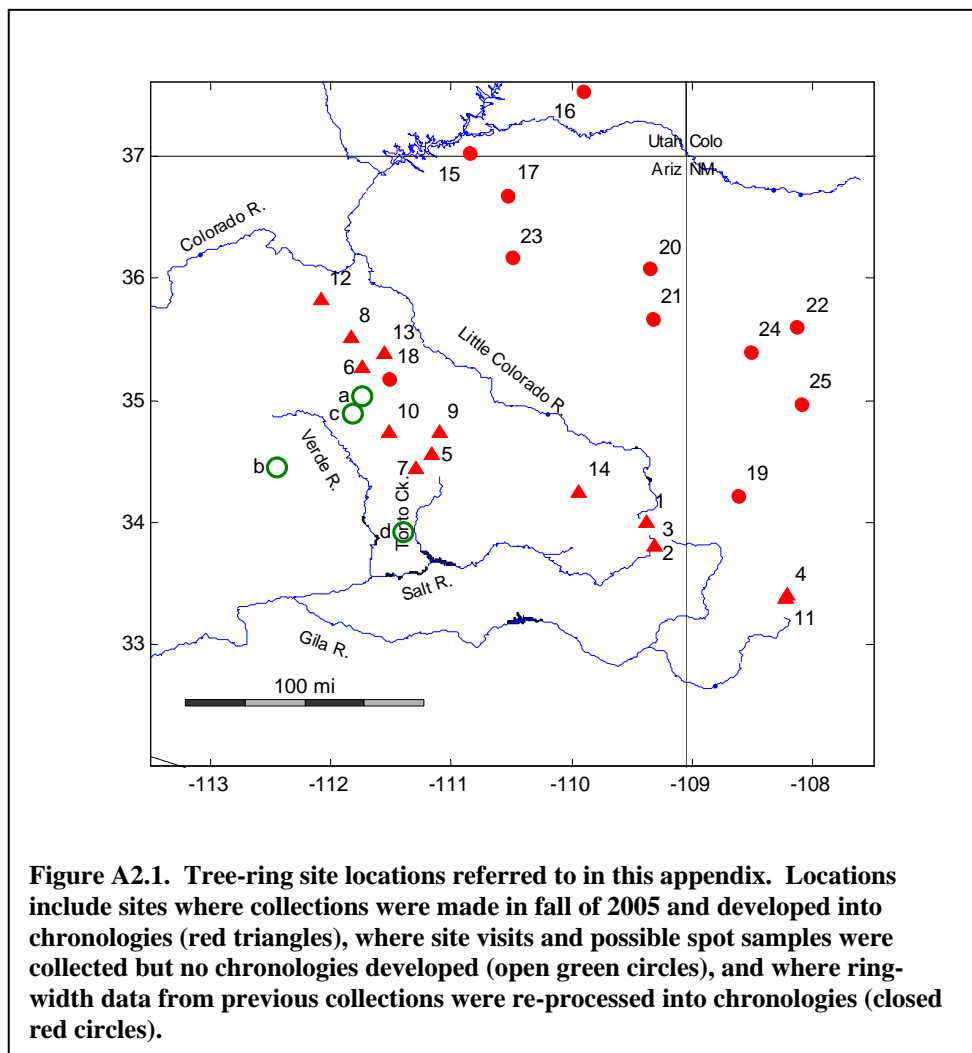


## APPENDIX 2 – FIELD COLLECTIONS AND RING-WIDTH DATA

This appendix describes the ring-width data assembled for the flow reconstructions. Ring widths came from several sources. First are the field collections in the fall of 2005. Second is the International Tree-Ring Data Bank, whose earlier collections at several of those sites were merged with the new data. Third is the Southwest Archaeology Project, which made live-tree collections from their network available to us (Gary Funkhouser, personal communication).

All ring-width measurements used in the flow reconstructions on this project are included as “.rwl” files in file SRP2\_RingWidths.zip. Figure A2.1 shows 29 tree-ring site locations relevant to the projects. Tree-ring collections were made in fall of 2005 and developed into site chronologies at sites numbered 1-14. Spot samples were collected but not chronologies developed at sites labeled “a” and “b”, Site visits but no field collections were made at sites “c” and “d”. Sites labeled 15-25 are locations of previous tree-ring collections whose ring-width data were used in this project.



**Figure A2.1. Tree-ring site locations referred to in this appendix. Locations include sites where collections were made in fall of 2005 and developed into chronologies (red triangles), where site visits and possible spot samples were collected but no chronologies developed (open green circles), and where ring-width data from previous collections were re-processed into chronologies (closed red circles).**

## FIELD COLLECTIONS

Information on the 18 tree-ring sites visited in fall of 2005 is listed in Table A2.1. All sites were collected by David Meko, with assistance at various sites by Chris Baisan (sites 4,11), Scott St. George (sites 4,11), Christine Hallman (sites 5,6,8,9,10,13), and Ramzi Touchan (sites 6, 8,12,13). All samples were taken by increment borer.

Table A2.1. Field collections of tree-ring sites

N <sup>1</sup> Site Name	Spec <sup>2</sup>	Location <sup>3</sup>			T <sup>4</sup>	Date <sup>5</sup>	N <sub>T</sub> <sup>6</sup>
		Lat	Lon	El(ft)			
1 Wahl Knoll	PSME	34.00	-109.39	9625	P	11-19	18
2 Black River Fir	PSME	33.81	-109.32	6754	P	09-23	20
3 Black River Pine	PIPO	33.81	-109.32	7921	P	11-17	25
4 Wolf Head Draw Fir	PSME	33.40	-108.22	6593	P	10-13	8
5 East Clear Creek	PIPO	34.55	-111.16	6706	T	11-11	19
6 Gus Pearson	PIPO	35.27	-111.74	7423	T	10-27	30
7 Mogollon Rim West Fir	PSME	34.44	-111.29	7511	T	11-03	5
8 Slate Mountain	PIPO	35.52	-111.83	7027	T	10-28	31
9 Jacks Canyon	PIED	34.75	-111.11	6303	T	11-10	17
10 Rocky Gulch	PIPO	34.73	-111.52	6453	T	11-10	22
11 Black Mountain Lookout	PSME	33.38	-108.22	8692	T	10-13	15
12 Red Butte	PIED	35.83	-112.08	6332	T	10-28	16
13 Robinson Mountain	PIPO	35.38	-111.56	7313	T	10-27	30
14 Sitgreaves Gravel Pit	PIPO	34.25	-109.94	6740	T	09-24	24
a Oak Creek Canyon	PSME	35.03	-111.74	5904	N	10-21	4
b Wolf Creek Campground	PIPO	34.45	-112.45	5871	N	10-21	4
c Dry Creek	PIED	34.89	-111.82	4526	N	10-21	0
d Oak Spring Canyon	PIPO	33.92	-111.40	6199	N	10-19	0

<sup>1</sup>N=map number or letter (see Figure A2.1)

<sup>2</sup>Species: PSME = *Pseudotsuga menziesii*; PIPO = *Pinus ponderosa*  
PIED = *Pinus edulis*

<sup>3</sup>Location = latitude and longitude in decimal degrees; elevation in ft

<sup>4</sup>T = type of chronology developed (P=partial width and total width, T=total width only, N=none)

<sup>5</sup>Date=month-day of field collection

<sup>6</sup>N<sub>T</sub>: number of trees sampled

## RING-WIDTH DATA

All ring-width data used in this project are included in International Tree-Ring Data Bank (ITRDB) format in the file SRP2\_RingWidths.zip. The data can be associated with sites through the file names in column "File" in Table A2.2. For example, file whkwt2.rwl has the ring-width data for Wahl Knoll (site 1 in Table A2.2).

**Table A2.2. Tree-ring chronologies used in flow reconstructions.** (This table identical to Table 3 in the text of final report)

N <sup>1</sup>	Site <sup>2</sup>	File <sup>3</sup>	Species <sup>4</sup>	Location <sup>5</sup>			Period <sup>6</sup>	s <sup>7</sup>
				Lat	Lon	El(ft)		
1	Wahl Knoll,	whkwt2	PSME	34.0	-109.4	9512	1435-2005	d
2	Black River	brfwt1	PSME	33.8	-109.3	6757	1598-2005	d
3	Black River	brpwt1	PIPO	33.8	-109.3	7921	1598-2005	d
4	Wolf Head D	wlftwt1	PSME	33.4	-108.2	6593	1736-2005	d
5	East Clear	eccwt1	PIPO	34.5	-111.2	6704	1694-2005	d
6	Gus Pearson	guswt1	PIPO	35.3	-111.7	7423	1583-2005	d
7	High View P	hvwwt1	PSME	34.4	-111.3	7872	*1595-2005	d
8	Slate Mount	slawt1	PIPO	35.5	-111.8	6986	1634-2005	d
9	Jacks Canyo	jkcwt1	PIED	34.7	-111.1	6298	1686-2005	d
10	Rocky Gulch	rghwt1	PIPO	34.7	-111.5	6429	1694-2005	d
11	Black Mount	bkmwt1	PSME	33.4	-108.2	8856	1327-2005	d
12	Red Butte,	redwt1	PIED	35.8	-112.1	6298	1478-2005	d
13	Robinson Mo	robwt1	PIPO	35.4	-111.6	7314	1619-2005	d
14	Sitgreaves	sgpwt1	PIPO	34.3	-109.9	6757	1640-2005	d
15	Navajo Moun	nv90	PIED	37.0	-110.8	7498	1330-1989	a
16	Kane Spring	nat90	PIED	37.5	-109.9	6448	1361-1988	a
17	Betatakin C	bet90	PSME	36.7	-110.5	6701	1306-1989	a
18	Walnut Cany	wcpwt1	PIPO	35.2	-111.5	6799	1451-1987	b
19	Agua Fria	agfwt1	PIED	34.2	-108.6	7298	1496-1987	b
20	Spider Rock	cdcwt1	MIX	36.1	-109.3	6199	1399-1989	a
21	Cross Canyo	crswt1	PIPO	35.7	-109.3	7200	1541-1989	a
22	Satan Pass	spswt1	PSME	35.6	-108.1	7498	1410-1990	a
23	Upper Dinne	dinwt1	PIED	36.2	-110.5	6298	1410-1983	a
24	Turkey Spri	tspwt1	PIED	35.4	-108.5	7797	1490-1985	a
25	El Malpais	nm572_b	PSME	35.0	-108.1	7947	1100-1990	c

<sup>1</sup>site number; <sup>2</sup>site name, truncated; <sup>3</sup>prefix of ring-width-list (rwl)file; <sup>4</sup>Species code: PIED=Pinus edulis; PIPO=Pinus ponderosa; PSME=Psuedotsuga menziesii; MIX=mix of two or more of the preceding species; <sup>5</sup>Latitude and longitude in decimal degrees, elevation in feet above sea level; <sup>6</sup>Start and end year of chronology, after trimming off all data preceding 1100; <sup>7</sup>code cross-referenced to Principal Investigator responsible for chronology collection: a and b) Jeff Dean and collaborators from Southwest Archeology Project, c) Henri Grissino-Mayer, d)David Meko --- primarily updates of chronologies previously collected by researchers from Laboratory of Tree-Ring Research (LTRR)

The last three characters of the filename in Table A2.2 refer to the type of measurements. Characters “wt2” for example, mean “width”, “total”, “version 2”. The version number is of no interest to the user of the data, but note that in addition to “total” width files, some sites may have “early” (e) width files and “late” (l) width files. Wahl Knoll, for example, has files whkwt2.rwl, whkwe2.rwl and whkw12.rwl.

Corrections, trimming and screening were sometime necessary for ring-width files obtained from the ITRDB. To facilitate reproducibility of the basic ring-width measurements, information is included below on any special actions taken in preparing the ring-width data for the 25 chronologies. Each ring-width series was plotted and sliding correlations with other series analyzed with program lockdown.m. Results were used to make corrections to measured series, or to truncate those series. Notation used below includes:

[-- nnnn] ... series truncated by dropping portion after year nnnn  
[nnnn -- ] ... series truncated by dropping portion before year nnnn  
del ... entire series deleted

#### **Wahl Knoll (1)**

**Merging:** Ring widths from 2005 collection combined with selected series from file wah90.rwl, collected in 1990 by Chris Baisan

**Editing:** (samples WAH from wah90.rwl)

WAH011 [1735 --]  
WAH012 del  
WAH052 [1550 --]

#### **Black River Pine (2)**

**Merging:** Ring widths from 2005 collection combined with those of ITRDB series AZ513.rwl, Beaver Creek.

**Editing:** (samples brp from AZ513)

brp05b [- 1815]  
brp06b [- 1860]  
brp20b del  
brp24b del

#### **Black River Fir (3)**

**Merging:** Ring widths from 2005 collection combined with those of ITRDB series AZ514.rwl, Black River. Both collections use “BRF” code; 2005 collections begin numbering with tree 21.

**Editing:** (no editing)

#### **Wolf Head Draw (4)**

**Merging:** No merging, as this was a site with no previous collections

#### **East Clear Creek (5)**

**Merging:** No merging, as this was a site with no previous collections

### Gus Pearson (6)

**Merging:** Ring widths from 2005 collection combined with those of ITRDB series AZ521.rwl.

**Editing:** Only the oldest cores from AZ521, those beginning in 1600 or earlier, were merged with the 2005 data.

### High View Point (Mogollon Rim West Fir) (7)

**Merging:** Ring widths from 2005 collection combined with those of ITRDB series AZ027.rwl

**Editing:** (samples from AZ513 have numeric site code 138)

138081 del

138021 [-- 1829]

138061 [-- 1946]: also, msmt for 1877 off by a decimal point --  
HUGE errow; changed 365 to 36

138081: [-- 1941]

### Slate Mountain (8)

**Merging:** Ring widths from 2005 collection with those of ITRDB series AZ098.rwl (Jeff Dean), and AZ543.rwl (Don Graybill).

**Editing:** Merged by including subsets of long and very good (lockdown-evaluated) series from the earlier collections. The cores included from earlier collections were:

From AZ098:

312012

312022

312031

312032

312041

From AZ543:

smp042

smp071

smp082

smp112

smp161

smp162

smp191

smp192

### Jacks Canyon (9)

**Merging:** Ring widths from 2005 collection combined with those of ITRDB series AZ101.rwl. Series in AZ101 have site code "413". This site was estimated to have 95 percent mortality of old trees dead in the 2005 visit.

**Editing:** Merged the data, deleting three files from the AZ101 set:

413011 del

413012 del

412101 del

413102 del

### Rocky Gulch (10)

**Merging:** Ring widths from 2005 collection with those of ITRDB series AZ538.rwl.

**Editing:** Program lockdown indicated that the earlier collection had relatively strong inter-series correlation, and superior length to the new collection (many of the oldest trees had died since the earlier collection). Therefore, all samples from AZ538 were used as the foundation of the chronology, which was then updated by in the best of the 2005 collection.

### Black Mountain Lookout (11)

**Merging:** Ring widths from 2005 collection combined with those of ITRDB series AZ565.rwl.

**Editing:** Samples from AZ565 have three-character site code “BKF”; samples from the 2005 collection were labeled “BKM”. Only one series from the earlier collection was altered, and that was truncated:

BKF211 [1407 --]

### Red Butte (12)

**Merging:** Ring widths from 2005 collection combined with those of ITRDB series AZ047.rwl and AZ106.rwl.

**Editing:** Samples from AZ047 have three-character site code “180”; those from the AZ106 have code “453”; those from the 2005 collection have code “RBT”. 180021 del

180022 del

180012 [1800-] compensating dating errors between 1783 and 1799

453041 [1632-] dating off earlier by maybe a year

453081 [1686-], dating off before

453051 [accepted] but suspect problem before 1613

### Robinson Mountain (13)

**Merging:** Ring widths from 2005 collection combined with those of ITRDB series AZ087.rwl.

**Editing:** Samples from AZ087 have three-character site code “212”;; those from the 2005 collection have code “ROB”. From AZ087, included these:

212021, 212022, 212061, 212071, 212072, 212111, 212112, 212121, 212122, 212141, 212142

### Sitgreaves Gravel Pit (14)

**Merging:** Ring widths from 2005 collection combined with those of ITRDB series AZ542.

**Editing:** Samples from both collections have three-character site code “SGP”; those from the AZ542 stop with tree number 13, and use a numeric rather letter code to distinguish cores within a tree. The 2005 collection uses higher tree numbers and a letter code for distinguishing cores. The AZ542 ring-width set did not require editing before merging with the new data.

### Navajo Mountain (15)

**Merging:** Southwest Archaeology dataset NVN90.rwl. These and other such files provided by Gary Funkhouser. We used only live-tree chronology portions of any Southwest Archaeology data (i.e., no samples from archaeological structures)

**Editing:** No editing required.

### Kane Spring (16)

**Merging:** Southwest Archaeology dataset of combined ring widths from two Utah sites: Milk Ranch Point (MRN90.rwl), and Kane Springs (KAN90.rwl).

**Editing:** No editing required.

### Betatakin Canyon (17)

**Merging:** Southwest Archaeology dataset of combined ring widths from a 1970s collection with site code "115" and a later collection with site code "BCD".

**Editing:**

```
BCD602 [1594 -- ]
151220 del
```

### Walnut Canyon (18)

**Merging:** Southwest Archaeology dataset of combined ring widths from a 1960s (AZ049.rwl) collection with site code "182" and a 1987 collection with site code "WCP".

**Editing:** The best of AZ049 were added to the WCP set collected in 1987. One change was made:

```
182042 [-- 1667]
```

### Agua Fria (19)

**Merging:** Southwest Archaeology dataset of combined ring widths from ITRDB chronologies NM035.rwl and NM564.rwl. Ring widths from NM035 have code "323" and those from NM564 have code "AFN".

**Editing:** Two series were deleted:

```
323031 del
323032 del
```

### Spider Rock (20)

**Merging:** Southwest Archaeology dataset. "Spider Rock" is used interchangeably with "Canyon de Chelly" in describing the site. According to Gary Funkhouser, the ring-width set is a combination of "old Spider Rock" (ORN) and "spider rock" (DCD). Both were collected in 1989 or 1990. There are also earlier collections from the location.

**Editing:** Earliest portions of about 10 series were flagged for suspect dating by Lockdown. Those series were truncated.

### **Cross Canyon (21)**

**Merging:** Southwest Archaeology dataset. Ring widths have letter codes “CCN” and “CCP”, corresponding to pinyon pine and ponderosa pine.

**Editing:** Early portions of some series flagged for weak dating by lockdown were deleted.

### **Satan Pass (22)**

**Merging:** Southwest Archaeology dataset. Ring widths with character code “161” are from NM025.rwl. Those with code “STD” are from a 1990 update of the site.

**Editing:** The 1990 collection was used as the basis. This was supplemented by cores:

161152

161161

161162

161201

161202

### **Upper Dinnebito Wash (23)**

**Merging:** Southwest Archaeology dataset. Ring widths with character code “UDN” are from a chronology with data ending in 1980. Those with code “GCN” are from a 1983 collection. An earlier collection, in AZ082.rwl, was found to have inferior inter-series correlation, and was not used.

**Editing:**

UDNN042 del

### **Turkey Springs (24)**

**Merging:** Southwest Archaeology dataset. Ring widths with character code “273” are from NM030.rwl. Those with code “TSP” are from TSP90.rwl. The two sets were combined, relying mainly on the more recent collection and using mainly the very old series from the earlier collection.

**Editing:** From NM030.rwl, used just those cores beginning near or before year 1600. Added those to the full set from TSP90.rwl

### **El Malpais (25)**

**Merging:** No merging. Ring-width series were culled from ITRDB file NM572.rwl.

**Editing:** Program lockdown was run on the series in NM572.rwl, and only those series with median correlation 0.80 or greater with an “all others” master, and with segment length 300 years or greater, were accepted.