**Supplemental Text 1**

**Notes 1–6, with References Cited Here and in Supplemental Tables 1 and 2**

For: "Spatiotemporal Patterns in the Agricultural Demographic Transition of Mesoamerica and Southwestern North America," by Richard G. Lesure, R. J. Sinensky, Gregson Schachner, Thomas Wake, and Katelyn J. Bishop

**Note 1: Middle Preclassic Population Expansion in the Maya Lowlands**

Surveys in the Maya Lowlands have not generally yielded the sort of population estimates used to prepare Figures 3 and 4, and settlement patterns during the second millennium BC are poorly understood in large part because pottery was not used until 1200/1000 BC.

Kaufman (2017) and Campbell (2017) provide recent summaries of the diversification of Mayan languages with further references.

On pre-ceramic settlement in the Maya Lowlands, see Andrews and Robles Castellanos (2018), Iceland (2005), Lohse (2010), Rosenswig (2015:136–141), and Rosenswig et al. (2014).

Concerning in situ development versus migrations of farmers in the Middle Preclassic of the Northern Lowlands, see: Andrews (1990), Andrews et al. (2018), Bey (2006:21–25), Glover et al. (2011), and Stanton and Arden (2005).

For discussion of in situ population expansion possibly leading to ethnic/linguistic heterogeneity in the Middle Preclassic, see: Ball and Taschek (2003), Clark and Cheetham (2005), Clark et al. (2000), Sullivan and Awe (2013).

The following examples collectively help to document the Middle Preclassic population explosion across the Maya Lowlands: Yucatán Peninsula: Anderson et al. (2018), Andrews and Robles Castellanos (2004); Andrews et al. (2018); Glover et al. (2011). Northern Petén and Northern Belize: Andrews and Hammond (1990), Clark et al. (2000). Belize River Valley: Ball and Taschek (2003), Ford and Fedick (1992), Sullivan et al. (2018). Pasion Valley: Inomata et al. (2013), Inomata et al. (2017), Johnston (2006).

**Note 2: Relative Versus Absolute Chronology in the Study of the ADT**

To identify the signature of the ADT in burial assemblages, scholars have used a relative chronology that factors out the spatial component of radial expansion by farmers, leaving only the temporal dimension of time elapsed since the transition to effective agriculture in a given

area (see Bocquet-Appel 2002, 2011a, 2011b). Bandy (2005, 2008) also used a relative chronology in his study of settlement data from Mesoamerica and South America. A relative chronology has proven problematic in more detailed efforts to investigate the ADT in Mesoamerica and the Southwest. Recent efforts to identify an ADT in both Mesoamerica and the Southwest have shifted to an absolute chronology (compare Kohler et al. 2008 to Kohler and Reese 2014; see also Lesure et al. 2014). We use an absolute chronology in this paper.

**Note 3: Notes on the Mesoamerican Surveys in Supplemental Table 1**

In the Southern Highlands, survey evidence begins from approximately 1800/1750 cal BC. The earliest phase listed in Table S1 for each region is the first in that area with evidence of ceramic-using villagers. The regions and corresponding surveys in Figure 3 are: the Valley of Oaxaca itself (2114 $km^2$ surveyed, Kowalewski et al. 1989), the Ejutla Valley (516 $km^2$, Feinman and Nicholas 2013), the Sola Valley (522 $km^2$, Balkansky 1997, 2002), the Albarradas region (110 $km^2$, Feinman and Nicholas 1996), the Sierra Norte of Oaxaca (650 $km^2$, Drennan 1989), and the Cuicatlán region (52 $km^2$, Spencer and Redmond 1997).

The regions and corresponding surveys in Figure 5 are: in Morelos: the Amatzinac Valley (454 $km^2$, Hirth 1987, Hirth 1980); in the Basin of Mexico: Chalco-Xochimilco (812 $km^2$, Parsons et al. 1982), Ixtapalapa (Blanton 1972, Parsons et al. 1983), Texcoco (377 $km^2$, Parsons 1971; Parsons et al. 1983), Cuautitlán (275.2 $km^2$, Sanders and Gorenflo 2007), the Teotihuacán Valley (Gorenflo and Sanders 2007), Zumpango (526 $km^2$, Parsons et al. 2008); other Central Mexico cases: the Toluca Valley (González de la Vara 1999), the central Puebla-Tlaxcala Valley (560 $km^2$, Castanzo 2002), Tlaxco (Merino Carrión 1989); Tehuacán: Quachilo (Drennan and Haller 2007); other Southern Highlands: Yucuita (Plunket 1983), Central Mixteca Alta (1343 $km^2$, Balkansky et al. 2000).

**Note 4: Notes on the Southwest Site Area and Population Estimate Data Included in Supplemental Table 2**

*A Note on our Southwest Survey Data*

Since the primary goal of our study is to identify periods of increased population growth associated with the ADT, and we strongly suspect that the earliest example of this occurred prior

to the widespread manufacture of ceramics in the Southwest, it was critical that surveys included in this study include preceramic sites that could be confidently placed into discrete temporal intervals. We focused our attention on regions with well-documented preceramic and ceramic era occupations that can be identified via survey due to the presence of broadly recognizable diagnostic material culture. Moreover, survey documentation had to contain key data for inclusion, most notably site area and numbers of the types of projectile points or other diagnostic artifacts recorded on such sites.

*Sonoran Desert Site Area Data*

Our Sonoran Desert sample includes data derived from full coverage surveys in the Marana Study Area of the Northern Tucson Basin Survey (Fish et al. 1992; Madsen et al. 1993) and the Cienega Valley Survey (Stevens 2001). Data from the Marana Study Area (~185 $km^2$) comprises our Tucson Basin sample (see Fish et al. 1992:6 for a map), while data from the Cienega Valley survey (~170 $km^2$) represents our Southeastern Arizona sample. Preceramic site area data from the Marana Study Area are derived from Roth (1989, note we only include sites located within the Marana Study Area), while Preclassic and Classic period Hohokam site area data are derived from Fish et al. (1992:26). Area data from pre-Hohokam and Early Pioneer sites (Agua Caliente and Tortolita phases grouped as a single interval) were collected from ASM site cards for the Pioneer period sites displayed by Fish et al. (1992:12, Figure 2.1). Our preceramic data from Southeastern Arizona is derived from Stevens (2001).

Both Roth (1989) and Stevens (2001) placed preceramic sites into discrete temporal categories, and we used these when possible. For the Late Archaic period, however, it was necessary for us to make finer temporal subdivisions. We used Sliva's (2015) projectile point typology to classify individual sites to the Silverbell Interval (2100-1200 BC, preceramic sites that contained only Cortaro points), the San Pedro phase (1200-800 BC, preceramic sites that contained only San Pedro and/or Empire points), and the Cienega phase (800 BC - AD 100, preceramic sites that contained only Cienega points). This was possible from the published data available for these two survey projects because Roth (1989) and Stevens (2001) report the types and counts of projectile points and site area values for each individual Late Archaic site. If a site contained projectile points associated with multiple Late Archaic phases, we included the site area values in our calculation for each phase. For example, a site with San Pedro and Cienega

points was included in our San Pedro phase and Cienega phase calculations, while a site with Cortaro and San Pedro points was included in our Silverbell interval and San Pedro phase calculations. If a preceramic site did not contain any diagnostic projectile points, we did not include it in our calculations.

*Colorado Plateau Site Area Data*

Our Colorado Plateau data also focuses on surveys that consistently identified sites with preceramic and ceramic era occupations. Results from 256km$^2$ of full coverage survey by the Black Mesa Archaeological Project (BMAP) are reported in a fairly consistent fashion from 1977 onwards (see Plog 1986; Powell and Smiley 2002 for syntheses). We compiled all of the survey data for prehispanic sites presented in the 1977-1984 annual BMAP reports (Andrews et al. 1982; Christenson and Parry 1985; Klessert 1978; Klessert and Powell 1979; Nichols and Smiley 1984; Smiley et al. 1983) and the survey data presented in the 1972-1976 volume (Powell 1984). From these reports, 1,262 sites could be placed into a discrete temporal category useful for the study.

We grouped sites recorded on survey into four temporally discrete categories: Basketmaker II (400 BC - AD 300, 89 sites, see Schachner et al. in press for the reasoning behind this date range), Basketmaker II-III transitional (AD 300-800, 9 sites, this interval is poorly represented on northern Black Mesa, see Nichols 2002), Early Pueblo (AD 800-1050, 352 sites) and Late Pueblo (AD 1050-1150, 813 sites). We believe that the latter two temporal groups are the most conservative and useful for the current study given that the presence or absence of corrugated sherds in assemblages was coded consistently from year to year and has been shown to be reliably indicative of occupations dating to AD 800-1050 or AD 1050-1150 on northern Black Mesa (see detailed discussion in Smiley and Ahlstrom 1998).

Our sample also includes four excavated Late Archaic sites (2100-400 BC, AZ D:7:3003a [BMAP], AZ D:7:2100 [BMAP], AZ D:7:3144 [BMAP], AZ D:11:1281 [BMAP]) in order to allow us to calculate growth trends following the onset of the Basketmaker II period - a key interval for this study as no pre-400 BC sites were confidently identified on survey (values for the previous phase are necessary to calculate growth rates for the following phase). We feel confident that including the site area values from these five excavated Archaic sites is appropriate given that extensive excavations at nearly 200 sites by BMAP only revealed these 5

Archaic components, while sites dating to later periods are well-represented by survey and excavation by the BMAP project. Our Basketmaker II growth rates for Black Mesa should therefore be viewed as conservative.

Although narrower in scope, we also include data from ~22 $km^2$ of survey in Canyon del Muerto 1971-1977 since this area contains preceramic and ceramic-era sites identified on survey. Fall et al. (1981) report data from discrete temporal components at 171 sites dating between 400 BC - AD 1280. We use the date ranges presented by Fall et al. (1981) for ceramic era sites. However, Fall et al. (1981) did not document a single Late Archaic site on these surveys. Yet we know that there was an occupation in the area by preceramic farmers prior to the "classic" Basketmaker II period (~400 BC-AD 300) since Gilpin (1994) reports two such sites just north and east of Canyon de Chelly. In order to approximate a low-density occupation for the pre-Basketmaker II component, and allow us to calculate growth rates for the Basketmaker II period, we include the site area values from the Late Archaic components (pre-400 BC) from Lukachuki and Salinas Springs (Gilpin 1994). Our Basketmaker II growth rates for Canyon del Muerto should therefore be viewed as conservative.

Lastly, we include site area data recorded during the 1972-1974 Cedar Mesa Project survey (Matson et al. 1990: Appendix C, Table 1). The original table only includes site area data for a portion of the recorded sites (see discussion in Matson et al. [1990]). We follow the chronology presented by Matson et al. (1990) for ceramic era sites with Late Basketmaker III sites dating AD 650-725 and group all later Pueblo sites together in a single interval AD 1060-1270. For Basketmaker II sites, however, we use a date range of AD 1-400. We chose this broader date range since 22 recent radiocarbon dates derived from maize and human coprolites from Turkey Pen Shelter (located in Grand Gulch, just west of Cedar Mesa), and 11 recent dates derived from human bone from Cave 7 (located in Butler Wash, just east of Cedar Mesa) form a strong cluster between AD 1-200, while wood charcoal derived radiocarbon dates and non-cutting tree-ring dates from open air excavated sites on Cedar Mesa suggest continued occupation AD 200-400 (Batillo 2017; Geib and Hurst 2013; Matson 1991:91). Our Basketmaker II growth rate should therefore be viewed as a cautious estimate.

In order to calculate growth rates for intervals that follow periods of hiatus, we included the mean area of a single site from the following period during the period of hiatus (population estimates for the previous phase are necessary to calculate growth rates during the following

phase). For example, for the gap between the Basketmaker II and Late Basketmaker III occupation (AD 400-650) we used a value of 0.782 hectares, which is the mean site area during the subsequent Late Basketmaker III occupation (AD 650-725).

*Population Estimates*

Our population estimates are derived from previously published data. An important point of contrast between the site area values and the population estimates included in the current study is that the latter incorporate a momentary population estimate for each site based on the expected use-life of structures occupied during a particular phase, or uses excavated and well-dated sites to derive expectations for sites of a similar size recorded on survey (Doelle 1995:519-521; Matson et al. 1988:250; Ortman et al. 2012:27-28). We note, however, that growth rates calculated using population estimates and site area data are in close agreement, particularly when population estimates and site area data are derived from the same underlying survey data (see Cedar Mesa data presented in Figure 5).

Our population estimates for subregions of the Sonoran Desert (AD 700-1400) are derived from Doelle (1995), while our population estimates for the entire Hohokam region (AD 100-1500) are derived from Doelle (2000). The discrepancy in the timing of the period of high growth during the High Productivity phase of the ADT in the Tucson Basin identified via site area versus structure counts may derive from the population estimate methodology and differences in the areas covered (see discussion above). There may be a phase of increasing growth in portions of the Hohokam region during this period, but it is not evident in the population estimates made by Doelle (2000) for the Hohokam region as a whole, which incorporates the larger, more populated Phoenix Basin where the period of rapid growth is more clearly earlier in the sequence.

Our population estimates for the northern San Juan (NSJ) are derived from Ortman et al. (2012:37), who also provide a detailed description of their methods. In order to allow us to include the NSJ data in Figure 5 (20-year and 40-year intervals could not be displayed), we grouped contiguous intervals with high growth or declining growth together. Supplemental Table 2 presents growth rates derived from the coarser chronology displayed in Figure 5 and growth rates derived from the finer chronology presented by Ortman et al. (2012).

Our Cedar Mesa population estimates are derived from Matson, Lipe and Masse (1988). We

used a midpoint between the low and high population estimates in our calculations. In order to calculate growth rates for Basketmaker II and following periods of occupational hiatus, we used a value of 10 individuals for each of the 800 BC-AD 1, AD 400-650, and AD 725-1060 intervals (populations estimates for the previous phase are necessary to calculate growth rates during the following phase).

**Note 5: Population Estimates in Surveys from Highland Mexico**

Population estimates in most of the Central Mexico and Southern Highlands surveys are based on an approach originally developed by Sanders (1965) based on ethnoarchaeological observations of mid-20$^{th}$ century rural communities in the Teotihuacan Valley (see Sanders and Gorenflo 2007:27–33). The approach was further refined for generalized used in the Basin of Mexico survey by Parsons (1971:23; see also Sanders et al. 1979:38–39). Hectares occupied is the primary variable, generally modified by a correction for density of occupation in which sherd densities provide a proxy for an estimated range of population density (people per hectare) that in most cases appears to derive from Sanders' distinction between dispersed villages, low density compact villages, and high density compact villages. These standards were used consistently in the Basin of Mexico surveys and most others in Central Mexico (e.g., Hirth 1980:21–25; Castanzo 2002:103–108). The approach was adapted for the Valley of Oaxaca survey by Blanton (1978, Blanton et al. 1982). In Oaxaca, artifact density varied less from site to site and hectares of occupation consequently plays a more dominant role in the final population estimates (Kowalewski et al. 1989:25; Feinman and Nicholas 2013:28).

**Note 6: Notes on the Gulf Coast surveys**

Although there have been various surveys on the Gulf Coast, most of the resulting publications present the data as site counts and provide neither hectares occupied nor estimates of population. Exceptions are Symonds et al. (2002) and Santley et al. (1997). Other surveys include: Borstein (2001), Daneels (1997), Killion and Urcid (2001), Kruger (1996), Rust and Sharer (1988), Sisson (1976), and von Nagy (2003).

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