (1972:57–58) provide the identification and the Cahuilla name, which Seiler and Hioki (1979:127) recorded as *nexiš*.

32. The Proto-Tepiman reconstructions in (23) are from Bascom (1965:#11a, #27, #42), with two minor differences: he reconstructs stress on the initial syllables of all three etyma and reconstructs the etymon for 'planting stick' as *giikai ~ *giiki.

33. Cultural similarities between the Hopi and SUA societies have long intrigued researchers. Recent studies focused on this theme are James 2000, Neurath 2005, Gutiérrez 2006, Hays-Gilpin 2008, Secakuku 2006, and Carot and Hers 2011.

34. A photograph of some of these hoes appears in Fewkes (1912: plate 76 [following p. 146]). Secakuku (2006) and Carot and Hers (2011; cf. Washburn 1995:20–22) propose that *Palatkwapi* may have been the Mesoamerica metropolis Teotihuacan.

35. I collected the Rarámuri word in the community of Rejogochi, Chihuahua, and although I heard it pronounced on numerous occasions, I never detected a medial glottal stop (Merrill 1988:73). Brambila (1976:583), however, gives the form of this word as *waʔruruwi* ~ *waʔrúruwa*, which he glosses as ‘legendary being’.

36. For comparative analyses of Hopi, Cora, and Huichol cosmology and ritual, see Neurath 2005 and Gutiérrez 2006.

37. Relying on evidence distinct from that presented here, several scholars have proposed this same area as a possible location of the homeland of the Southern Uto-Aztecs and even the Uto-Aztecs as a whole (Romney 1957; Miller 1983a:123; Fowler 1972b:110; Fowler 1983:242; cf. Carpenter, Sánchez, and Villalpando 2002). Hill (2012:65) mentions this possibility for the Proto-Uto-Aztecan speech community, but concludes that the available evidence indicates a Mesoamerican homeland instead.

38. The scarlet macaw (*Ara macao*), native to the tropical lowlands of eastern and southern Mexico and Central and South America, was imported into northern Mexico and the American Southwest, with the earliest evidence for its presence in the region dating to around 1850 B.P. (100 A.D.) (Somerville, Nelson, and Knudson 2010). Reflexes of the PSUA *haro ‘macaw’ may have served as generic term for ‘large parrot’ in SUA languages whose speakers were familiar with both species, as was the case in Classical Nahuatl (see appendix 2, #2).

References

Anderton, Alice J.

- 1988 The Language of the Kitanemuks of California. Ph.D. dissertation, University of California, Los Angeles.

Bascom, Burton W.

- 1965 Proto-Tepiman. Ph.D. dissertation, University of Washington.

Bean, Lowell John

- 1978 Cahuilla. *In California*, edited by Robert F. Heizer, 575–87. Vol. 8, Handbook of North American Indians, William C. Sturtevant, gen. ed. Washington: Smithsonian Institution.

Bean, Lowell John, and Katherine S. Saubel

- 1972 Temalpakh: Cahuilla Indian Knowledge and Usage of Plants. Banning: Malki Museum Press.

Bean, Lowell John, and Florence C. Shipek

- 1978 Luiseño. *In California*, edited by Robert F. Heizer, 550–63. Vol. 8, Handbook of North American Indians, William C. Sturtevant, gen. ed. Washington: Smithsonian Institution.

Bean, Lowell John, and Charles R. Smith

- 1978a Gabrielino. *In California*, edited by Robert F. Heizer, 538–49. Vol. 8, Handbook of North American Indians, William C. Sturtevant, gen. ed. Washington: Smithsonian Institution.

- 1978b Serrano. *In California*, edited by Robert F. Heizer, 570–74. Vol. 8, Handbook of North American Indians, William C. Sturtevant, gen. ed. Washington:

Smithsonian Institution.

- 1978c Cupeño. *In* California, edited by Robert F. Heizer, 588–91. Vol. 8, Handbook of North American Indians, William C. Sturtevant, gen. ed. Washington: Smithsonian Institution.

Bellwood, Peter

- 1993 An Archaeologist's View of Language Macrofamily Relationships. *Bulletin of the Indo-Pacific Prehistory Association* 13:46–60.
- 1997 Prehistoric Cultural Explanations for Widespread Language Families. *In* Archaeology and Linguistics: Aboriginal Australia in Global Perspective, edited by Patrick McConvell and Nicholas Evans, 123–134. Melbourne: Oxford University Press.
- 2001 Early Agriculturalist Population Diasporas? Farming, Languages, and Genes. *Annual Review of Anthropology* 30:181–207.

Bellwood, Peter, and Marc Oxenham

- 2008 The Expansions of Farming Societies and the Role of the Neolithic Demographic Transition. *In* The Neolithic Demographic Transition and its Consequences, edited by Jean-Pierre Bocquet-Appel and Ofer Bar-Yosef, 13–34. Dordrecht: Springer.

Bellwood, Peter, and Colin Renfrew

- 2002 Examining the Farming/Language Dispersal Hypothesis. Cambridge: University of Cambridge, McDonald Institute for Archaeological Research.

Blackburn, Thomas C., and Lowell John Bean

- 1978 Kitanemuk. *In* California, edited by R.F. Heizer, 564–69. Vol. 8, Handbook of

North American Indians, William C. Sturtevant, gen. ed. Washington:
Smithsonian Institution.

Boas, Franz

1917 El dialecto mexicano de Pochutla, Oaxaca. *International Journal of American Linguistics* 1:9–44.

Bradfield, Richard M.

1971 Changing Patterns of Hopi Agriculture: Royal Anthropological Institute, Great Britain and Ireland, Occasional Paper No. 30.

Brambila, David

1976 Diccionario rarámuri–castellano (tarahumar). Mexico City: La Obra Nacional de la Buena Prensa.

Bright, William

1968 A Luiseño Dictionary: University of California Publications in Linguistics, Vol. 51.

Brown, Cecil H.

2006 Prehistoric Chronology of the Common Bean in the New World: The Linguistic Evidence. *American Anthropologist* 108(3):507–16.

2010a Development of Agriculture in Prehistoric Mesoamerica: The Linguistic Evidence. *In Pre-Columbian Foodways: Interdisciplinary Approaches to Food, Culture, and Markets in Ancient Mesoamerica*. J.E. Staller and M. Carrasco, eds. Pp. 71–107. New York: Springer.

2010b Lack of Linguistic Support for Proto-Uto-Aztecan at 8900 BP. *Proceedings of the National Academy of Sciences, U.S.A.* 107:E34.

Bunte, Pamela A., and Robert J. Franklin

- 1987 From the Sand to the Mountain: Change and Persistence in a Southern Paiute Community. Lincoln: University of Nebraska Press.

Burgess, Don H.

- 1970 Tarahumara Phonology (Rocoroibo Dialect). University of Texas at El Paso, Studies in Language and Linguistics, 1969-70:45–66.

Caballero, Gabriela

- 2008 Choguita Raramuri (Tarahumara) Phonology and Morphology. Ph.D. diss., University of California, Berkeley.
- 2011 Behind the Mexican Mountains: Recent Developments and New Directions in Research on Uto-Aztecan Languages. Language and Linguistics Compass 5(7):485-504.

Campbell, Lyle

- 1985 The Pipil Language of El Salvador. Berlin: Mouton.
- 1997 American Indian Languages: The Historical Linguistics of Native America. Oxford: Oxford University Press.
- 2002 What Drives Linguistic Diversification and Language Spread? *In* Examining the Farming/Language Dispersal Hypothesis. P. Bellwood and C. Renfrew, eds. Pp. 49–63. Cambridge: MacDonald Institute for Archaeological Research, University of Cambridge.

Campbell, Lyle, and Ronald W. Langacker

- 1978 Proto-Uto-Aztecan Vowels: Part III. International Journal of American Linguistics 44:262–79.

Carot, Patricia Carot y , and Marie-Areti Hers

- 2011 De Teotihuacan al cañón de Chaco: Nueva perspectiva sobre las relaciones entre Mesoamérica y el suroeste de los Estados Unidos. *Anales del Instituto de Investigaciones Estéticas* [Mexico, UNAM] 33(98):5–53.

Carpenter, John P., Guadalupe Sánchez de Carpenter, and Jonathan B. Mabry

- 2001 La arqueología de los grupos yutoaztecas tempranos. *In Avances y balances de lenguas yutoaztecas: Homenaje a Wick R. Miller*, edited by José L. Moctezuma Zamarrón and Jane H. Hill, 359–73. Mexico City: Instituto Nacional de Antropología e Historia.

Carpenter, John P., Guadalupe Sánchez, and Maria Elisa Villalpando

- 2002 Of Maize and Migration: Mode and Tempo in the Diffusion of Zea mays in Northwest Mexico and the American Southwest. *In Traditions, Transitions, and Technologies*, edited by Sarah H. Schlanger, 245–58. Boulder: University Press of Colorado.
- 2005 The Late Archaic/Early Agricultural Period in Sonora, Mexico. *In The Late Archaic across the Borderlands*, edited by Bradley J. Vierra, 13–40. Austin: University of Texas Press.

Chamberlin, Ralph V.

- 1911 The Ethno-Botany of the Gosiute Indians. *Proceedings of the Academy of Natural Sciences of Philadelphia* 63:24–99.

Collard, Howard, and Elizabeth S. Collard

- 1962 Castellano-mayo, mayo-castellano. Mexico City: Instituto Lingüístico de Verano.

CONABIO

n.d. AVESMX.NET: La red de conocimiento sobre las aves de México.
<http://avesmx.conabio.gob.mx/>.

Cramaussel, Chantal

1998 Sistema de riego y espacio habitado: La lenta y azarosa génesis de un pueblo rural. *In* Historia y arte en un pueblo rural: San Bartolomé, hoy Valle de Allende, Chihuahua, edited by Clara Bargellini, 17–89. Mexico City: Universidad Nacional Autónoma de México, Instituto de Investigaciones Estéticas.

Crown, Patricia L.

1991 The Hohokam: Current Views of Prehistory and the Regional System. *In* Chaco & Hohokam: Prehistoric Regional Systems in the American Southwest, edited by Patricia L. Crown and James Judge, 135–57. Santa Fe: School of American Research Press.

Dakin, Karen

1982 La evolución fonológica del proto-náhuatl. Mexico City: Universidad Nacional Autónoma de México.

2001a Animals and Vegetables: Uto-Aztecan Noun Derivation, Semantic Classification, and Cultural History. *In* Historical Linguistics 1999: Selected Papers from the 14th International Conference on Historical Linguistics, edited by Laurel J. Brinton, 105–117. Amsterdam: John Benjamins.

2001b Isoglosas e innovaciones yutoaztecas. *In* Avances y Balances de Lenguas Yutoaztecas: Homenaje a Wick R. Miller, edited by JoséLuis Moctezuma Zamarrón and Jane H. Hill, 313–343. Mexico City: Instituto Nacional de Antropología e Historia.

Dayley, Jon P.

- 1989 Tümpisha (Panamint) Shoshone Dictionary: University of California Publications in Linguistics, vol. 116.

Diamond, Jared, and Peter Bellwood

- 2003 Farmers and Their Languages: The First Expansions. *Science* 300:597–603.

Doolittle, William E.

- 1980 Aboriginal Agricultural Development in the Valley of Sonora, Mexico. *Geographical Review* 70:328–42.
- 1984a Settlements and the Development of “Statelets” in Sonora, Mexico. *Journal of Field Archaeology* 11:13–24.
- 1984b Cabeza de Vaca’s Land of Maize: An Assessment of its Agriculture. *Journal of Historical Geography* 10:246–62.
- 1988 Pre-Hispanic Occupance in the Valley of Sonora, Mexico: Archaeological Confirmation of Early Spanish Reports. *University of Arizona Anthropological Papers*, no. 48.
- 2000 *Cultivated Landscapes of Native North America*. Oxford: Oxford University Press.

Downs, James F.

- 1966 The Significance of Environmental Manipulation in Great Basin Cultural Development. *In* *The Current Status of Research in the Great Basin*, edited by Warren L. d’Azevedo, Wilbur A. Davis, Don D. Fowler, and Wayne Suttles, 39–56. Reno: Desert Research Institute, Technical Report Series S-H, Social Sciences and Humanities Publications, no. 1.

Elliott, Eric B.

- 1999 Dictionary of Rincón Luiseño. Ph.D. dissertation, University of California, San Diego.

Estrada Fernández, Zarina, Crescencio Buitimea Valenzuela, Adriana Elizabeth Gurrola

Camacho, María Elena Castillo Celaya, and Anabela Carlón Flores

- 2004 Diccionario Yaqui-Español y Textos: Obra de Preservación: Mexico City: Plaza y Valdés; Hermosillo: Universidad de Sonora.

Felger, Richard S., and Elaine Joyal

- 1999 The Palms (Arecaceae) of Sonora, Mexico. *Aliso* 18:1–18.

Ferguson, T.J., and Chip Colwell-Chanthaphonh, eds.

- 2006 History Is In The Land: Multivocal Tribal Traditions in Arizona's San Pedro Valley. Tucson: University of Arizona Press.

Fewkes, Jesse W.

- 1912 Casa Grande, Arizona. Smithsonian Institution, Bureau of American Ethnology Annual Report 33:25–179.

Forde, C. Daryll

- 1931 Hopi Agriculture and Land Ownership. *The Journal of the Royal Anthropological Institute of Great Britain and Ireland* 61:357–405.

Fowler, Catherine S.

- 1972a Comparative Numic Ethnobiology. Ph.D. dissertation, University of Pittsburgh.
- 1972b Some Ecological Clues to Proto-Numic Homelands. *In* Great Basin Cultural Ecology: A Symposium, edited by Don D. Fowler, 105–21. Reno: Desert Research Institute Publications in the Social Sciences, no. 8.

- 1983 Some Lexical Clues to Uto-Aztecan Prehistory. *International Journal of American Linguistics* 49:224–257.
- 1986 Subsistence. *In* *Great Basin*, edited by Warren L. d’Azevedo, 64–97. Vol. 11, *Handbook of North American Indians*, William C. Sturtevant, gen. ed. Washington: Smithsonian Institution.
- 1994 Corn, Beans, and Squash: Some Linguistic Perspectives from Uto-Aztecan. *In* *Corn and Culture in the Prehistoric New World*, edited by Sissel Johannessen and Christine A. Hastorf, 445–67. Boulder: Westview Press.
- 1995 Some Notes on Ethnographic Subsistence Systems in Mojavean Environments in the Great Basin. *Journal of Ethnobiology* 15:99–117.
- Fowler, Catherine S., and Don D. Fowler
- 1981 The Southern Paiute: A.D. 1400-1776. *In* *The Protohistoric Period in the North American Southwest, A.D. 1450-1700*, edited by David R. Wilcox and Bruce Masse, 129–62. *Arizona State University Anthropological Papers*, no. 24.
- Gasser, Robert E., and Scott M. Kwiatkowski
- 1991 Regional Signatures of Hohokam Plant Use. *Kiva* 56:207–26.
- Givón, Talmy, ed.
- 1979 Ute Dictionary (Preliminary Edition). Ignacio: Ute Press and the Southern Ute Tribe.
- Gómez, Paula
- 1999 Huichol de San Andrés Cohamiata, Jalisco. Mexico City: El Colegio de México.
- Griffen, William B.
- 1969 Culture Change and Shifting Populations in Central Northern Mexico. University

of Arizona Anthropological Papers, no. 13.

Grimes, Joseph E.

1980 Huichol Life Form Classification II: Plants. *Anthropological Linguistics*
22:264–74.

Grimes E., José, Pedro de la Cruz Avila, José Carrillo Vicente, Filiberto Díaz, Román Díaz,
Antonio de la Rosa, and Toribio Rentería

1981 *El huichol: Apuntes sobre el léxico*. Ithaca: Cornell University.

Gutiérrez, Arturo

2006 *Mitología y ritualidad: Un acercamiento comparativo a los sistemas religiosos hopi, huichol y cora*. In *Las vías del noroeste I: Una macroregión indígena americana*, edited by Carlo Bonfiglioli, Arturo Gutiérrez, and María Eugenia Olavarría, 171–187. Mexico City: Universidad Nacional Autónoma de México, Instituto de Investigaciones Antropológicas.

Hack, John T.

1942 *The Changing Physical Environment of the Hopi Indians of Arizona: Papers of the Peabody Museum of American Archaeology and Ethnography*, vol. 35, no. 1.

Hammarström, Harald

2010 *A Full-Scale Test of the Language Farming Dispersal Hypothesis*. *Diachronica*
27(2):197–213.

Hays-Gilpin, Kelly

2008 *All Roads Lead to Hopi*. In *Las vías del noroeste III: Propuesta para una perspectiva sistémica e interdisciplinaria*, edited by Carlo Bonfiglioli, Arturo Gutiérrez, Marie-Areti Hers, and María Eugenia Olavarría, 65–82. Mexico City:

Universidad Nacional Autónoma de México, Instituto de Investigaciones Antropológicas.

Hill, Jane H.

- 2001a Dating the Break-up of Southern Uto-Aztecan. *In Avances y balances de lenguas yutoaztecas: Homenaje a Wick R. Miller*, edited by José L. Moctezuma Zamarrón and Jane H. Hill, 345–57. Mexico City: Instituto Nacional de Antropología e Historia.
- 2001b Proto-Uto-Aztecan: A Community of Cultivators in Central Mexico? *American Anthropologist* 103:913–34.
- 2002a Proto-Uto-Aztecan Cultivation and the Northern Devolution. *In Examining the Farming/Language Dispersal Hypothesis*, edited by Peter Bellwood and Colin Renfrew, 331–40. Cambridge: University of Cambridge, MacDonald Institute for Archaeological Research.
- 2002b Toward a Linguistic Prehistory of the Southwest: “Azteco-Tanoan” and the Arrival of Maize Cultivation. *Journal of Anthropological Research* 58:457–75.
- 2004 The Non-Agricultural Origins of the Proto-Uto-Aztecan Vocabulary of Maize Use. *In VIII Encuentro sobre la lingüística en el noroeste*, edited by Zarina Estrada, 59–81. Hermosillo: Universidad de Sonora.
- 2005 A Grammar of Cupeño: University of California Publications in Linguistics, vol. 136.
- 2006 The Historical Linguistics of Maize Cultivation in Mesoamerica and North America. *In Histories of Maize: Multidisciplinary Approaches to the Prehistory, Linguistics, Biogeography, Domestication, and Evolution of Maize*, edited by

John E. Staller, Robert H. Tykot, and Bruce F. Benz, 631–45. Amsterdam:
Elsevier.

- 2008 Northern Uto-Aztecan and Kiowa-Tanoan: Evidence of Contact Between the
Proto-Languages? *International Journal of American Linguistics* 74:155–88.
- 2010 New Evidence for a Mesoamerican Homeland for Proto-Uto-Aztecan.
Proceedings of the National Academy of Sciences, U.S.A. 107:E33.
- 2011 Subgrouping in Uto-Aztecan. *Language Dynamics and Change* 1(2):241–278.
- 2012 Proto-Uto-Aztecan as a Mesoamerican Language. *Ancient Mesoamerica*
23:57–68.

Hill, Jane H., and Rosinda Nolasquez

- 1973 Mulu'wetam: The First People. *Cupeño Oral History and Language*. Banning:
Malki Museum Press.

Hopi Dictionary Project

- 1998 Hopi Dictionary / Hopiikwa Lavàytutuveni: A Hopi-English Dictionary of the
Third Mesa Dialect. Tucson: University of Arizona Press.

Íñigo Elías, Eduardo E.

- 2000 Guacamaya verde. *In Las aves de México en peligro de extinción*, edited by
Gerardo Ceballos and Laura Márquez Valdelamar, 213–15. Mexico City:
Universidad Nacional Autónoma de México, Instituto de Ecología, CONABIO,
and Fondo de Cultura Económica.

James, Susan E.

- 2000 Some Aspects of the Aztec Religion in the Hopi Kachina Cult. *Journal of the
Southwest* 42(4):897–926.

Jöel, Judith

- 1978 The Yuman Word for ‘Bean’ as a Clue to Prehistory. *Journal of California Anthropology, Papers in Linguistics* 1:77–92.

Joyal, Elaine

- 1995 An Ethnoecology of *Sabal uresana* Trelease (Arecaceae) in Sonora, Mexico. Ph.D. dissertation, Arizona State University.
- 1996a The Use of *Sabal uresana* (Arecaceae) and Other Palms in Sonora, Mexico. *Economic Botany* 50:429–45.
- 1996b The Palm Has Its Time: An Ethnoecology of *Sabal uresana* in Sonora, Mexico. *Economic Botany* 50:446–62.

Kaplan, Lawrence, and Thomas F. Lynch

- 1999 *Phaseolus* (Fabaceae) in Archaeology: AMS Radiocarbon Dates and Their Significance for Pre-Colombian Agriculture. *Economic Botany* 53:261–72.

Karttunen, Frances

- 1992 An Analytical Dictionary of Nahuatl. Norman: University of Oklahoma Press.

Kaufman, Terrence

- 1981 Comparative Uto-Aztecan Phonology: Unpublished manuscript.

Kaufman, Terrence, and John Justeson

- 2009 Historical Linguistics and Pre-Columbian Mesoamerica. *Ancient Mesoamerica* 20:221–31.

Kelly, Isabel T.

- 1964 Southern Paiute Ethnography. University of Utah Anthropological Papers, no. 69.

Kelly, Isabel T., and Catherine S. Fowler

- 1986 Southern Paiute. *In* Great Basin, edited by Warren L. d'Azevedo, 368–97. Vol. 11, Handbook of North American Indians, William C. Sturtevant, gen. ed. Washington: Smithsonian Institution.
- Kindl, Olivia S.
- 2000 The Huichol Gourd Bowl as Microcosm. *Journal of the Southwest* 42:37–60.
- Kraft, Kraig H.
- 2009 The Domestication of the Chile Pepper, *Capsicum annuum*: Genetic, Ecological, and Anthropogenic Patterns of Genetic Diversity. Ph.D. diss., University of California, Davis. Lawlor, Elizabeth J.
- 1995 Archaeological Site-Formation Processes Affecting Plant Remains in the Mojave Desert. Ph.D. dissertation, University of California, Riverside.
- Lawton, Harry W., and Lowell J. Bean
- 1968 A Preliminary Reconstruction of Aboriginal Agricultural Technology among the Cahuilla. *Indian Historian* 1:18–24, 29.
- LeBlanc, Steven A.
- 2008 The Case for an Early Farmer Migration into the Greater American Southwest. *In* *Archaeology Without Borders: Contact, Commerce, and Change in the U.S. Southwest and Northwestern Mexico*, edited by Laurie D. Webster and Maxine E. McBrinn, 107–42. Boulder: University Press of Colorado.
- Liljeblad, Sven, Catherine S. Fowler, and Glenda Powell
- 2012 Northern Paiute-Bannock Dictionary. Salt Lake City: University of Utah Press.
- Lionnet, Andrés
- 1978 El idioma tubar y los tubares según documentos inéditos de C.S. Lumholtz y C.V.

- Hartman. Mexico City: Universidad Iberoamericana.
- 1985 Relaciones internas de la rama sonoreense. *Amerindia* 10:26–58.
- Lowie, Robert H.
- 1924 Notes on Shoshonean Ethnography: American Museum of Natural History, Anthropological Papers, vol. 20, part 3.
- Mabry, Jonathan B.
- 2005 Changing Knowledge and Ideas about the First Farmers in Southeastern Arizona. *In* *The Late Archaic across the Borderlands*, edited by Bradley J. Vierra, 41–83. Austin: University of Texas Press.
- Mabry, Jonathan B., John P. Carpenter, and Guadalupe Sanchez
- 2008 Archaeological Models of Early Uto-Aztecan Prehistory in the Arizona-Sonora Borderlands. *In* *Archaeology Without Borders: Contact, Commerce, and Change in the U.S. Southwest and Northwestern Mexico*, edited by Laurie D. Webster and Maxine E. McBrinn, 155–83. Boulder: University Press of Colorado.
- McIntosh, John B., and Joseph E. Grimes
- 1954 Niuqui 'Iquisicayari (vocabulario huichol-castellano, castellano-huichol). Mexico City: Instituto Lingüístico de Verano.
- McMahon, Ambrosio, and Maria Aiton McMahon
- 1959 Vocabulario Cora. Mexico City: Instituto Lingüístico de Verano.
- Manaster Ramer, Alexis
- 1992 A Northern Uto-Aztecan Sound Law: *-c- → -y-. *International Journal of American Linguistics* 58:251–68.
- Mathiot, Madeleine

- 1973 A Dictionary of Papago Usage, 2 vols. Bloomington: Indiana University.
- Matson, R.G.
- 1991 The Origins of Southwestern Agriculture. Tucson: University of Arizona Press.
- Matthews, John A., and Keith R. Briffa
- 2005 The ‘Little Ice Age’: Re-Evaluation of an Evolving Concept. *Geografiska Annaler, Series A, Physical Geography* 87(1):17–36.
- Medina Murillo, Ana A.
- 2002 Diccionario morfológico: Formación de palabras en el guarijío. M.A. thesis, Universidad de Sonora.
- Merrill, William L.
- 1988 Rarámuri Souls: Knowledge and Social Process in Northern Mexico. Washington: Smithsonian Institution Press.
- 2007 La obra lingüística del padre Matthäus Steffel, S.J. *In* Desde los confines de los imperios ibéricos: Los jesuitas de habla alemana en las misiones americanas, edited by Karl Kohut and María Cristina Torales Pacheco, 409–439. Frankfurt: Vervuert Verlag and Madrid: Iberoamericana.
- Merrill, William L., Robert J. Hard, Jonathan B. Mabry, Gayle J. Fritz, Karen R. Adams, John R. Roney, and A.C. MacWilliams
- 2009 The Diffusion of Maize to the Southwestern United States and Its Impact. *Proceedings of the National Academy of Sciences, U.S.A.* 106:21019–26.
- 2010 Reply to Hill and Brown: Maize and Uto-Aztecan Cultural History. *Proceedings of the National Academy of Sciences, U.S.A.* 107:E35–E36.
- Miller, Wick R.

- 1966 Anthropological Linguistics in the Great Basin. *In* The Current Status of Anthropological Research in the Great Basin: 1964, edited by Warren L. d'Azevedo, Wilbur A. Davis, Don D. Fowler, and Wayne Suttles, 75–112. Reno: Desert Research Institute, Technical Report Series S-H, Social Sciences and Humanities Publications, no. 1.
- 1972 Newe Natekwinapeh: Shoshoni Stories and Dictionary. University of Utah Anthropological Papers, no. 94.
- 1983a A Note on Extinct Languages of Northwest Mexico of Supposed Uto-Aztecan Affiliation. *International Journal of American Linguistics* 49:328–34.
- 1983b Uto-Aztecan Languages. *In* Southwest, edited by Alfonso Ortiz, 113–24. Vol. 10, Handbook of North American Indians, William C. Sturtevant, gen. ed. Washington: Smithsonian Institution.
- 1996 Guarijío: Gramática, textos y vocabulario. Mexico City: Universidad Nacional Autónoma de México.
- Mills, Elaine L., ed.
- 1981-1988 The Papers of John Peabody Harrington in the Smithsonian Institution, 1907-1957: A Guide to the Field Notes. Millwood, NY: Kraus International Publications.
- Molina, Alonso de
- 1970 [1571] Vocabulario en lengua castellana y mexicana y mexicana y castellana, edited by Miguel León-Portilla. Facsimile edition. Mexico City: Editorial Porrúa.
- Molina, Felipe S., Herminia Valenzuela, and David L. Shaul
- 1999 Yoeme-English, English-Yoeme Dictionary, With a Comprehensive Grammar of

Yoeme Language.

Munro, Pamela

1973 Proto-Uto-Aztecan *w: One Source for Luiseño η . *International Journal of American Linguistics* 39:135–36.

Munro, Pamela, and William E. Mace

1995 A New Tübatulabal Dictionary: Unpublished manuscript.

Muñoz, L. Carmenza, et al.

2006 Taxonomy of Tepary Bean and Wild Relatives as Determined by Amplified Fragment Length Polymorphism (AFLP) Markers. *Crop Science* 46(4):1744-1754.

Nabhan, Gary P., and Richard S. Felger

1978 Teparies in Southwestern North America. *Economic Botany* 32(1):3-19.

Neurath, Johannes

2005 Cosmogonic Myths, Ritual Groups, and Initiation: Toward a New Comparative Ethnology of the Gran Nayar and the Southwest of the U.S. *Journal of the Southwest* 47(4):571–614.

Oliver, Symmes

1962 Ecology and Cultural Continuity as Contributing Factors in the Social Organization of the Plains Indians. *University of California Publications in American Archaeology and Ethnology* 48(2).

Ortega, José de

1860 [1732] Vocabulario en lengua castellana y cora. *Boletín de la Sociedad Mexicana de*

Geografía y Estadística, 1a. época, 8:561–605.

Pennington, Campbell W.

1963 The Tarahumar of Mexico: Their Environment and Material Culture. Salt Lake City: University of Utah Press.

Pennington, Campbell W., ed.

1979 Vocabulario en la Lengua Névome. The Pima Bajo of Central Sonora, Mexico, vol. 2. Salt Lake City: University of Utah Press.

1981 Arte y vocabulario de la lengua dohema, heve o eudeva. Mexico City: Universidad Nacional Autónoma de México.

Piperno, Dolores R.

2011 The Origins of Plant Cultivation and Domestication in the New World Tropics: Patterns, Process, and New Developments. *Current Anthropology* 52(S4):S453–S470.

Press, Margaret L.

1979 Chemehuevi: A Grammar and Lexicon: University of California Publications in Linguistics, vol. 92.

Preuss, Konrad Theodor

1934 Wörterbuch Deutsch-Cora. *International Journal of American Linguistics* 8:81–102.

Rankin, Robert L.

2006 Siouan Tribal Contacts and Dispersions Evidenced in the Terminology for Maize and Other Cultigens. *In* *Histories of Maize: Multidisciplinary Approaches to the Prehistory, Linguistics, Biogeography, Domestication, and Evolution of Maize,*

edited by John E. Staller, Robert H. Tykot, and Bruce F. Benz, 563–75.
Amsterdam: Elsevier.

Rea, Amadeo M.

1997 At the Desert's Green Edge: An Ethnobotany of the Gila River Pima. Tucson:
University of Arizona Press.

Rinaldini, Benito

1994 [1743] Arte de la lengua tepeguana, con vocabulario, confessionario, y catechismo,
edited by Javier Guerrero Romero. Mexico City: Consejo Nacional para la
Cultura y las Artes and Gobierno del Estado de Durango.

Robichaux, Robert H., and David A. Yetman, eds.

2000 The Tropical Deciduous Forest of Alamos: Biodiversity of a Threatened
Ecosystem in Mexico. Tucson: University of Arizona Press.

Robinson, Lila W., and James Armagost

1990 Comanche Dictionary and Grammar. Dallas: Summer Institute of Linguistics and
the University of Texas at Arlington.

Romney, A. Kimball

1957 The Genetic Model and Uto-Aztecan Time Perspective. *Davidson Journal of
Anthropology* 3(2):35–41.

Santley, Robert S., and Eric K. Rose

1979 Diet, Nutrition and Population Dynamics in the Basin of Mexico. *World
Archaeology* 11:185–207.

Sapir, Edward

1931 Southern Paiute Dictionary. *Proceedings of the American Academy of Arts and*

Sciences 65:539–730.

Saxton, Dean, Lucille Saxton, and Susie Enos

1983 Dictionary Tohono O’odham/Pima to English, English to Tohono O’odham/Pima, 2nd edition, edited by R.L. Cherry. Tucson: University of Arizona Press.

Secakuku, Ferrell H.

2006 Hopi and Quetzalcoatl: Is There a Connection? M.A. thesis, Northern Arizona University

Seiler, Hansjakob, and Kojiro Hioki

1979 Cahuilla Dictionary. Banning: Malki Museum Press.

Shaul, David L.

1994 A Sketch of the Structure of Oob No’ok (Mountain Pima). *Anthropological Linguistics* 36:277–365.

Shaul, David L., and Jane H. Hill

1998 Tepimans, Yumans, and Other Hohokam. *American Antiquity* 63:375–96.

Shimkin, Demitri B.

1986 The Introduction of the Horse. *In* *Great Basin*, edited by Warren L. d’Azevedo, 517–524. Vol. 11, *Handbook of North American Indians*, gen. ed. William C. Sturtevant. Washington: Smithsonian Institution.

Smith, Bruce D.

1997a The Initial Domestication of *Cucurbita pepo* in the Americas 10,000 Years Ago. *Science* 276:932–34.

1997b Reconsidering the Ocampo Caves and the Era of Incipient Cultivation in Mesoamerica. *Latin American Antiquity* 8:342–83.

- 2001a Documenting Plant Domestication: The Consilience of Biological and Archaeological Approaches. *Proceedings of the National Academy of Sciences, U.S.A.* 98:1324–26.
- 2001b Low-Level Food Production. *Journal of Archaeological Research* 9:1–43.
- 2011 General Patterns of Niche Construction and the Management of ‘Wild’ Plant and Animal Resources by Small-scale Pre-industrial Societies. *Philosophical Transactions of the Royal Society B: Biological Sciences* 366(1566):836–848.
- Smith, Charlene G.
- 1973 Selé, A Major Vegetal Component of the Aboriginal Hualapai Diet. *Plateau* 45:102–10.
- Smith, Charles R.
- 1978 Tubatulabal. *In California*, edited by Robert F. Heizer, 437–45. Vol. 8, *Handbook of North American Indians*, William C. Sturtevant, gen. ed. Washington: Smithsonian Institution.
- Somerville, Andrew D., Ben A. Nelson, and Kelly J. Knudson
- 2010 Isotopic investigation of pre-Hispanic macaw breeding in Northwest Mexico. *Journal of Anthropological Archaeology* 29(1):125–135.
- Steffel, Matthäus
- 1809 Tarahumarisches Wörterbuch, nebst einigen Nachrichten von den Sitten und Gebräuchen der Tarahumaren, in Neu-Biscaya, in der Audiencia Guadalaxara im Vice-Königreiche Alt-Mexico, oder Neu-Spanien von P. Matthäus Steffel. *In Nachrichten von verschiedenen Ländern des Spanischen Amerika*, aus eigenhändigen Aufsätzen einiger Missionare der Gesellschaft Jesu, vol. 1, edited

by Christoph Gottlieb von Murr, 293–374. Halle: Joh. Christian Hendel.

Steward, Julian H.

- 1933 Ethnography of the Owens Valley Paiute. University of California Publications in American Archaeology and Ethnology 33:233–350.
- 1938 Basin-Plateau Aboriginal Sociopolitical Groups: Smithsonian Institution Bureau of American Ethnology Bulletin 120.
- 1941 Cultural Element Distributions, XIII: Nevada Shoshone. University of California Anthropological Records 4(2):209–360.

Stewart, Kenneth M.

- 1968 A Brief History of the Chemehuevi Indians. Kiva 34: 9–27.

Stewart, Omer C.

- 1942 Culture Element Distributions XVIII : Ute-Southern Paiute. University of California Anthropological Records 6(4).

Stine, Scott

- 2004 Climate Change in Wildland Management: Taking the Long View. *In* Proceedings of the Sierra Nevada Science Symposium, edited by Dennis D. Murphy and Peter A. Stine, 51–55. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Gen. Tech. Rep. PSW-GTR-193.

Stoffle, Richard W., and Henry F. Dobyns

- 1983 Nuvagantu: Nevada Indians Comment on the Intermountain Power Project: U.S. Department of the Interior, Bureau of Land Management, Nevada, Cultural Resource Series, no. 7.

Stoffle, Richard W., and M. Nieves Zedeño

- 2001 Historical Memory and Ethnographic Perspectives on the Southern Paiute Homeland. *Journal of California and Great Basin Anthropology* 23:229–248.

Stubbs, Brian D.

- 2008 *Uto-Aztecan: A Comparative Vocabulary*. Yorba Linda, Calif: Shumway Family History Services.

Stubbs, Brian D.

- 2000 The Comparative Value of Tubar in Uto-Aztecan. *In Uto-Aztecan: Structural, Temporal, and Geographic Perspectives. Papers in Memory of Wick R. Miller by the Friends of Uto-Aztecan*, edited by Eugene H. Casad and Thomas L. Willett, 357–369. Hermosillo: Universidad de Sonora.

- 2003 New Sets Yield New Perspectives for Uto-Aztecan Reconstructions. *In Studies in Uto-Aztecan*, edited by Luis M. Barragan and Jason D. Haugen, 1–20. Cambridge: MIT Working Papers in Endangered and Less Familiar Languages, vol. 5.

- 2011 *Uto-Aztecan: A Comparative Vocabulary*. Flower Mound, Texas: Shumway Family History Services and Blanding, Utah: Rocky Mountain Books and Productions.

Teague, Lynn S.

- 1993 Prehistory and the Traditions of the O’odham and Hopi. *Kiva* 58:435–54.

Tewksbury, Joshua J., Gary P. Nabhan, Donald Norman, Humberto Suzán, John Tuxill, and Jim Donovan

- 1999 *In Situ Conservation of Wild Chiles and Their Biotic Associates*. Conservation

Biology 13:98–107.

Valiñas Coalla, Leopoldo

- 2000 Lo que la lingüística yutoazteca podría aportar en la reconstrucción histórica del norte de México. *In* *Nómadas y sedentarios en el norte de México: Homenaje a Beatriz Braniff*, edited by Marie-Areti Hers, José L. Mirafuentes, María de los Dolores Soto, and Miguel Vallebuena, 175–205. Mexico City: Universidad Nacional Autónoma de México.

Voegelin, C. F.

- 1958 Working Dictionary of Tübatulabal. *International Journal of American Linguistics* 24:221–28.

Voegelin, C. F., F.M. Voegelin, and Kenneth Hale

- 1962 Typological and Comparative Grammar of Uto-Aztecan: I (Phonology). *International Journal of American Linguistics Memoir* 17.

Voegelin, Erminie W.

- 1938 Tübatulabal Ethnography. *University of California Anthropological Records*, vol. 2, no. 1.

Washburn, Dorothy K.

- 1995 *Living in Balance: The Universe of the Hopi, Zuni, Navajo, and Apache*. Philadelphia: University Museum, University of Pennsylvania.

Webster, Laurie D., and Micah Loma'omvaya

- 2004 Textiles, Baskets, and Hopi Cultural Identity. *In* *Identity, Feasting, and the Archaeology of the Greater Southwest*, edited by Barbara J. Mills, 74–92. Boulder: University Press of Colorado.

Weigand, Phil C.

- 1992 Ensayos sobre el Gran Nayar: Entre Coras, Huicholes y Tepehuanos: Mexico City: Centro de Estudios Mexicanos y Centroamericanos de la Embajada de Francia en México and Instituto Nacional Indigenista; Zamora: El Colegio de Michoacán.

Weigand, Phil C., and Acelia García de Weigand

- 2000 Huichol Society before the Arrival of the Spanish. *Journal of the Southwest* 42(1):12–36.

West, Robert C.

- 1949 The Mining Community in Northern New Spain: The Parral Mining District. *Ibero-Americana*, no. 30.

Whiting, Alfred F.

- 1966 Ethnobotany of the Hopi. Flagstaff: Museum of Northern Arizona.

Wichmann, Søren

- 2002 Contextualizing Proto-languages, Homelands and Distant Genetic Relationship: Some Reflections on the Comparative Method from a Mesoamerican Perspective. *In Examining the Farming/Language Dispersal Hypothesis*, edited by Peter Bellwood and Colin Renfrew, 321-329. Cambridge: MacDonal Institute for Archaeological Research, University of Cambridge.

Wilcox, David R., Phil C. Weigand, J. Scott Wood, and Jerry B. Howard

- 2008 Ancient Cultural Interplay of the American Southwest in the Mexican Northwest. *Journal of the Southwest* 50:103–206.

Wilde, James D., and Deborah E. Newman

- 1989 Late Archaic Corn in the Eastern Great Basin. *American Anthropologist* 91:712-720.
- Winter, Joseph C., and Patrick F. Hogan
- 1986 Plant Husbandry in the Great Basin and Adjacent Northern Colorado Plateau. *In Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, 117–44. University of Utah Anthropological Papers, no. 110.
- Wolff, Hans
- 1950 Comparative Siouan III. *International Journal of American Linguistics* 16:168–78.
- Yetman, David, and Thomas R. Van Devender
- 2002 Mayo Ethnobotany: Land, History, and Traditional Knowledge in Northwest Mexico. Berkeley: University of California Press.
- Zigmond, Maurice L.
- 1941 Ethnobotanical Studies among California and Great Basin Shoshoneans. Ph.D. dissertation, Yale University.
- Zigmond, Maurice L.
- 1978 Kawaiisu. *In California*, edited by Robert F. Heizer, 398–411. Vol. 8, *Handbook of North American Indians*, William C. Sturtevant, gen. ed. Washington: Smithsonian Institution.
- Zigmond, Maurice L., Curtis G. Booth, and Pamela Munro
- 1991 Kawaiisu: A Grammar and Dictionary with Texts. University of California Publications in Linguistics, vol. 119.

