

Table S1
Comparison of ¹⁰Be age calculations using alternative scaling schemes

Scaling scheme for spallation:									
Constant production rate model Lal (1991) / Stone (2000)									
Sample name	Desilets and others (2003, 2006)		Dunai (2001)		Lifton and others (2005)		Time-dependent Lal (1991) / Stone (2000)		
	Exposure age (ky)	External uncertainty (ky)	Exposure age (ky)	External uncertainty (ky)	Exposure age (ky)	External uncertainty (ky)	Exposure age (ky)	External uncertainty (ky)	
<i>Robinson Creek Tahoe moraine (RCTA05)</i>									
RCTA05-1	152.5 +/- 15.1		138.1 +/- 18.3		135.5 +/- 17.8		132.3 +/- 14.6		136.7 +/- 13.0
RCTA05-2	53.4 +/- 5.1		49.5 +/- 6.2		48.7 +/- 6.1		47.5 +/- 5.1		48.9 +/- 4.5
RCTA05-3	123.0 +/- 12.2		112.5 +/- 14.8		110.6 +/- 14.4		108.4 +/- 12.0		111.4 +/- 10.6
RCTA05-4	121.1 +/- 12.0		110.9 +/- 14.5		109.0 +/- 14.2		106.8 +/- 11.8		109.9 +/- 10.5
RCTA05-5	114.7 +/- 11.4		105.4 +/- 13.8		103.6 +/- 13.5		101.7 +/- 11.2		104.5 +/- 10.0
RCTA05-6	54.2 +/- 5.1		50.2 +/- 6.3		49.4 +/- 6.1		48.2 +/- 5.1		49.6 +/- 4.5
RCTA05-7	114.8 +/- 11.6		105.5 +/- 14.0		103.7 +/- 13.6		101.8 +/- 11.4		104.5 +/- 10.2
RCTA05-8	133.8 +/- 13.4		121.5 +/- 16.1		119.5 +/- 15.7		116.9 +/- 13.0		120.4 +/- 11.6
RCTA05-9	71.3 +/- 7.0		66.7 +/- 8.6		65.6 +/- 8.4		64.4 +/- 7.0		65.9 +/- 6.3
<i>Sonora Junction Tioga moraine (southern lobe) (SJTI05)</i>									
SJTI05-1	19.2 +/- 1.8		19.0 +/- 2.3		18.8 +/- 2.3		18.5 +/- 1.9		18.8 +/- 1.7
SJTI05-2	19.7 +/- 1.8		19.4 +/- 2.4		19.2 +/- 2.3		18.9 +/- 2.0		19.2 +/- 1.7
SJTI05-3	19.0 +/- 1.7		18.8 +/- 2.3		18.6 +/- 2.3		18.3 +/- 1.9		18.6 +/- 1.7
SJTI05-4	16.3 +/- 1.5		16.3 +/- 2.0		16.2 +/- 2.0		15.9 +/- 1.6		16.1 +/- 1.4
SJTI05-5	18.4 +/- 1.7		18.2 +/- 2.2		18.0 +/- 2.2		17.8 +/- 1.8		18.0 +/- 1.6
SJTI05-6	21.2 +/- 2.0		20.9 +/- 2.6		20.7 +/- 2.5		20.4 +/- 2.1		20.7 +/- 1.8
SJTI05-7	22.0 +/- 2.0		21.6 +/- 2.6		21.3 +/- 2.6		21.0 +/- 2.2		21.4 +/- 1.9
SJTI05-8	20.1 +/- 1.8		19.8 +/- 2.4		19.6 +/- 2.4		19.3 +/- 2.0		19.6 +/- 1.7
SJTI05-9	19.0 +/- 1.7		18.7 +/- 2.3		18.6 +/- 2.3		18.3 +/- 1.9		18.5 +/- 1.7
<i>Buckeye Creek Tahoe outwash terrace (BCTA06)</i>									
BCTA06-1	167.4 +/- 17.1		152.5 +/- 20.6		149.5 +/- 20.1		145.9 +/- 16.5		150.7 +/- 14.8
BCTA06-2	150.5 +/- 15.0		136.1 +/- 18.1		133.6 +/- 17.6		130.4 +/- 14.5		134.9 +/- 12.9
BCTA06-3	149.2 +/- 15.1		134.9 +/- 18.0		132.5 +/- 17.6		129.3 +/- 14.5		133.8 +/- 13.0
BCTA06-4	118.4 +/- 11.6		108.5 +/- 14.1		106.6 +/- 13.8		104.5 +/- 11.4		107.6 +/- 10.1
BCTA06-5	106.1 +/- 10.3		98.1 +/- 12.7		96.4 +/- 12.4		94.8 +/- 10.3		97.4 +/- 9.1
BCTA06-6	124.4 +/- 12.3		113.5 +/- 14.9		111.5 +/- 14.5		109.2 +/- 12.0		112.6 +/- 10.7
BCTA06-7	130.4 +/- 12.9		118.6 +/- 15.6		116.6 +/- 15.2		114.1 +/- 12.6		117.6 +/- 11.2
BCTA06-8	145.3 +/- 14.5		131.6 +/- 17.4		129.3 +/- 17.0		126.2 +/- 14.0		130.4 +/- 12.5
BCTA06-9	148.2 +/- 14.7		134.1 +/- 17.7		131.7 +/- 17.3		128.5 +/- 14.2		132.9 +/- 12.6
<i>Sonora Junction Tenaya moraine (SJTE06)</i>									
SJTE06-1	22.5 +/- 2.0		22.1 +/- 2.7		21.9 +/- 2.6		21.6 +/- 2.2		21.9 +/- 1.9
SJTE06-2	17.9 +/- 1.6		17.7 +/- 2.2		17.6 +/- 2.1		17.3 +/- 1.8		17.5 +/- 1.6

SJTE06-3	22.8 +/- 2.1	22.3 +/- 2.7	22.0 +/- 2.7	21.7 +/- 2.2	22.1 +/- 2.0
SJTE06-4	16.7 +/- 1.5	16.6 +/- 2.0	16.5 +/- 2.0	16.2 +/- 1.7	16.4 +/- 1.5
SJTE06-5	21.2 +/- 1.9	20.8 +/- 2.5	20.5 +/- 2.5	20.2 +/- 2.1	20.6 +/- 1.8
SJTE06-6	17.3 +/- 1.6	17.1 +/- 2.1	17.0 +/- 2.1	16.7 +/- 1.7	17.0 +/- 1.5
SJTE06-7	19.8 +/- 1.8	19.5 +/- 2.4	19.3 +/- 2.3	19.0 +/- 1.9	19.3 +/- 1.7
SJTE06-8	3.3 +/- 0.3	3.7 +/- 0.5	3.8 +/- 0.5	3.7 +/- 0.4	3.6 +/- 0.3
SJTE06-9	24.1 +/- 2.2	23.5 +/- 2.9	23.2 +/- 2.8	22.9 +/- 2.4	23.3 +/- 2.1
<i>Sonora Junction Tahoe moraine (SJTA06)</i>					
SJTA06-1	108.9 +/- 10.8	99.7 +/- 13.0	98.0 +/- 12.7	96.3 +/- 10.6	99.5 +/- 9.5
SJTA06-2	89.6 +/- 8.6	82.4 +/- 10.6	80.9 +/- 10.3	79.2 +/- 8.5	82.5 +/- 7.7
SJTA06-3	114.5 +/- 11.3	103.9 +/- 13.5	102.0 +/- 13.2	100.1 +/- 11.0	104.1 +/- 9.9
SJTA06-4	90.0 +/- 8.7	82.7 +/- 10.6	81.1 +/- 10.3	79.5 +/- 8.6	82.8 +/- 7.7
SJTA06-5	90.9 +/- 8.7	83.5 +/- 10.7	81.9 +/- 10.4	80.3 +/- 8.6	83.6 +/- 7.8
SJTA06-6	50.6 +/- 4.7	46.1 +/- 5.7	45.4 +/- 5.6	44.4 +/- 4.6	46.1 +/- 4.2
SJTA06-7	51.8 +/- 4.8	47.2 +/- 5.8	46.5 +/- 5.7	45.4 +/- 4.7	47.2 +/- 4.2
SJTA06-8	78.0 +/- 7.6	71.7 +/- 9.2	70.4 +/- 9.0	69.0 +/- 7.5	71.8 +/- 6.8
SJTA06-9	45.6 +/- 4.2	41.8 +/- 5.2	41.2 +/- 5.1	40.4 +/- 4.2	41.8 +/- 3.7
SJTA06-10	56.3 +/- 5.3	51.5 +/- 6.5	50.7 +/- 6.3	49.3 +/- 5.2	51.6 +/- 4.7
<i>Sonora Junction Tioga moraine (northern lobe) (SJTI06)</i>					
SJTI06-1	19.2 +/- 1.8	19.2 +/- 2.4	19.0 +/- 2.3	18.7 +/- 1.9	18.8 +/- 1.7
SJTI06-2	19.3 +/- 1.8	19.2 +/- 2.3	19.0 +/- 2.3	18.8 +/- 1.9	18.9 +/- 1.7
SJTI06-3	19.9 +/- 1.8	19.8 +/- 2.4	19.6 +/- 2.4	19.3 +/- 2.0	19.4 +/- 1.7
SJTI06-4	19.3 +/- 1.8	19.3 +/- 2.4	19.1 +/- 2.3	18.8 +/- 1.9	18.9 +/- 1.7
SJTI06-5	18.9 +/- 1.7	18.9 +/- 2.3	18.7 +/- 2.3	18.4 +/- 1.9	18.5 +/- 1.6
SJTI06-6	19.5 +/- 1.8	19.5 +/- 2.4	19.3 +/- 2.4	19.0 +/- 2.0	19.1 +/- 1.7
<i>Virginia Creek Tahoe moraine (VCTA06)</i>					
VCTA06-1	69.0 +/- 6.4	60.8 +/- 7.6	59.7 +/- 7.4	58.2 +/- 6.1	63.2 +/- 5.7
VCTA06-2	150.3 +/- 15.0	127.1 +/- 16.7	124.3 +/- 16.2	121.3 +/- 13.3	132.8 +/- 12.7
VCTA06-3	23.8 +/- 2.1	22.2 +/- 2.7	22.0 +/- 2.6	21.6 +/- 2.2	22.9 +/- 2.0
VCTA06-5	23.1 +/- 2.1	21.7 +/- 2.6	21.4 +/- 2.6	21.0 +/- 2.1	22.3 +/- 2.0
VCTA06-6	62.1 +/- 5.8	54.3 +/- 6.7	53.2 +/- 6.6	51.7 +/- 5.4	56.8 +/- 5.1
VCTA06-7	32.3 +/- 3.0	29.4 +/- 3.6	29.0 +/- 3.5	28.5 +/- 2.9	30.4 +/- 2.7
VCTA06-8	42.8 +/- 3.9	37.9 +/- 4.7	37.3 +/- 4.6	36.7 +/- 3.8	39.2 +/- 3.5
VCTA06-9	23.6 +/- 2.1	22.1 +/- 2.7	21.8 +/- 2.6	21.4 +/- 2.2	22.8 +/- 2.0
<i>Lundy Canyon Tioga outwash terrace (LCTIO-07)</i>					
LCTIO-07-1	17.0 +/- 1.6	17.0 +/- 2.1	16.8 +/- 2.0	16.6 +/- 1.7	16.7 +/- 1.5
LCTIO-07-2	13.4 +/- 1.2	13.5 +/- 1.7	13.5 +/- 1.6	13.2 +/- 1.4	13.3 +/- 1.2
LCTIO-07-3	17.5 +/- 1.6	17.4 +/- 2.1	17.2 +/- 2.1	16.9 +/- 1.7	17.1 +/- 1.5
LCTIO-07-4	18.1 +/- 1.7	18.0 +/- 2.2	17.9 +/- 2.2	17.6 +/- 1.8	17.8 +/- 1.6
LCTIO-07-5	18.2 +/- 1.7	18.1 +/- 2.2	17.9 +/- 2.2	17.6 +/- 1.8	17.8 +/- 1.6
LCTIO-07-6	17.5 +/- 1.6	17.4 +/- 2.1	17.3 +/- 2.1	17.0 +/- 1.7	17.2 +/- 1.5
<i>Buckeye Creek Tioga outwash terrace (BCTI07)</i>					
BCTI07-1	19.5 +/- 1.8	19.5 +/- 2.4	19.3 +/- 2.3	19.0 +/- 2.0	19.1 +/- 1.7
BCTI07-2	21.0 +/- 1.9	20.9 +/- 2.5	20.6 +/- 2.5	20.4 +/- 2.1	20.4 +/- 1.8
BCTI07-3	8.0 +/- 0.7	8.2 +/- 1.0	8.2 +/- 1.0	7.9 +/- 0.8	7.9 +/- 0.7

BCTI07-4	20.0 +/- 1.8	20.0 +/- 2.5	19.8 +/- 2.4	19.6 +/- 2.0	19.6 +/- 1.7
BCTI07-5	19.5 +/- 1.8	19.4 +/- 2.4	19.2 +/- 2.3	19.0 +/- 2.0	19.0 +/- 1.7
BCTI07-6	13.9 +/- 1.3	14.1 +/- 1.7	14.0 +/- 1.7	13.8 +/- 1.4	13.7 +/- 1.2
<i>Lundy Canyon Mono Basin moraine (LCMB07)</i>					
LCMB07-1	43.1 +/- 4.0	39.3 +/- 4.9	38.8 +/- 4.8	38.0 +/- 4.0	39.7 +/- 3.6
LCMB07-2	45.8 +/- 4.3	41.4 +/- 5.1	40.9 +/- 5.1	40.0 +/- 4.2	41.8 +/- 3.8
LCMB07-3	28.7 +/- 3.0	27.2 +/- 3.6	26.9 +/- 3.6	26.5 +/- 3.1	27.4 +/- 2.8
LCMB07-4	22.4 +/- 2.1	21.7 +/- 2.7	21.5 +/- 2.6	21.1 +/- 2.2	21.8 +/- 2.0
LCMB07-5	36.7 +/- 3.4	34.2 +/- 4.2	33.7 +/- 4.1	33.2 +/- 3.5	34.4 +/- 3.1
LCMB07-6	38.9 +/- 3.8	36.1 +/- 4.6	35.5 +/- 4.5	35.0 +/- 3.8	36.2 +/- 3.5
<i>Green Creek Tahoe moraine (GCTA07)</i>					
GCTA07-1	22.3 +/- 2.0	21.5 +/- 2.6	21.2 +/- 2.6	20.9 +/- 2.2	21.7 +/- 1.1
GCTA07-2	20.7 +/- 1.9	19.9 +/- 2.4	19.7 +/- 2.4	19.4 +/- 2.0	20.1 +/- 1.0
GCTA07-3	26.9 +/- 2.5	25.5 +/- 3.1	25.1 +/- 3.1	24.7 +/- 2.6	25.8 +/- 0.9
GCTA07-4	77.6 +/- 7.3	69.6 +/- 8.8	68.3 +/- 8.6	66.9 +/- 7.1	71.1 +/- 6.5
GCTA07-5	190.2 +/- 19.6	165.3 +/- 22.5	161.4 +/- 21.8	157.4 +/- 17.9	169.7 +/- 16.7
GCTA07-6	37.9 +/- 3.5	34.8 +/- 4.3	34.2 +/- 4.2	33.7 +/- 3.5	35.4 +/- 3.1
<i>Lundy Canyon Tioga moraine (LCTI07)</i>					
LCTI07-1	16.1 +/- 1.5	16.0 +/- 1.9	15.9 +/- 1.9	15.6 +/- 1.6	15.8 +/- 1.4
LCTI07-2	17.9 +/- 1.6	17.7 +/- 2.2	17.5 +/- 2.1	17.2 +/- 1.8	17.5 +/- 1.6
LCTI07-3	16.4 +/- 1.5	16.3 +/- 2.0	16.2 +/- 2.0	15.9 +/- 1.6	16.1 +/- 1.4
LCTI07-4	19.8 +/- 1.8	19.5 +/- 2.4	19.3 +/- 2.3	19.0 +/- 2.0	19.3 +/- 1.7
LCTI07-5	19.2 +/- 1.8	18.9 +/- 2.3	18.7 +/- 2.3	18.4 +/- 1.9	18.7 +/- 1.7
LCTI07-6	14.4 +/- 1.3	14.5 +/- 1.7	14.4 +/- 1.7	14.1 +/- 1.4	14.3 +/- 1.2
<i>Sonora Junction Tahoe outwash terrace depth profile (SJPT06)</i>					
SJPT06	149.1 +/- 21.1	131.0 +/- 22.7	128.2 +/- 21.9	124.5 +/- 18.3	130.9 +/- 17.3
<i>Lundy Canyon Sherwin moraine (LCSH07)</i>					
LCSH07-1	41.5 +/- 3.8	37.9 +/- 4.7	37.3 +/- 4.6	36.7 +/- 3.8	38.3 +/- 3.4
LCSH07-2	89.3 +/- 8.6	80.4 +/- 10.3	78.8 +/- 10.0	77.2 +/- 8.3	81.7 +/- 7.6
LCSH07-3	52.7 +/- 4.9	47.1 +/- 5.8	46.3 +/- 5.7	45.2 +/- 4.7	47.8 +/- 4.3
LCSH07-4	45.7 +/- 4.3	41.3 +/- 5.2	40.7 +/- 5.1	39.9 +/- 4.2	41.7 +/- 3.8
LCSH07-5	76.9 +/- 7.3	69.8 +/- 8.8	68.5 +/- 8.6	67.1 +/- 7.2	70.5 +/- 6.5
LCSH07-6	101.1 +/- 9.8	91.5 +/- 11.8	89.7 +/- 11.5	88.0 +/- 9.5	92.5 +/- 8.7
<i>Woodfords Tioga outwash terrace (WFTI08)</i>					
WFTI08-1	19.6 +/- 1.8	20.0 +/- 2.4	19.8 +/- 2.4	19.5 +/- 2.0	19.3 +/- 1.7
WFTI08-2	20.7 +/- 1.9	21.0 +/- 2.6	20.8 +/- 2.5	20.5 +/- 2.1	20.3 +/- 1.8
WFTI08-3	21.8 +/- 2.0	22.1 +/- 2.7	21.8 +/- 2.7	21.6 +/- 2.2	21.4 +/- 1.9
<i>Woodfords Tahoe outwash terrace (WFTA08)</i>					
WFTA08-1	130.8 +/- 12.8	123.0 +/- 16.1	121.3 +/- 15.8	118.7 +/- 13.0	119.6 +/- 11.3
WFTA08-2	123.9 +/- 12.0	116.5 +/- 15.2	114.9 +/- 14.9	112.5 +/- 12.2	113.6 +/- 10.6
WFTA08-3	69.8 +/- 6.5	66.8 +/- 8.4	65.8 +/- 8.2	64.6 +/- 6.8	65.2 +/- 5.9

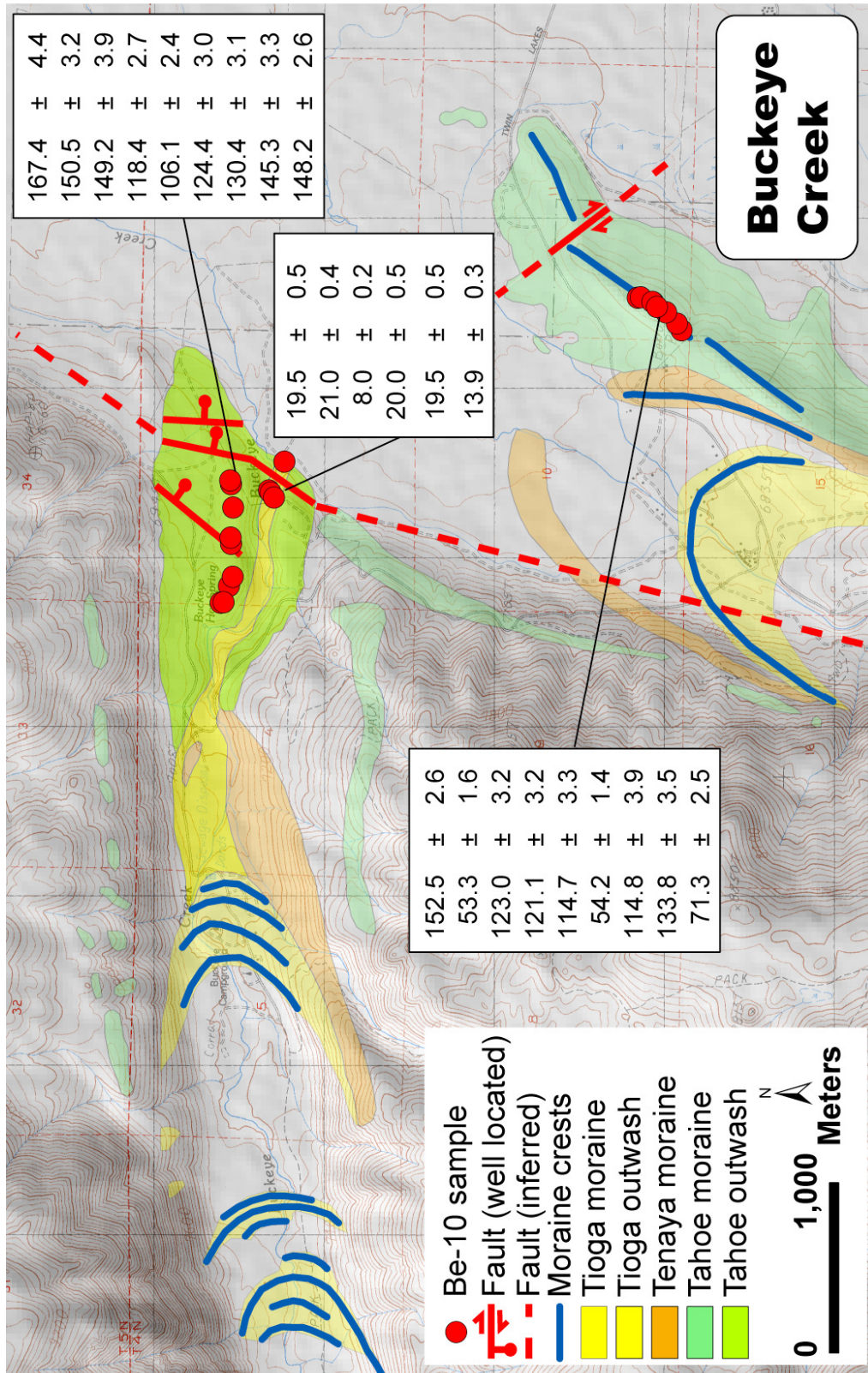


Figure S1. Geomorphic map of Buckeye Creek (BC) and Robinson Creek (RC) sites (modified after Sharp, 1972) showing sample locations and ^{10}Be ages.

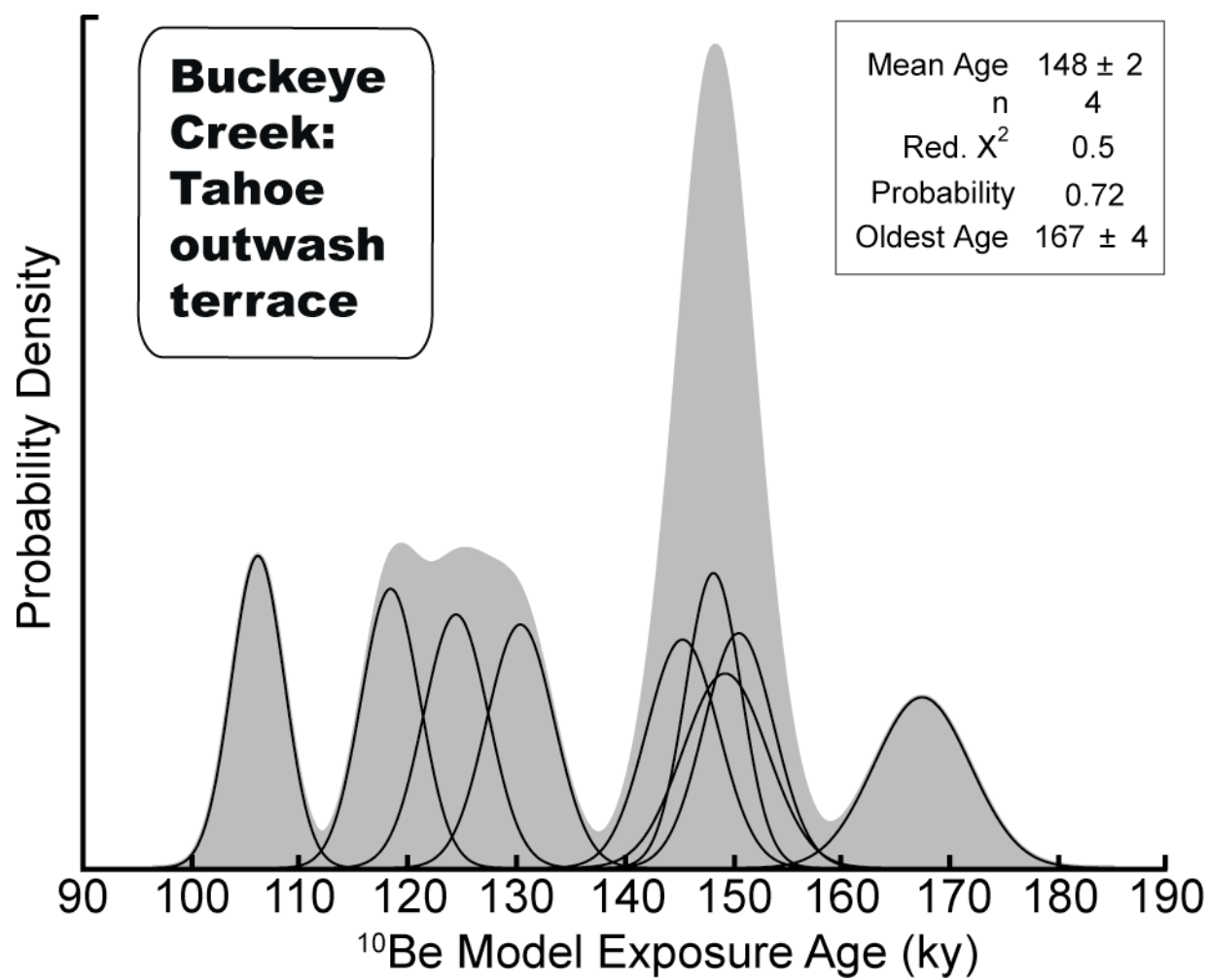


Figure S2. Probability density function and summary statistics for ^{10}Be boulder ages from the Buckeye Creek Tahoe outwash terrace (BCTA06).

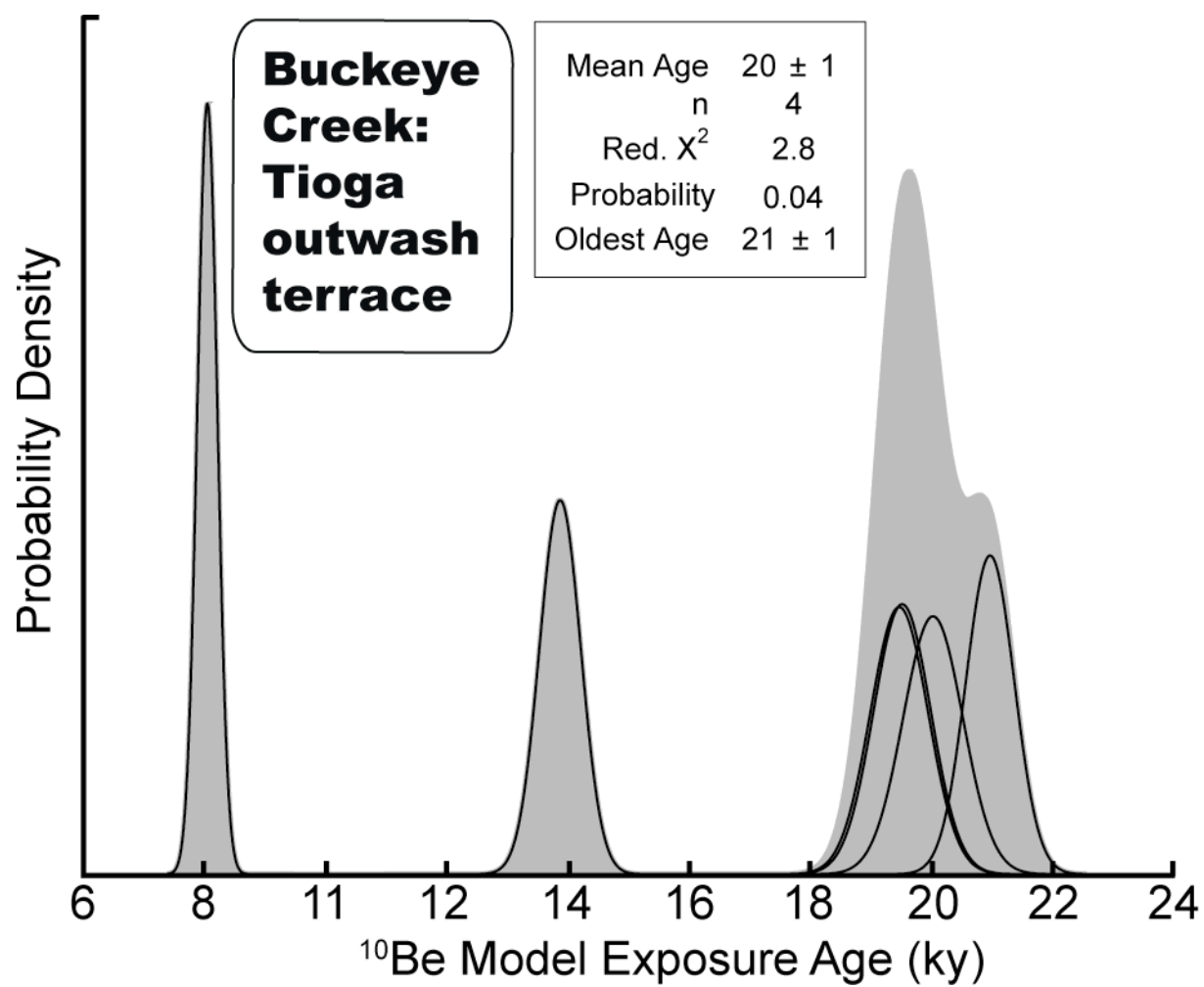


Figure S3. Probability density function and summary statistics for ^{10}Be boulder ages from the Buckeye Creek Tioga outwash terrace (BCTI07).

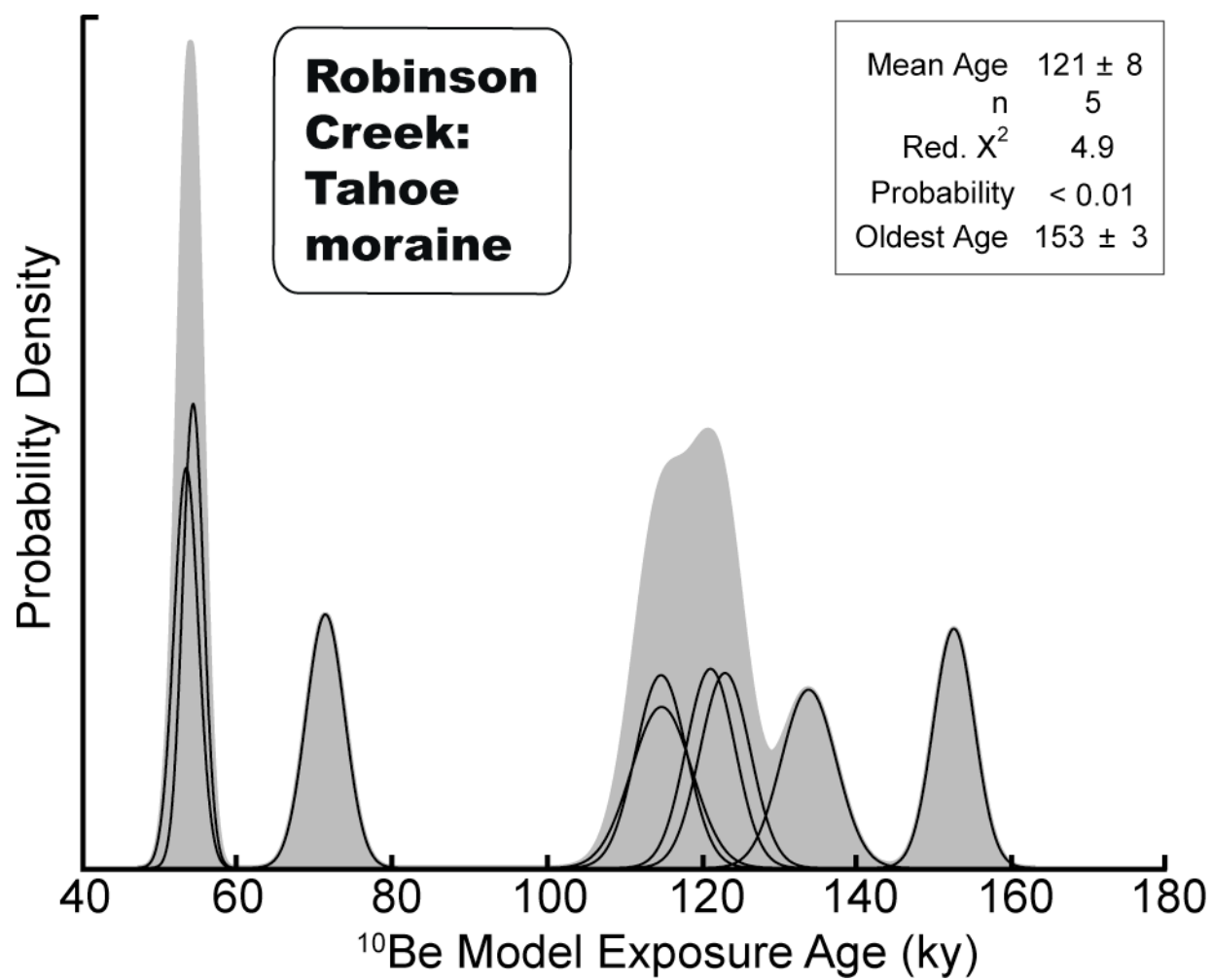


Figure S4. Probability density function and summary statistics for ^{10}Be boulder ages from the Robinson Creek Tahoe moraine (RCTA05).

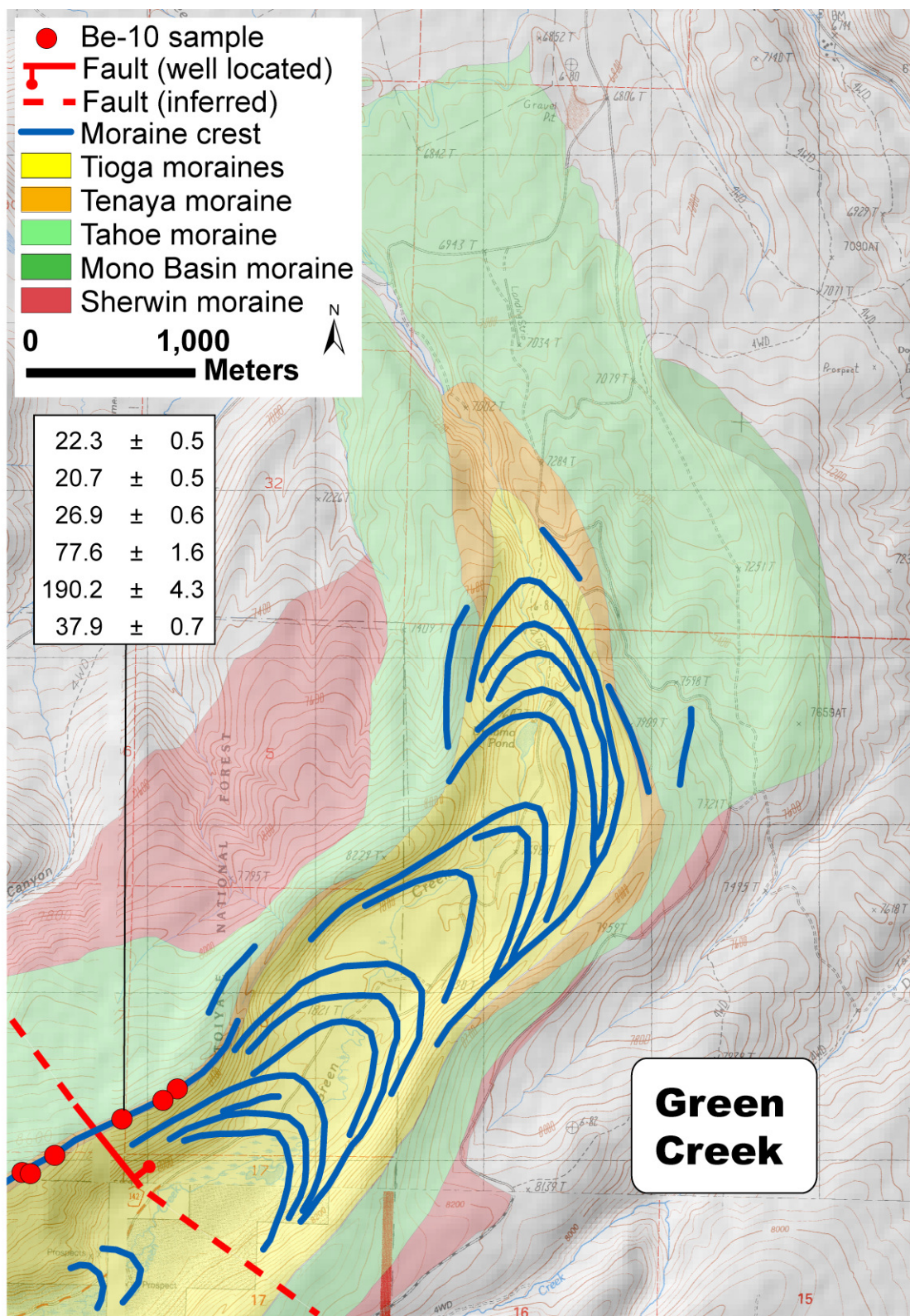


Figure S5. Geomorphic map of Green Creek (GC) site (modified after Sharp, 1972) showing sample locations and ^{10}Be ages.

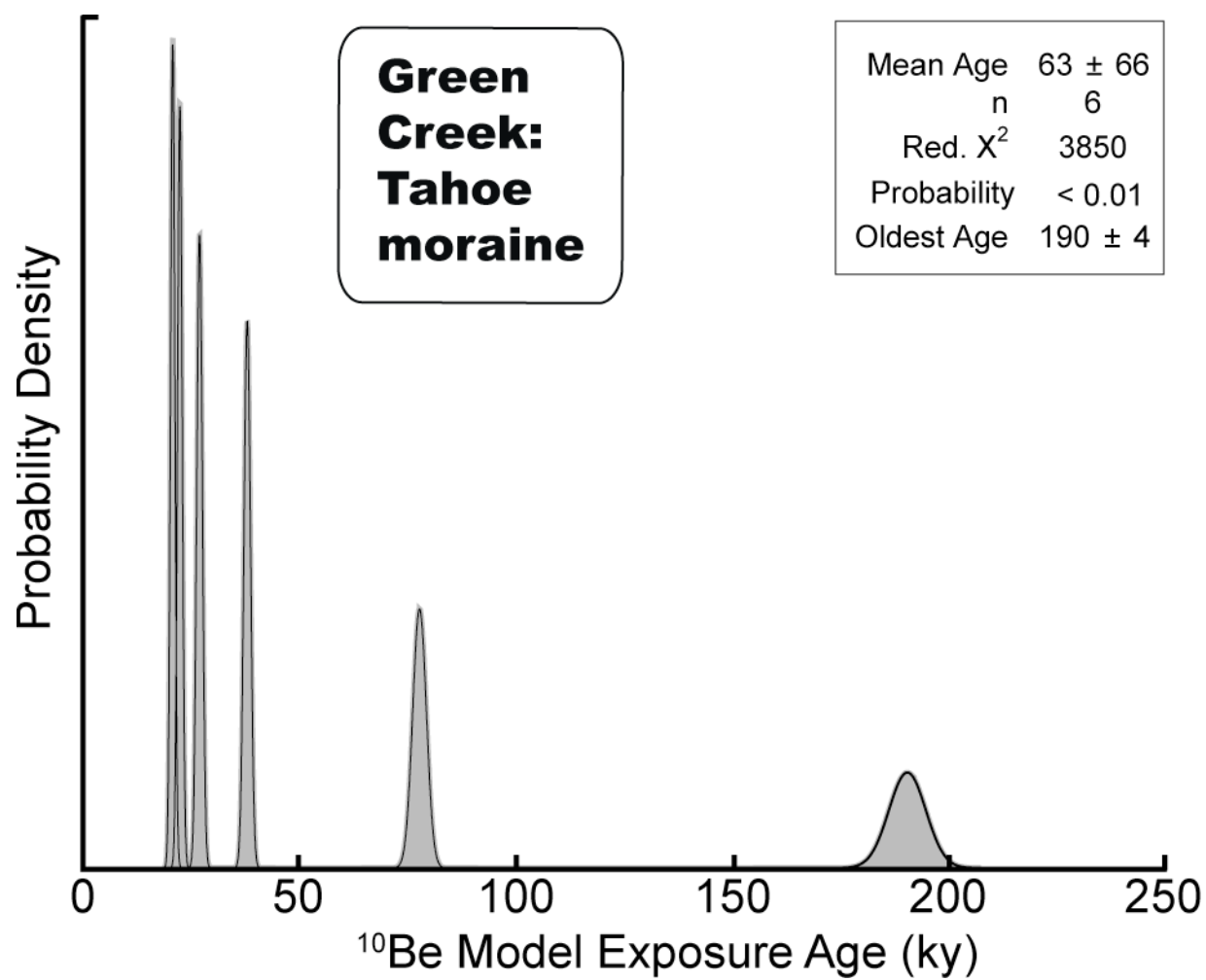


Figure S6. Probability density function and summary statistics for ^{10}Be boulder ages from the Green Creek Tahoe moraine (GCTA07).

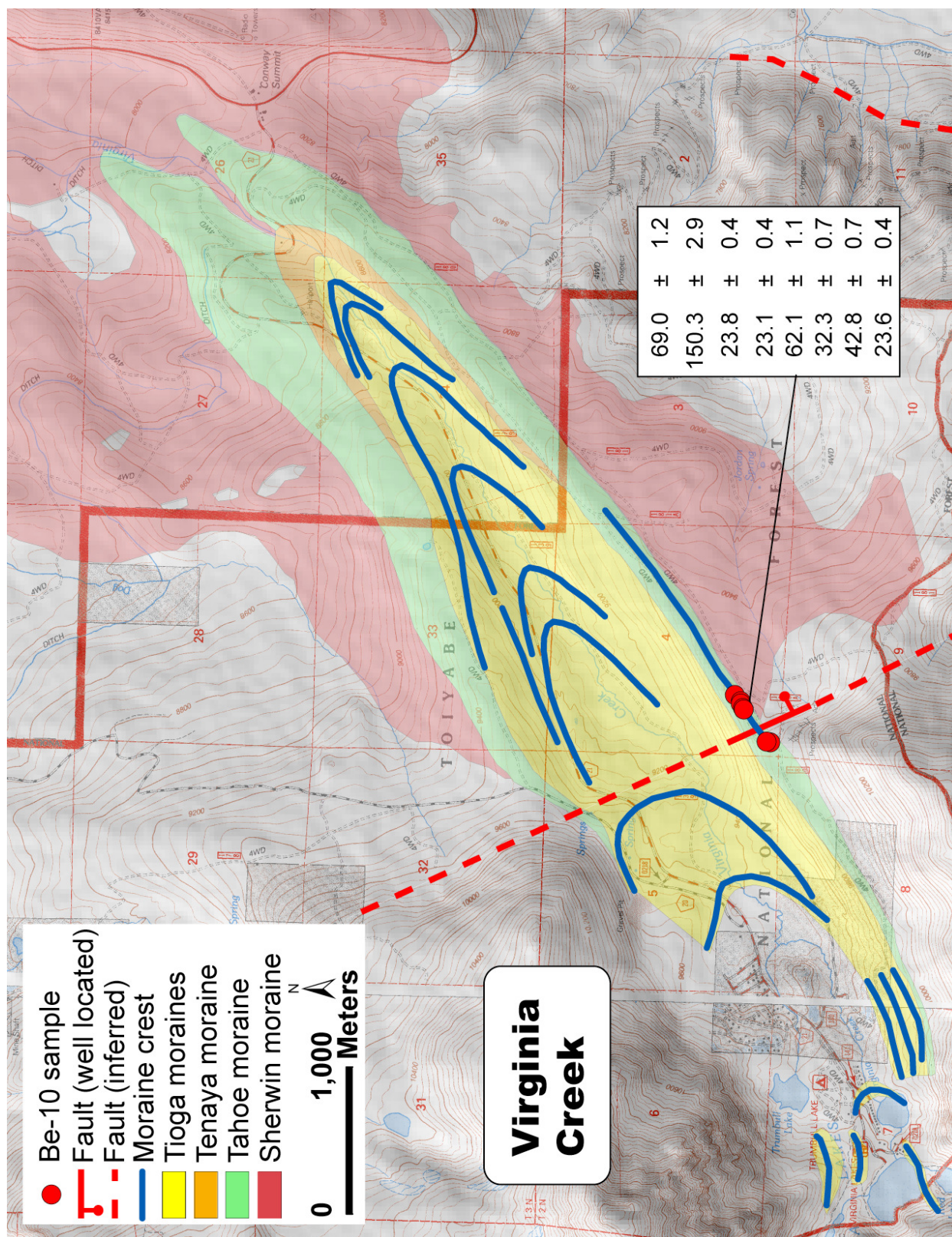


Figure S7. Geomorphic map of Virginia Creek (VC) site (modified after Sharp, 1972) showing sample locations and ^{10}Be ages.

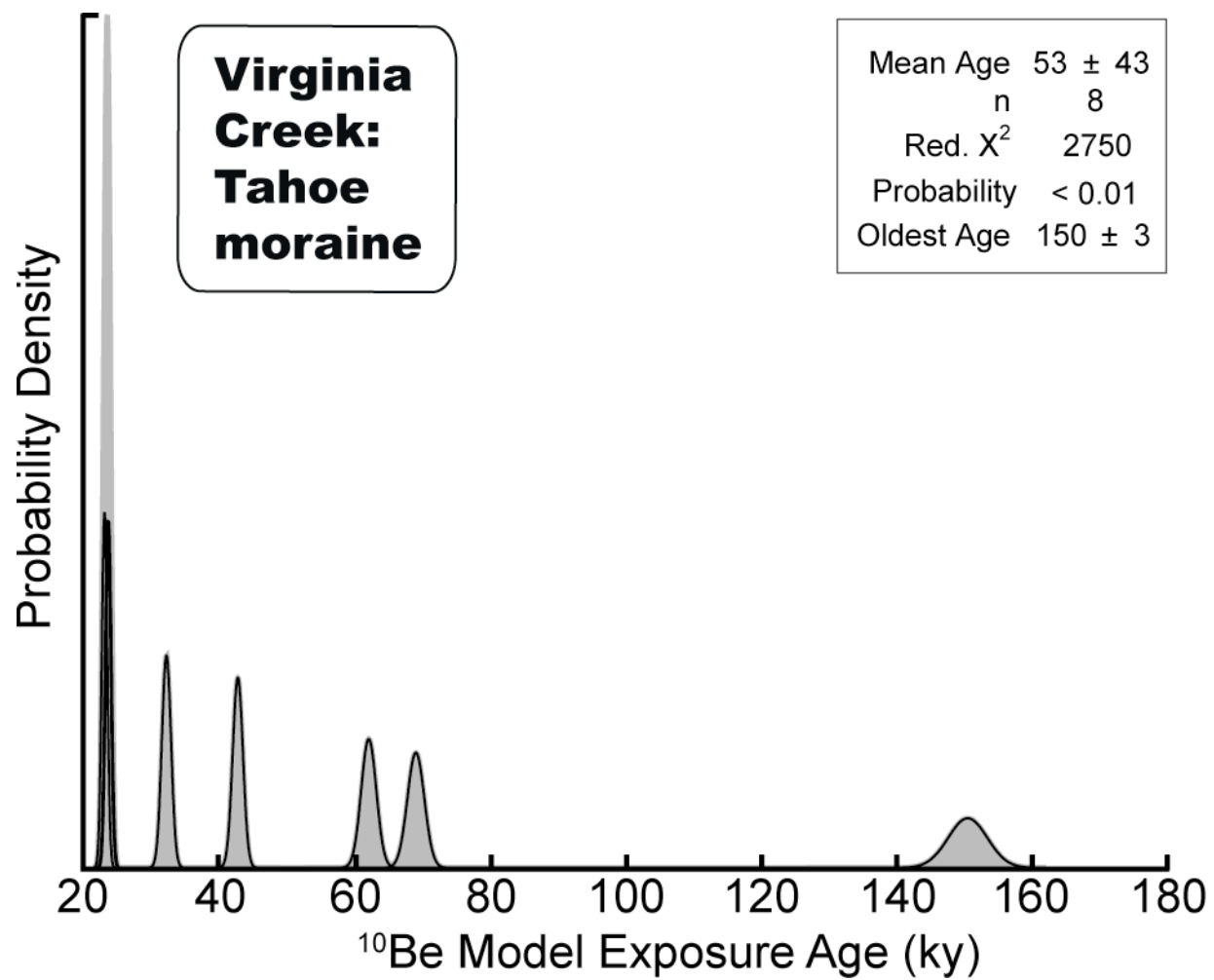


Figure S8. Probability density function and summary statistics for ^{10}Be boulder ages from the Virginia Creek Tahoe moraine (VCTA06).

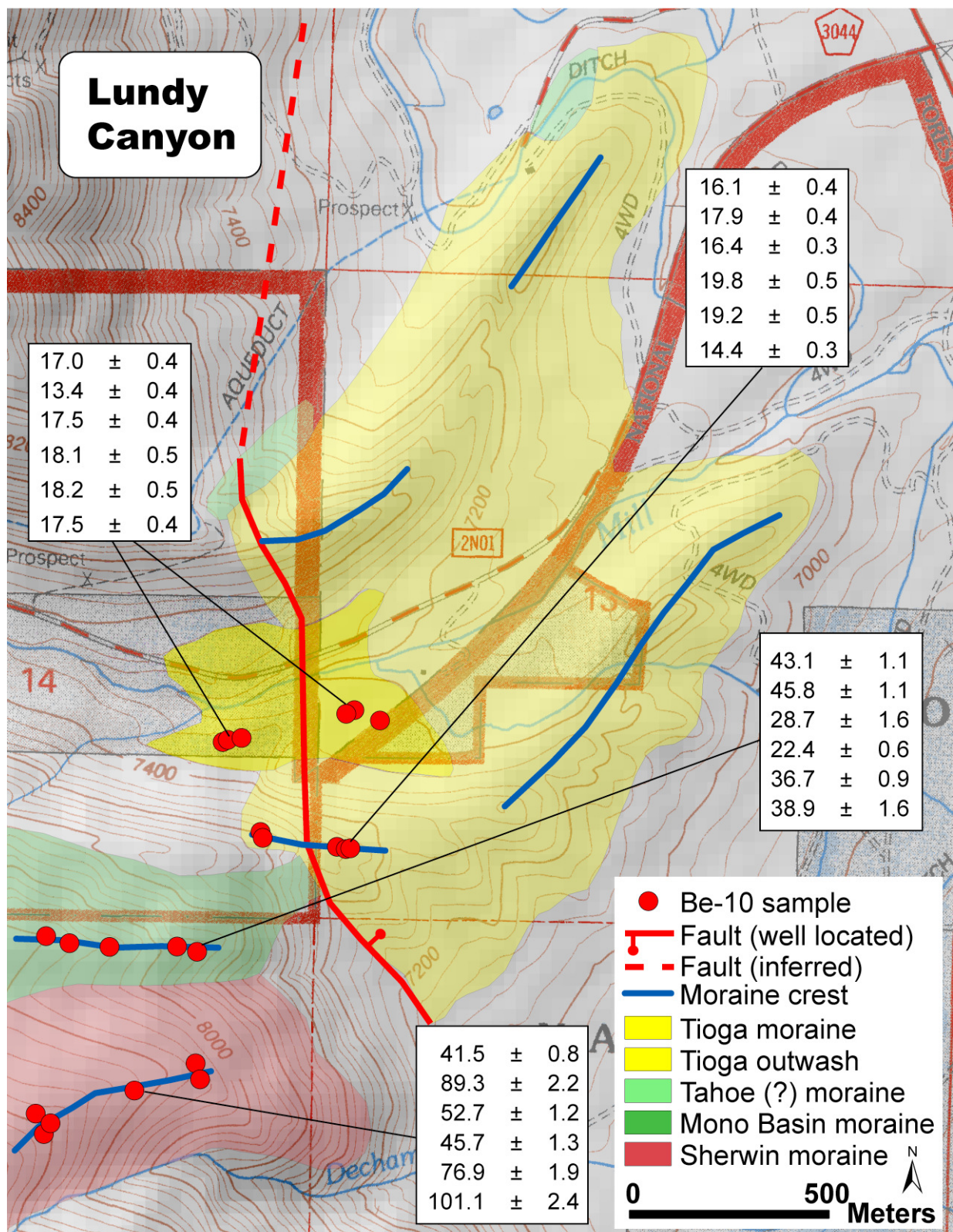


Figure S9. Geomorphic map of Lundy Canyon (LC) site (modified after Bursik, 1989) showing sample locations and ^{10}Be ages.

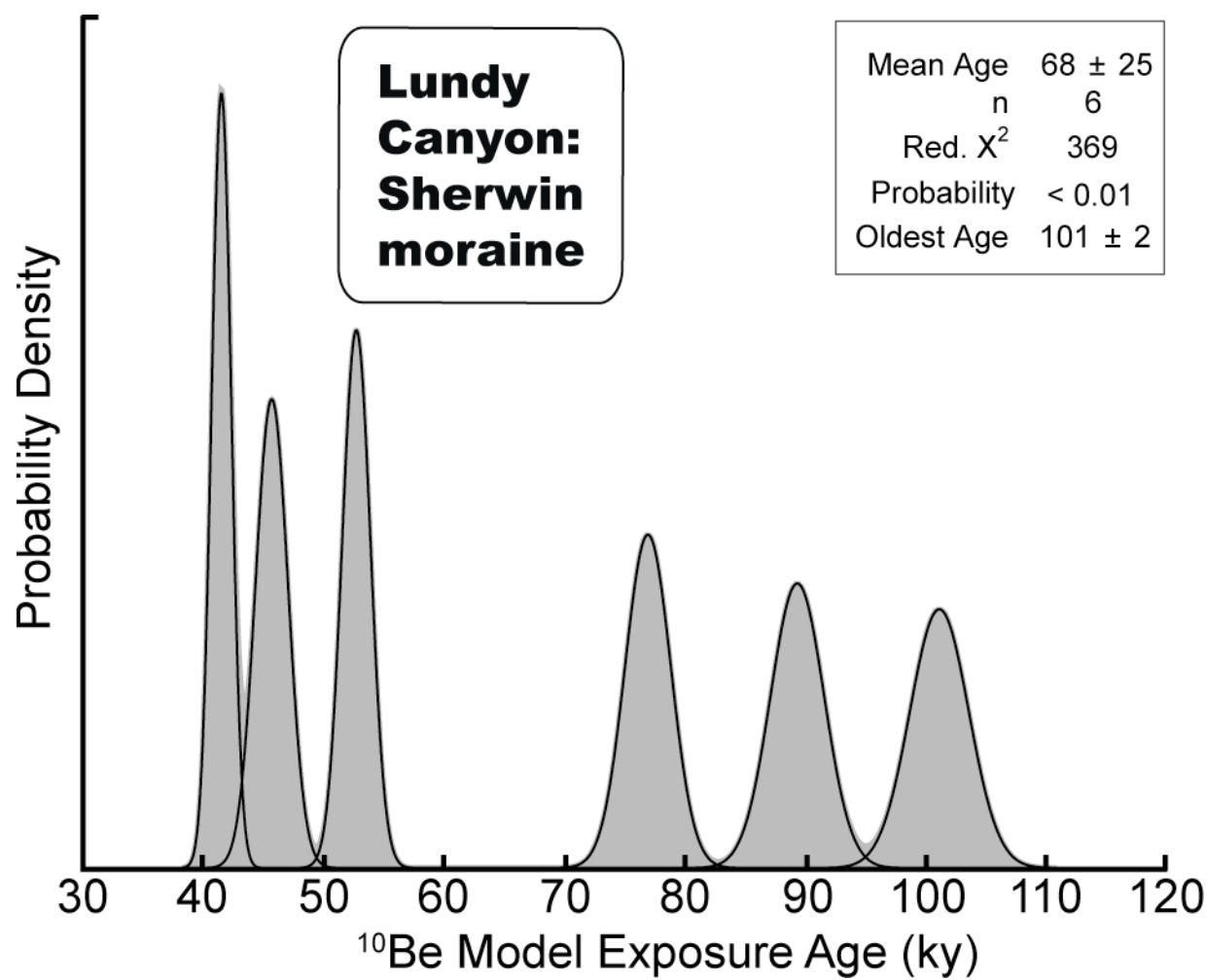


Figure S10. Probability density function and summary statistics for ^{10}Be boulder ages from the Lundy Canyon Sherwin moraine (LCSH07).

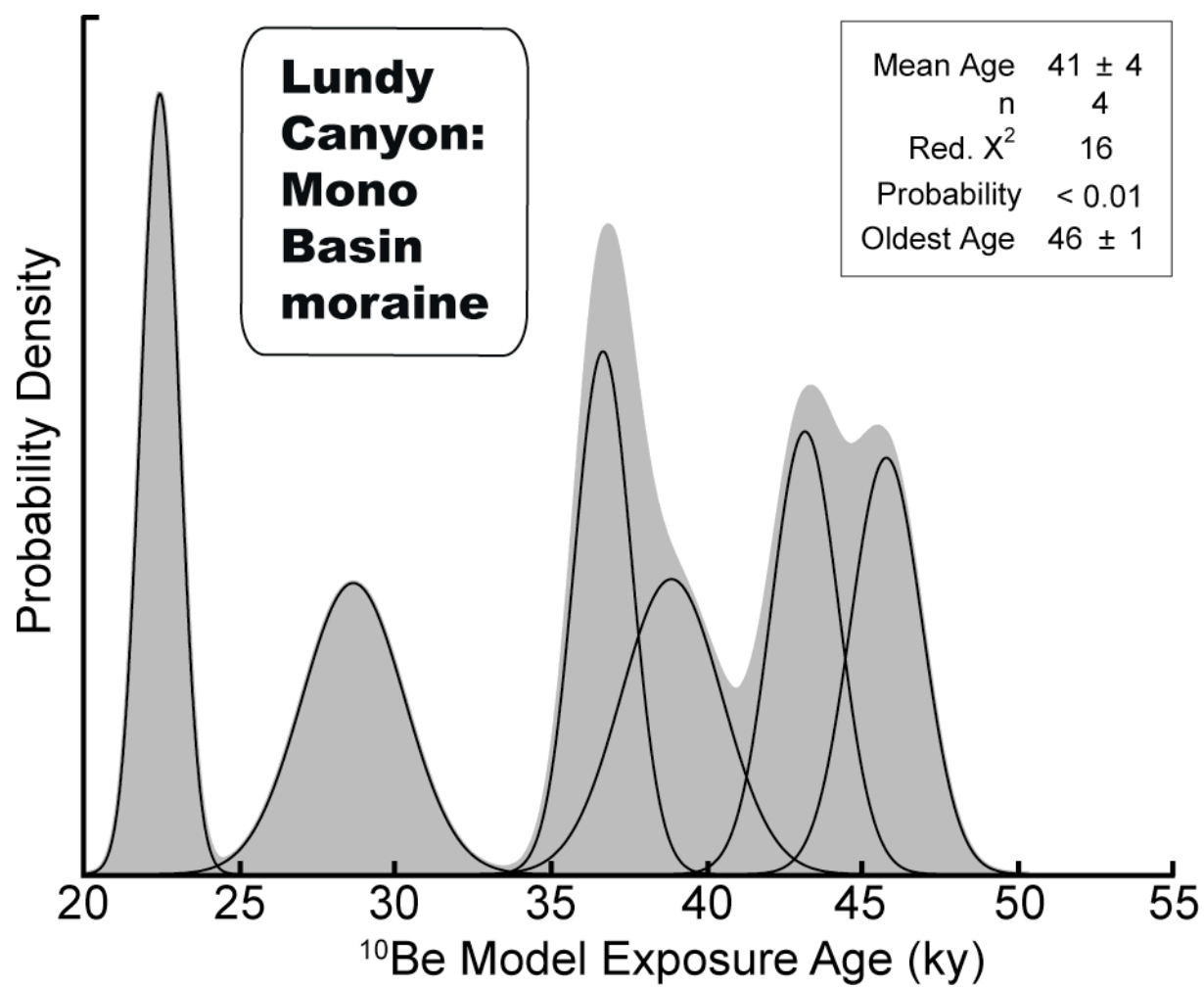


Figure S11. Probability density function and summary statistics for ^{10}Be boulder ages from the Lundy Canyon Mono Basin moraine (LCMB07).

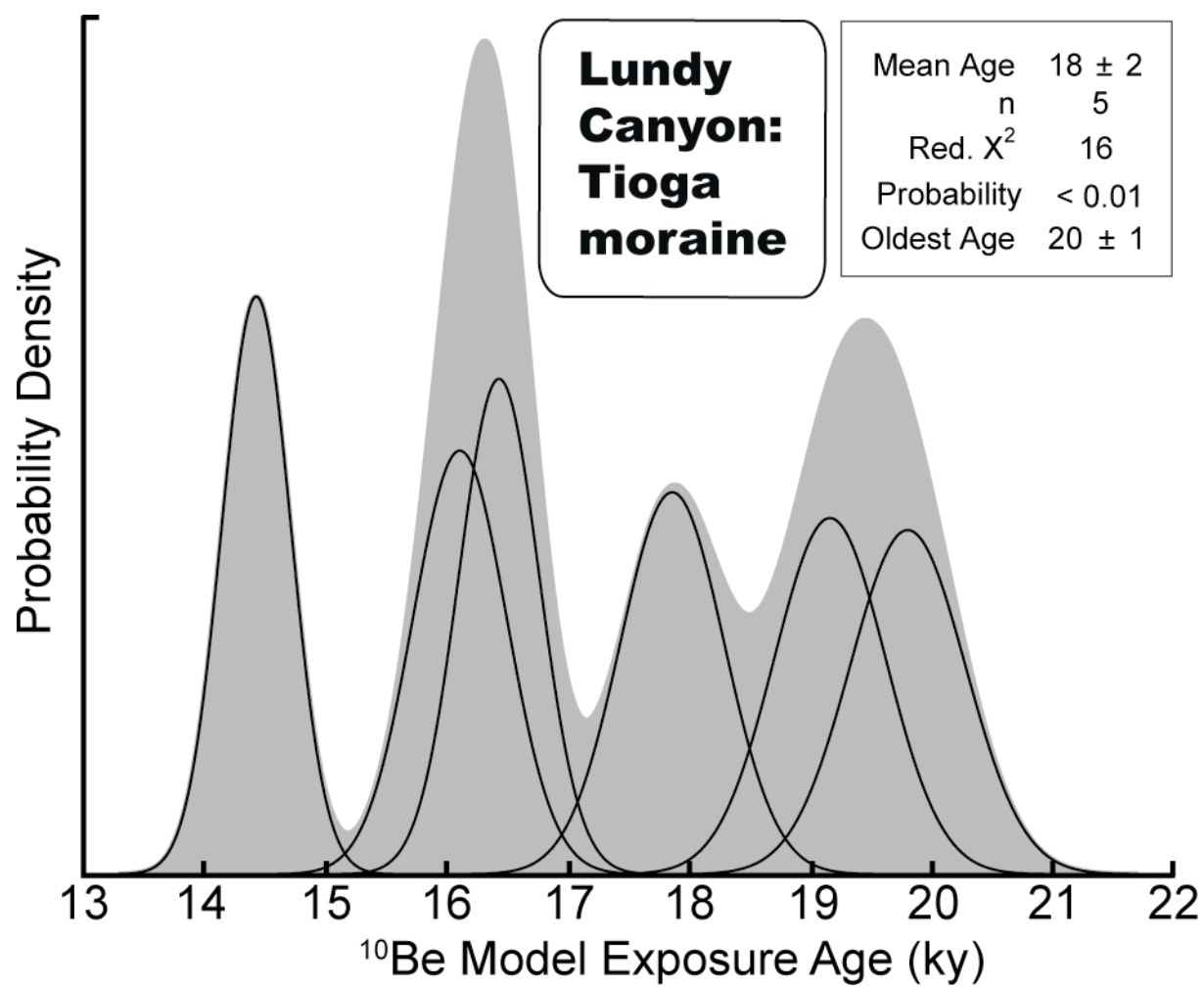


Figure S12. Probability density function and summary statistics for ^{10}Be boulder ages from the Lundy Canyon Tioga moraine (LCTI07).

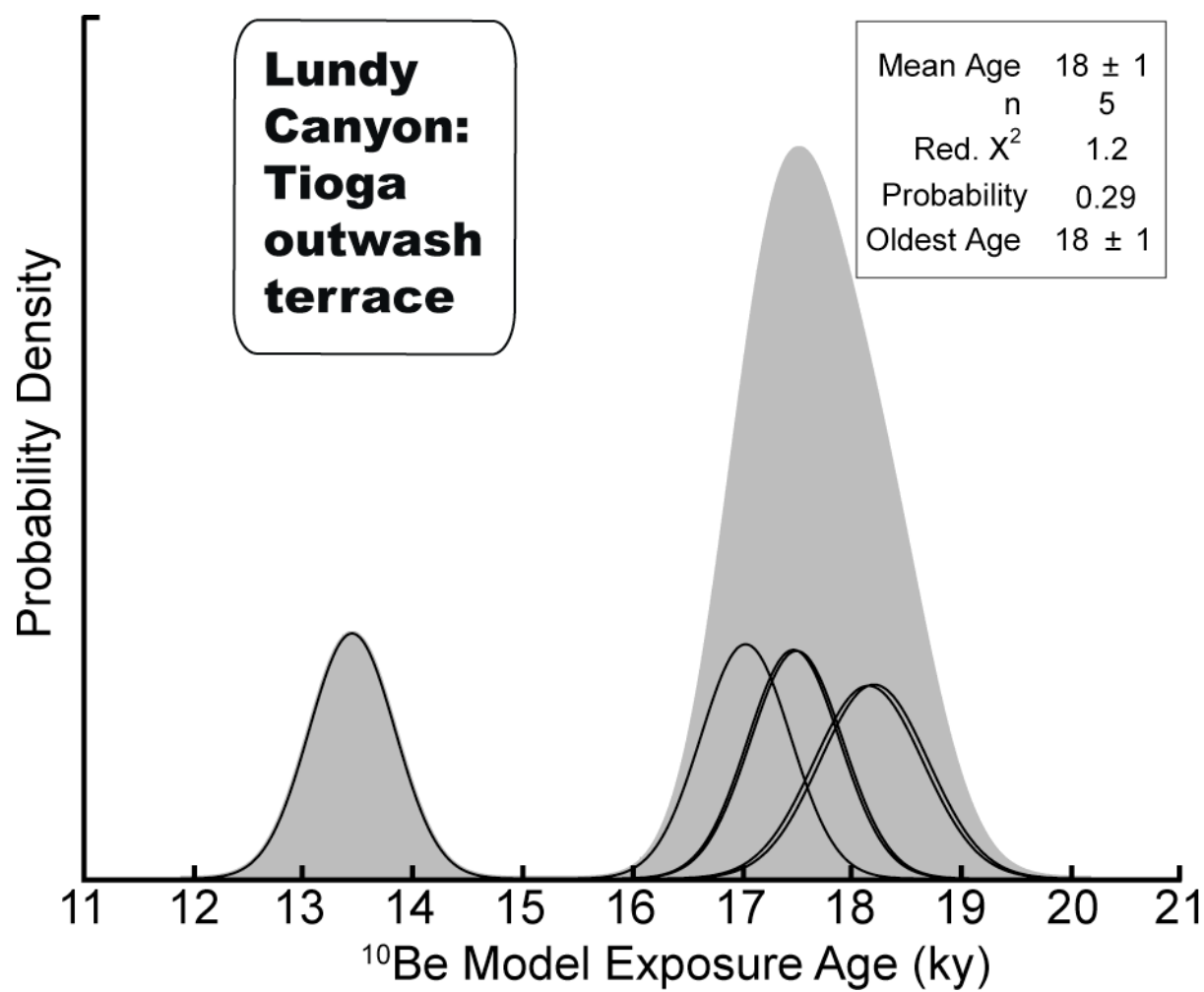


Figure S13. Probability density function and summary statistics for ^{10}Be boulder ages from the Lundy Canyon Tioga outwash terrace (LCTIO-07).

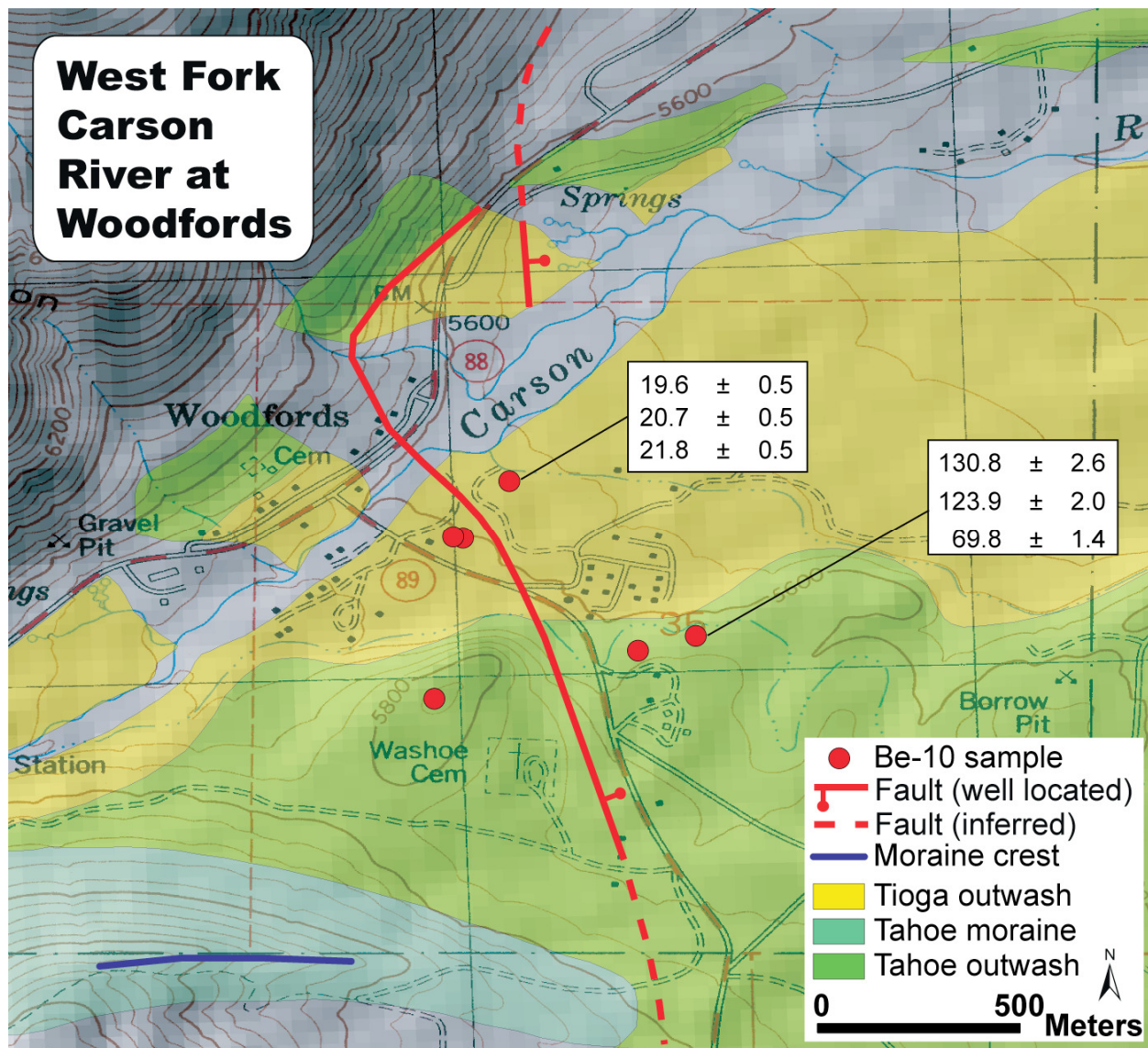


Figure S14. Geomorphic map of Woodfords (WF) site (modified after Ramelli et al., 1999) showing sample locations and ^{10}Be ages.

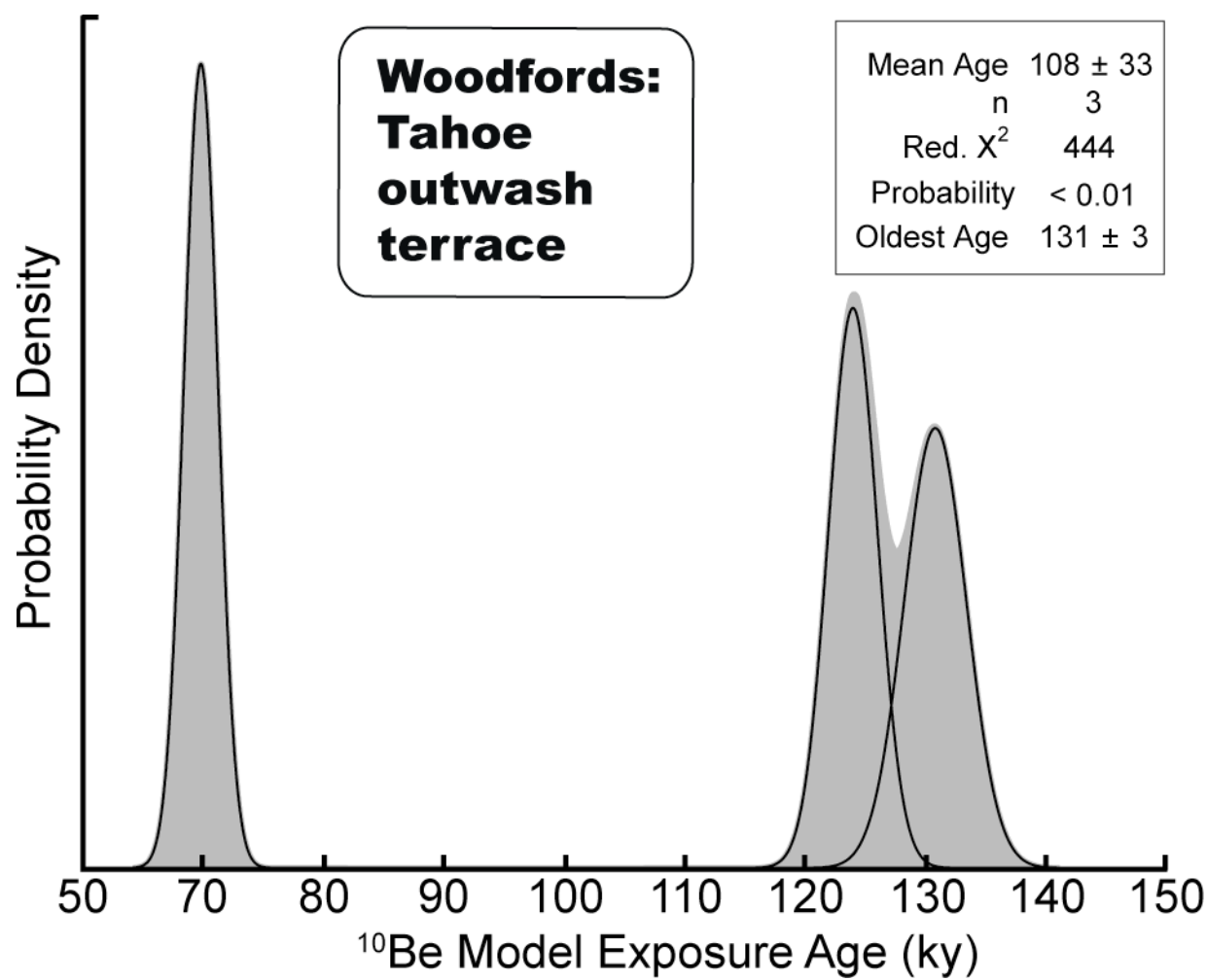


Figure S15. Probability density function and summary statistics for ^{10}Be boulder ages from the Woodfords Tahoe outwash terrace (WFTA08).

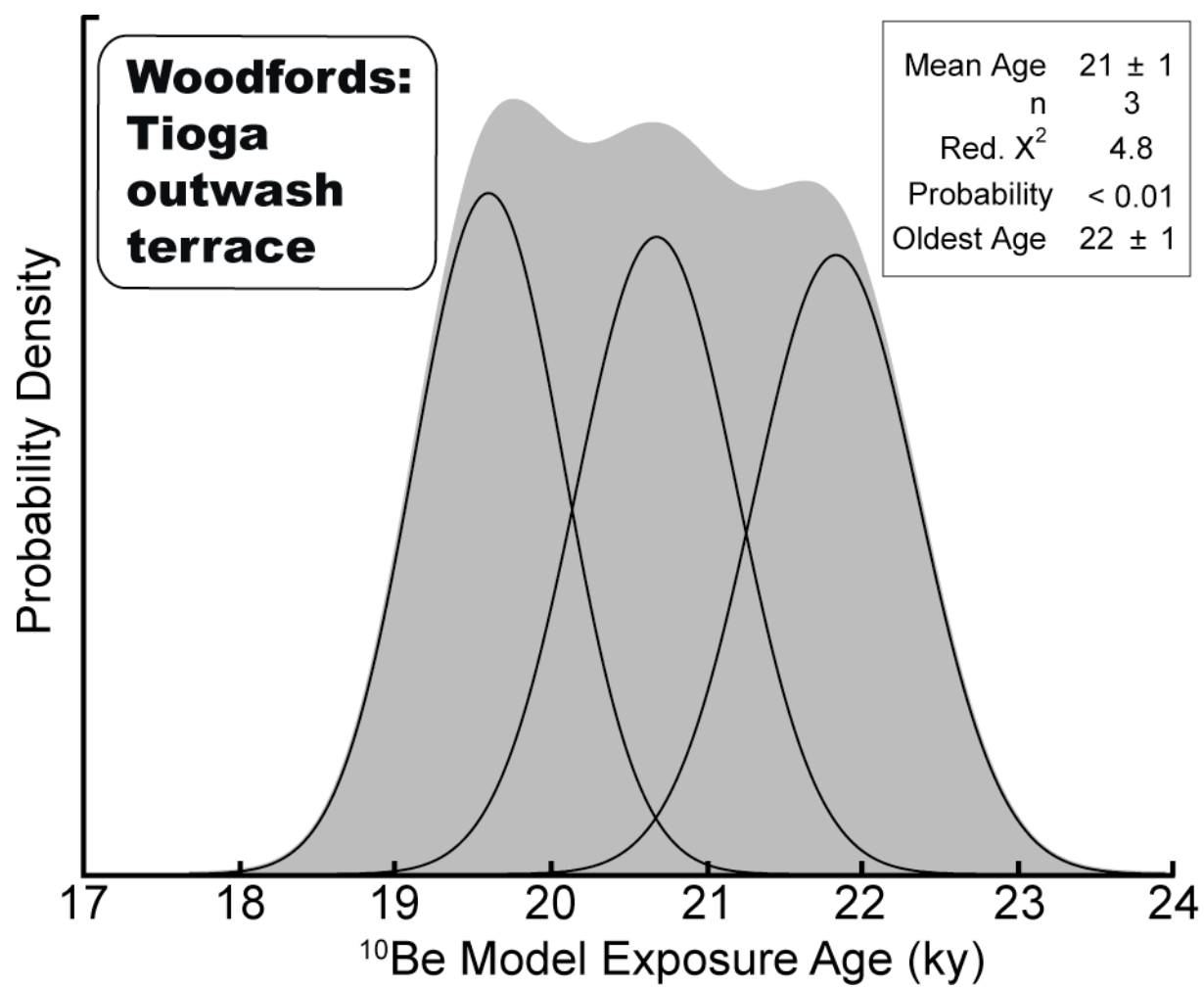


Figure S16. Probability density function and summary statistics for ^{10}Be boulder ages from the Woodfords Tioga outwash terrace (WFTI08).

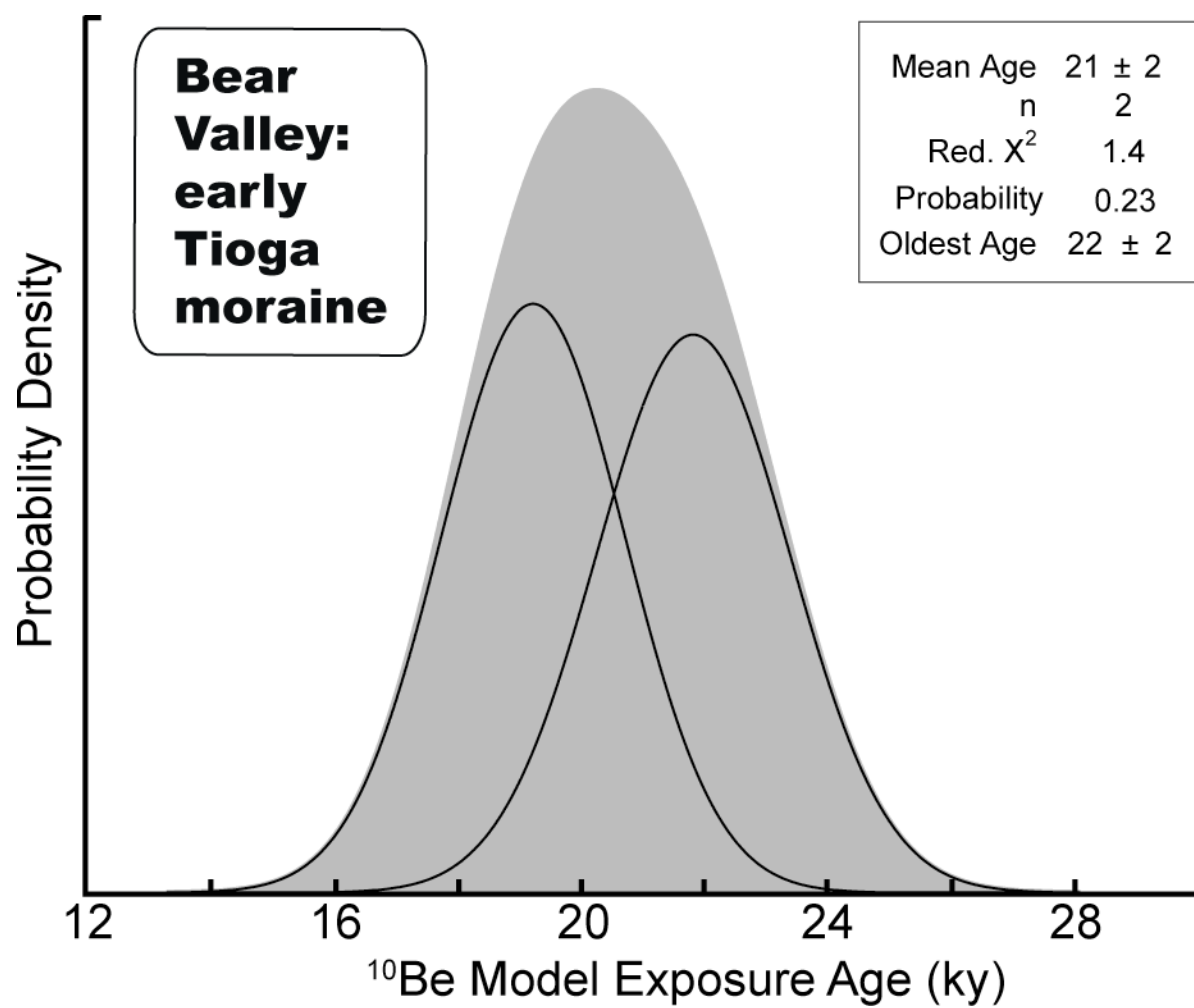


Figure S17. Probability density function and summary statistics for ^{10}Be boulder ages from the Bear Valley early Tioga moraine from James et al. (2002).

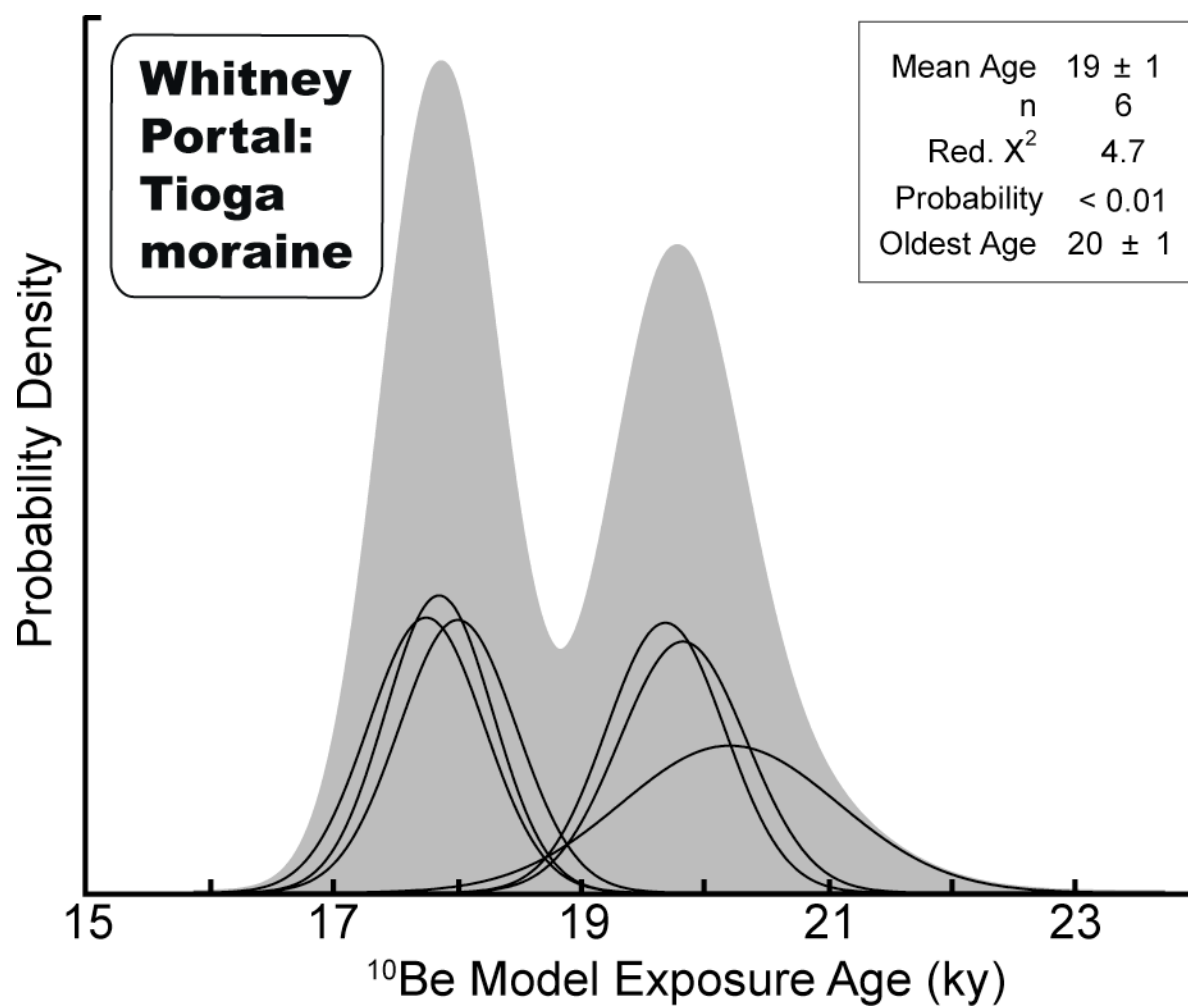


Figure S18. Probability density function and summary statistics for ^{10}Be boulder ages from the Whitney Portal Tioga moraine from Benn et al. (2006).

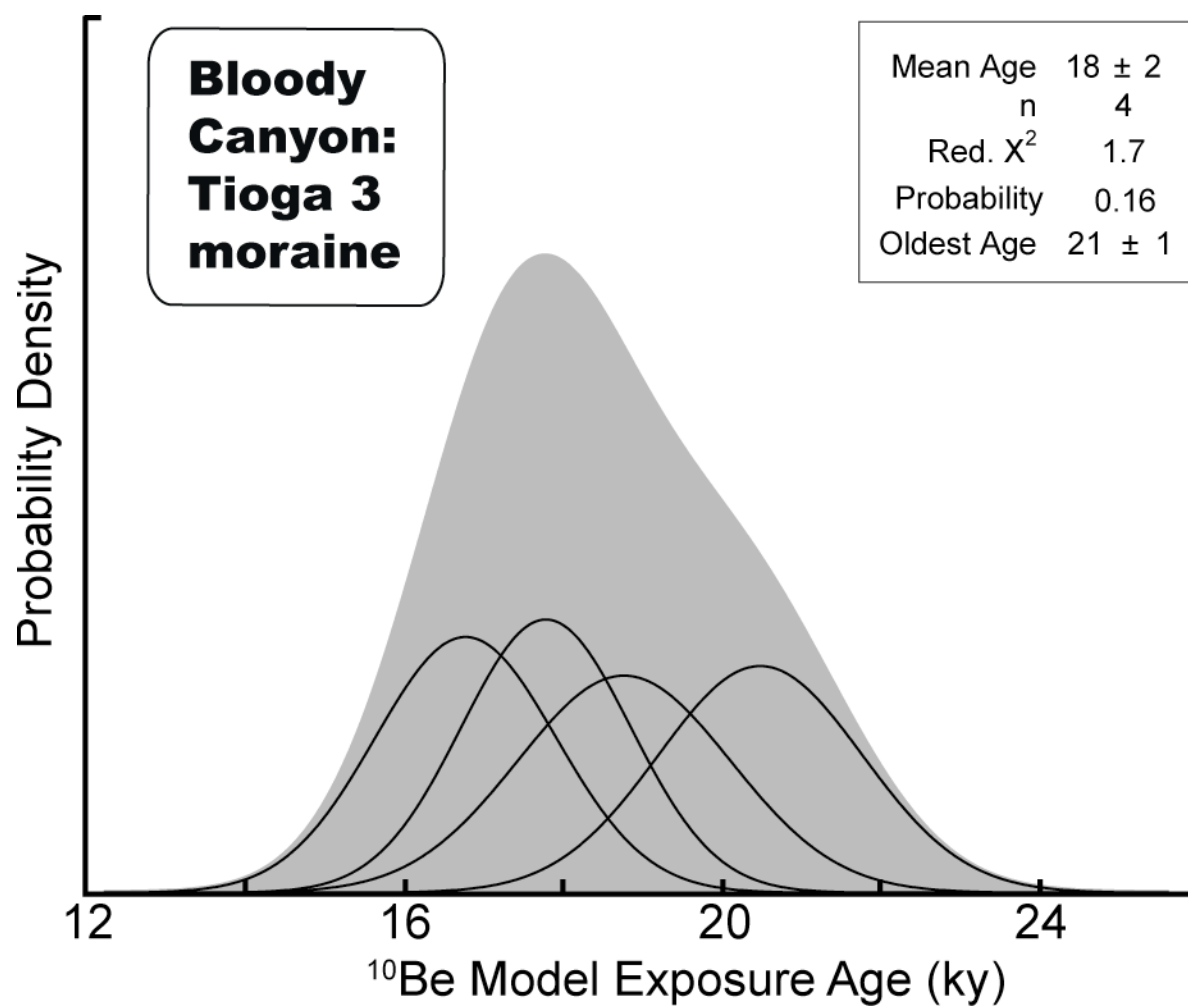


Figure S19. Probability density function and summary statistics for ^{10}Be boulder ages from the Bloody Canyon Tioga 3 moraine from Schaefer et al. (2006).

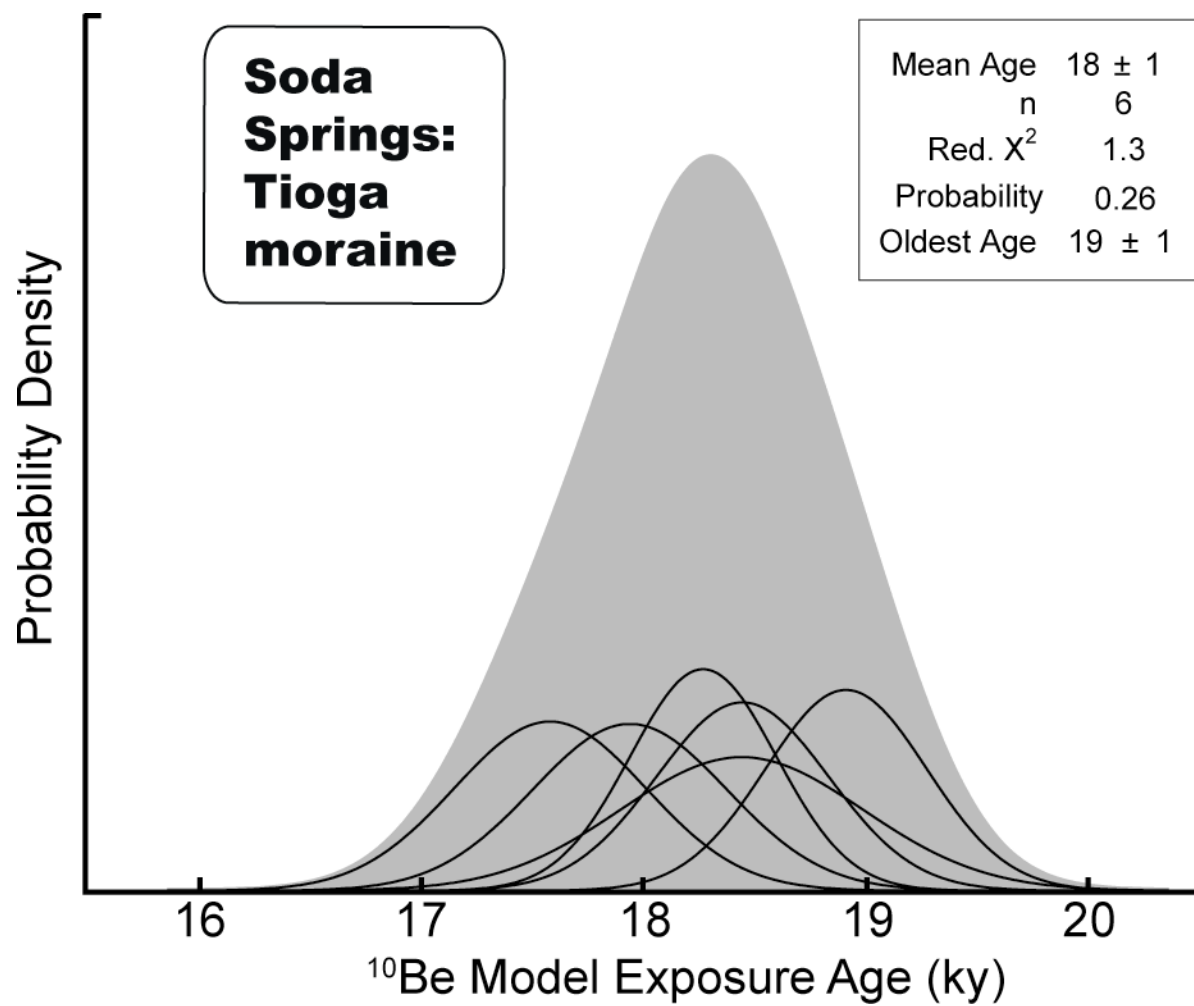


Figure S20. Probability density function and summary statistics for ^{10}Be boulder ages from the Soda Springs Tioga moraine from Amos et al. (2010).

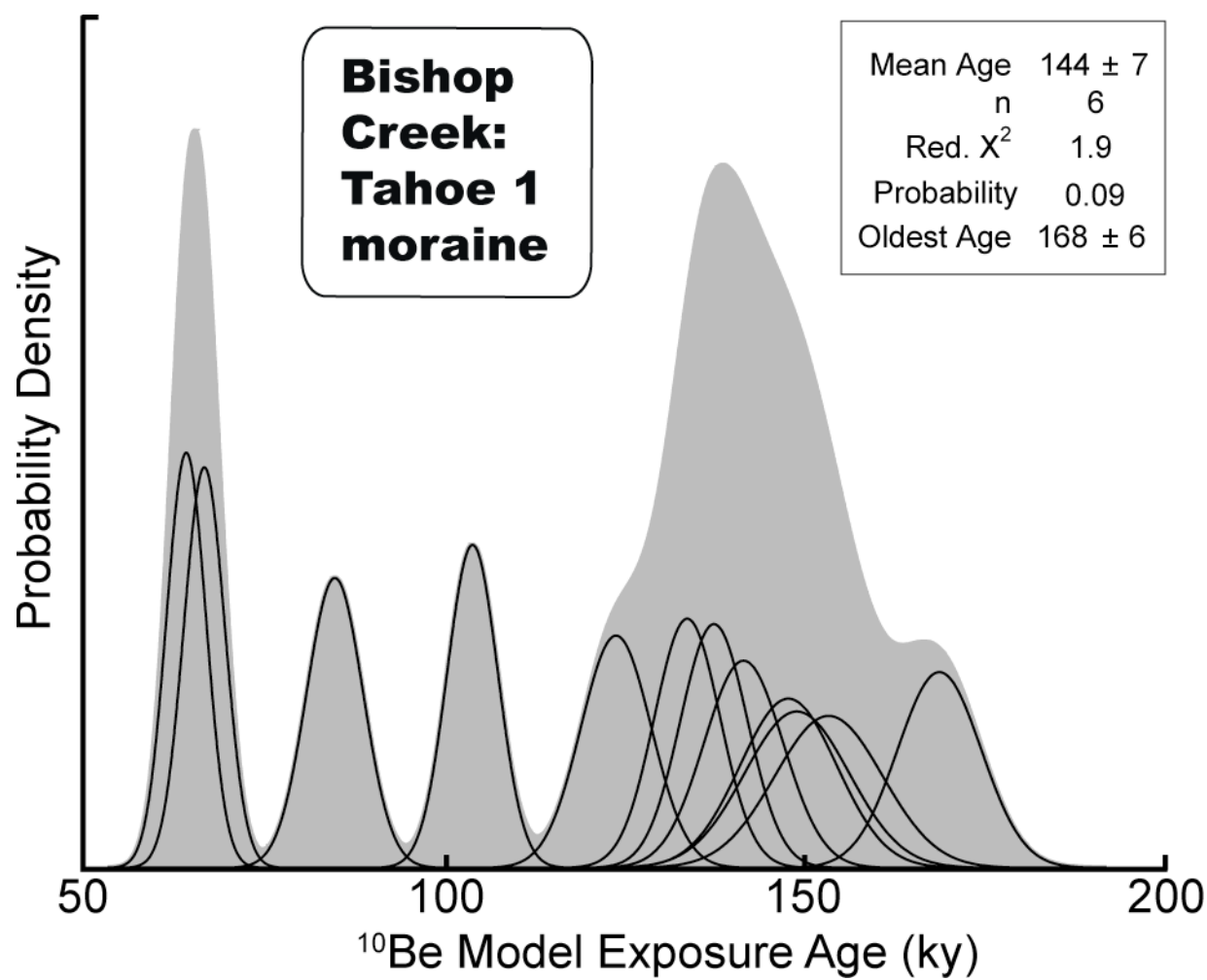


Figure S21. Probability density function and summary statistics for ^{36}Cl boulder ages from the Bishop Creek Tahoe 1 moraine from Phillips et al. (2009).

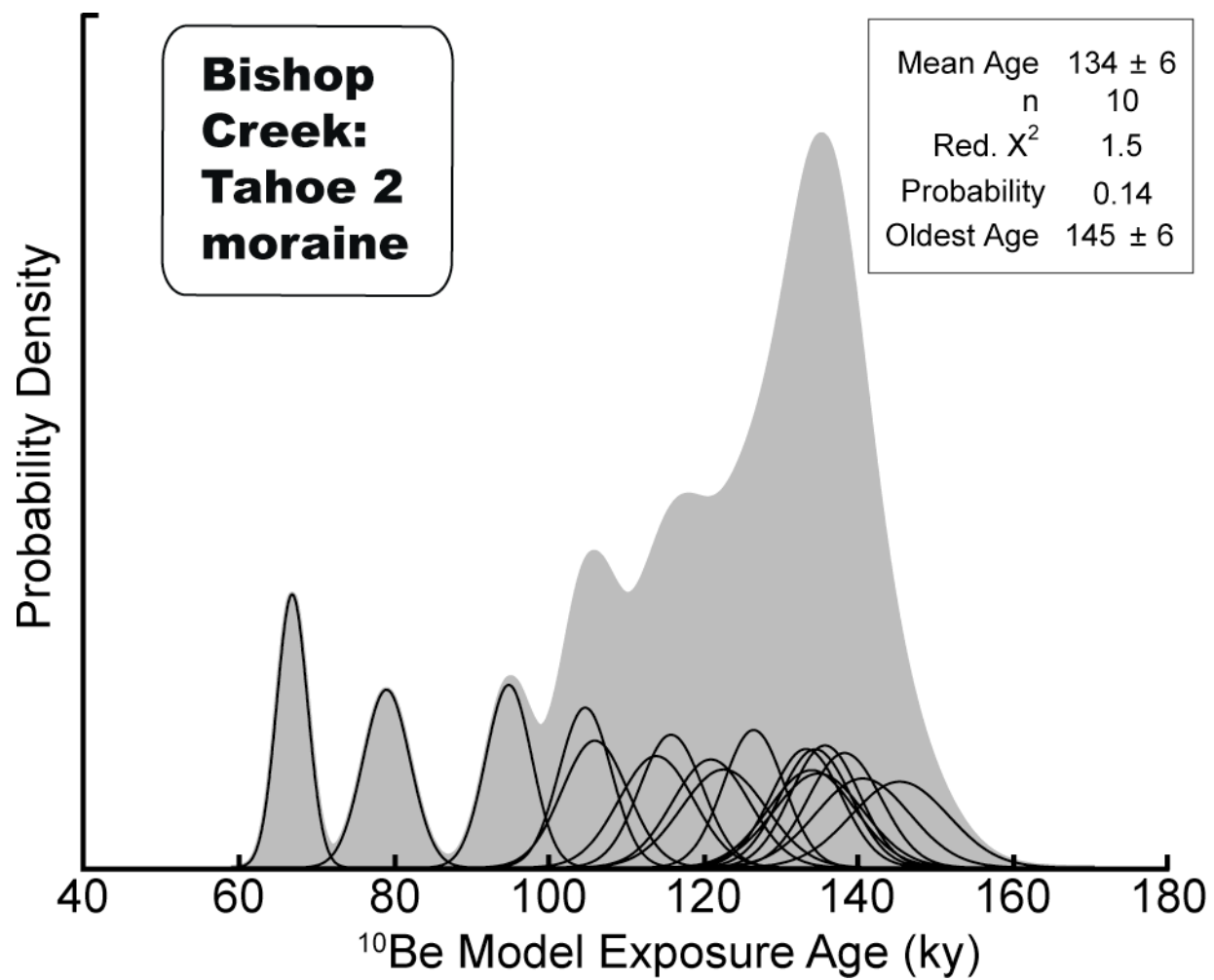


Figure S22. Probability density function and summary statistics for ^{36}Cl boulder ages from the Bishop Creek Tahoe 2 moraine from Phillips et al. (2009).

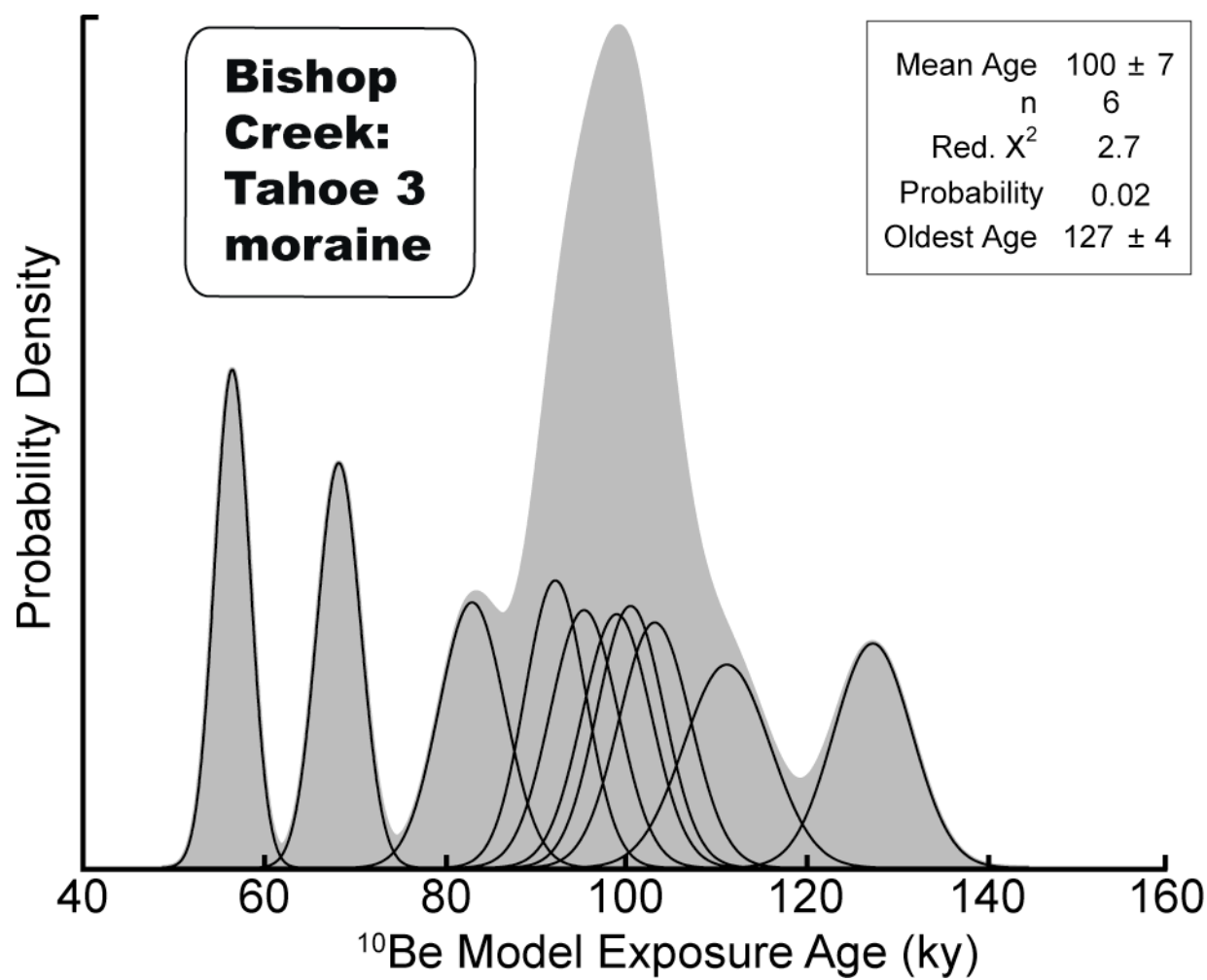


Figure S23. Probability density function and summary statistics for ^{36}Cl boulder ages from the Bishop Creek Tahoe 3 moraine from Phillips et al. (2009).

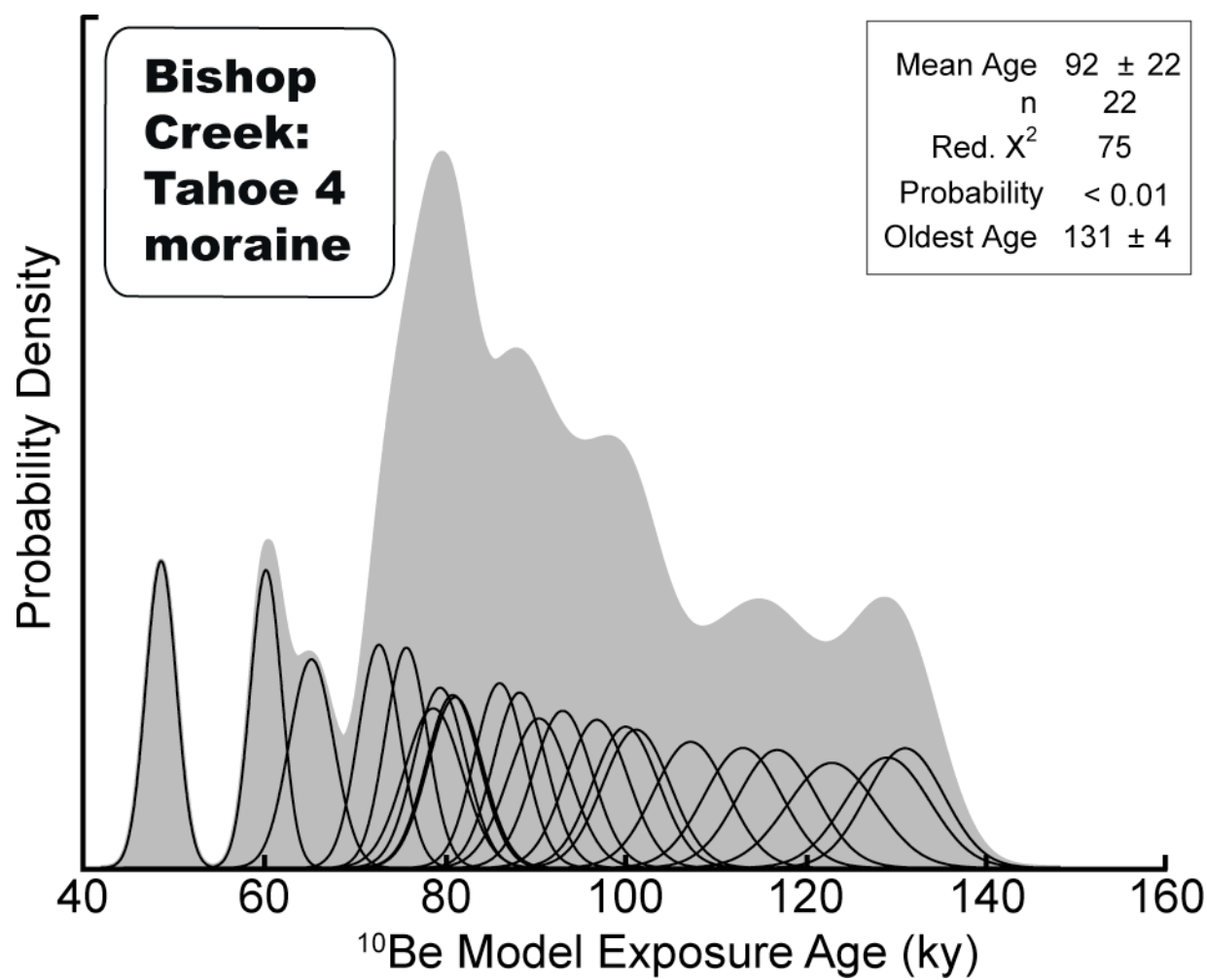


Figure S24. Probability density function and summary statistics for ^{36}Cl boulder ages from the Bishop Creek Tahoe 4 moraine from Phillips et al. (2009).

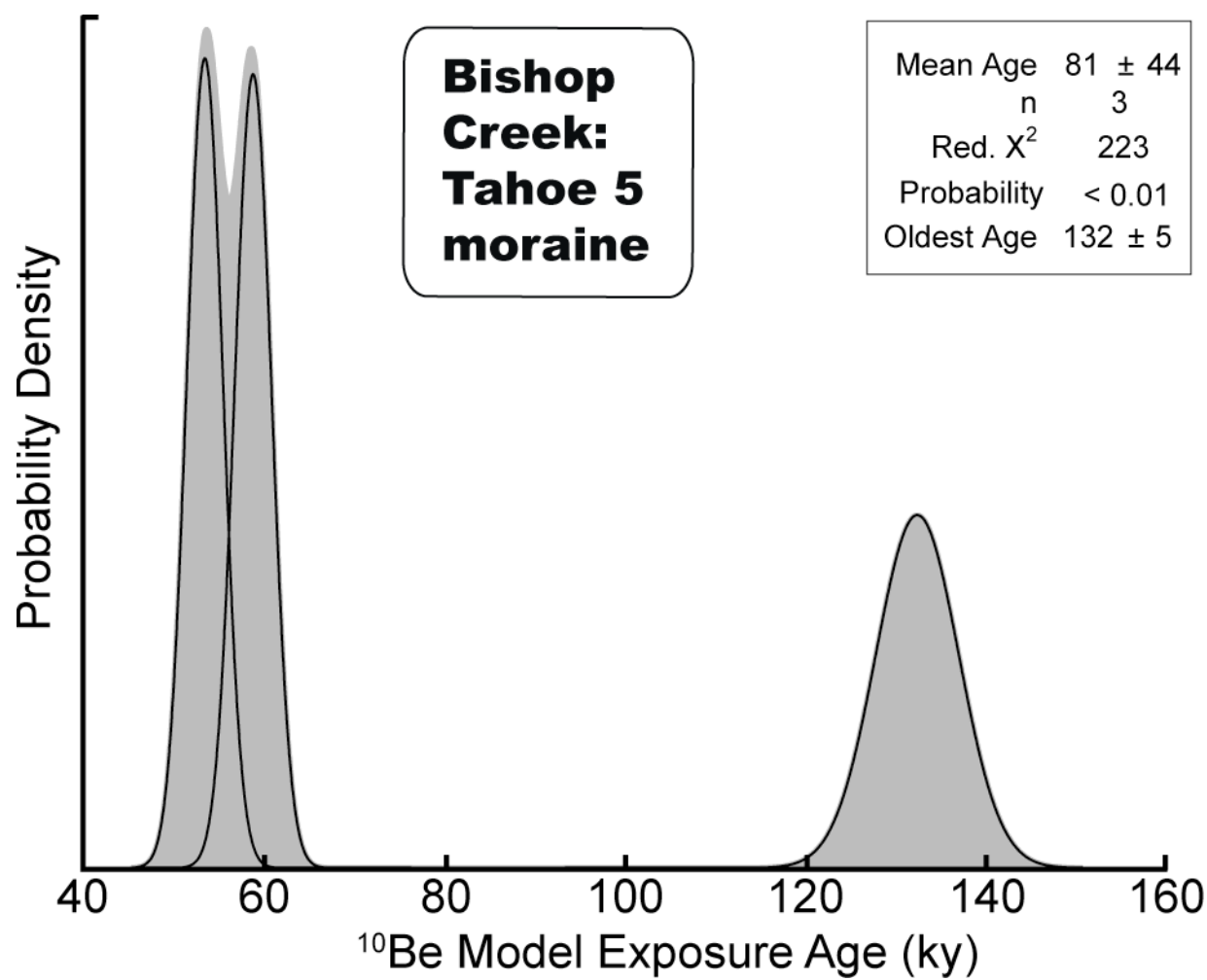


Figure S25. Probability density function and summary statistics for ^{36}Cl boulder ages from the Bishop Creek Tahoe 5 moraine from Phillips et al. (2009).

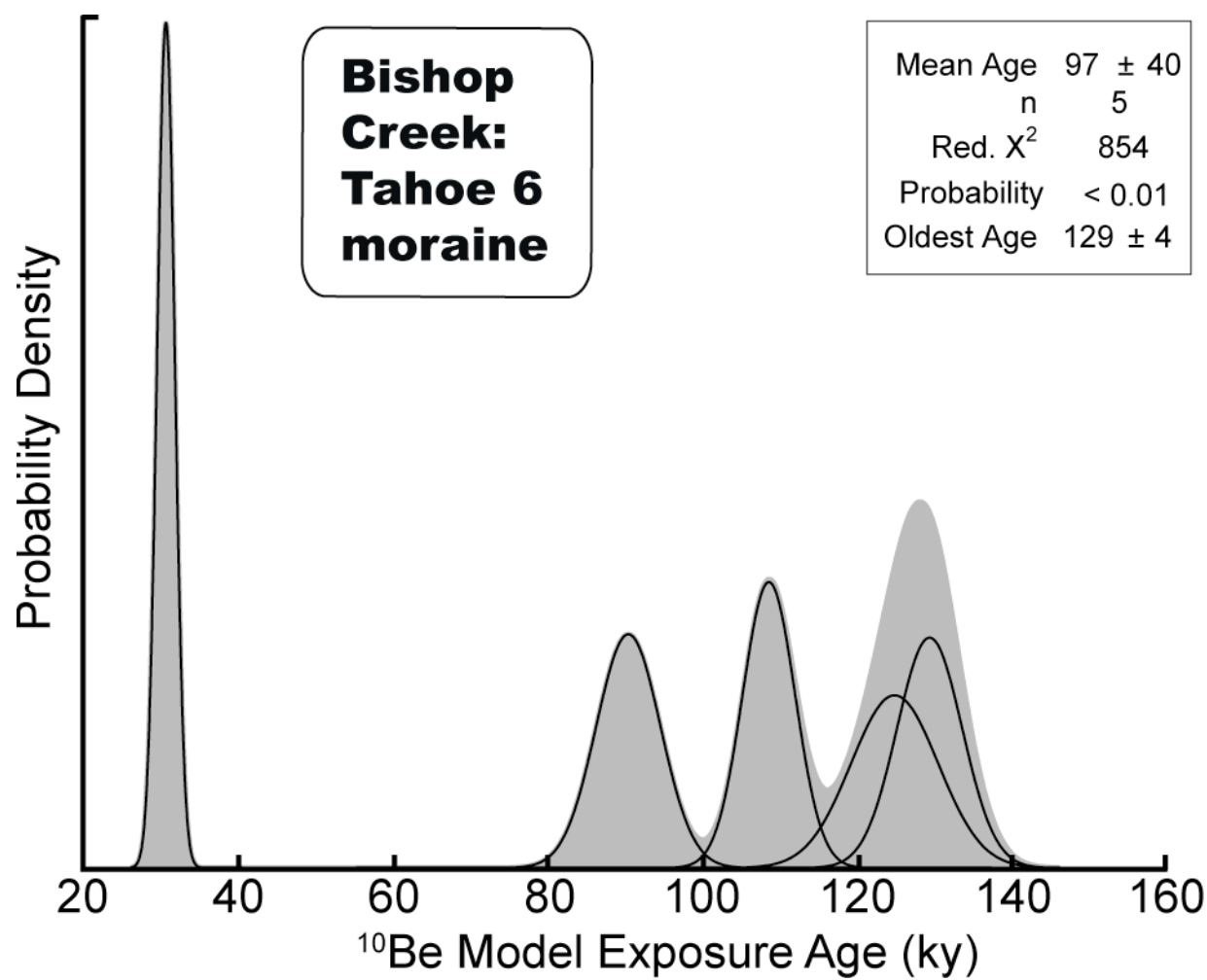


Figure S26. Probability density function and summary statistics for ^{36}Cl boulder ages from the Bishop Creek Tahoe 6 moraine from Phillips et al. (2009).

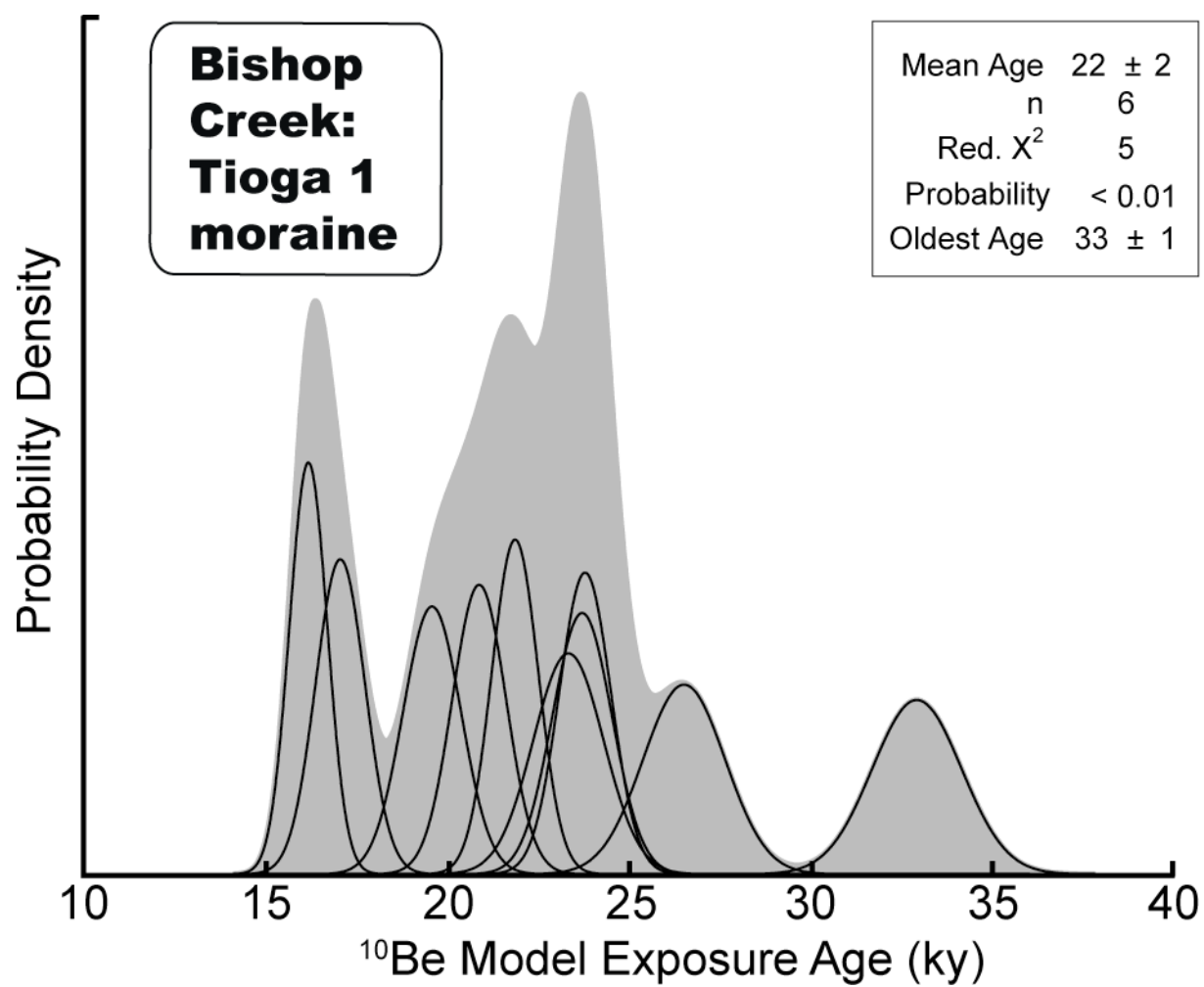


Figure S27. Probability density function and summary statistics for ^{36}Cl boulder ages from the Bishop Creek Tioga 1 moraine from Phillips et al. (2009).

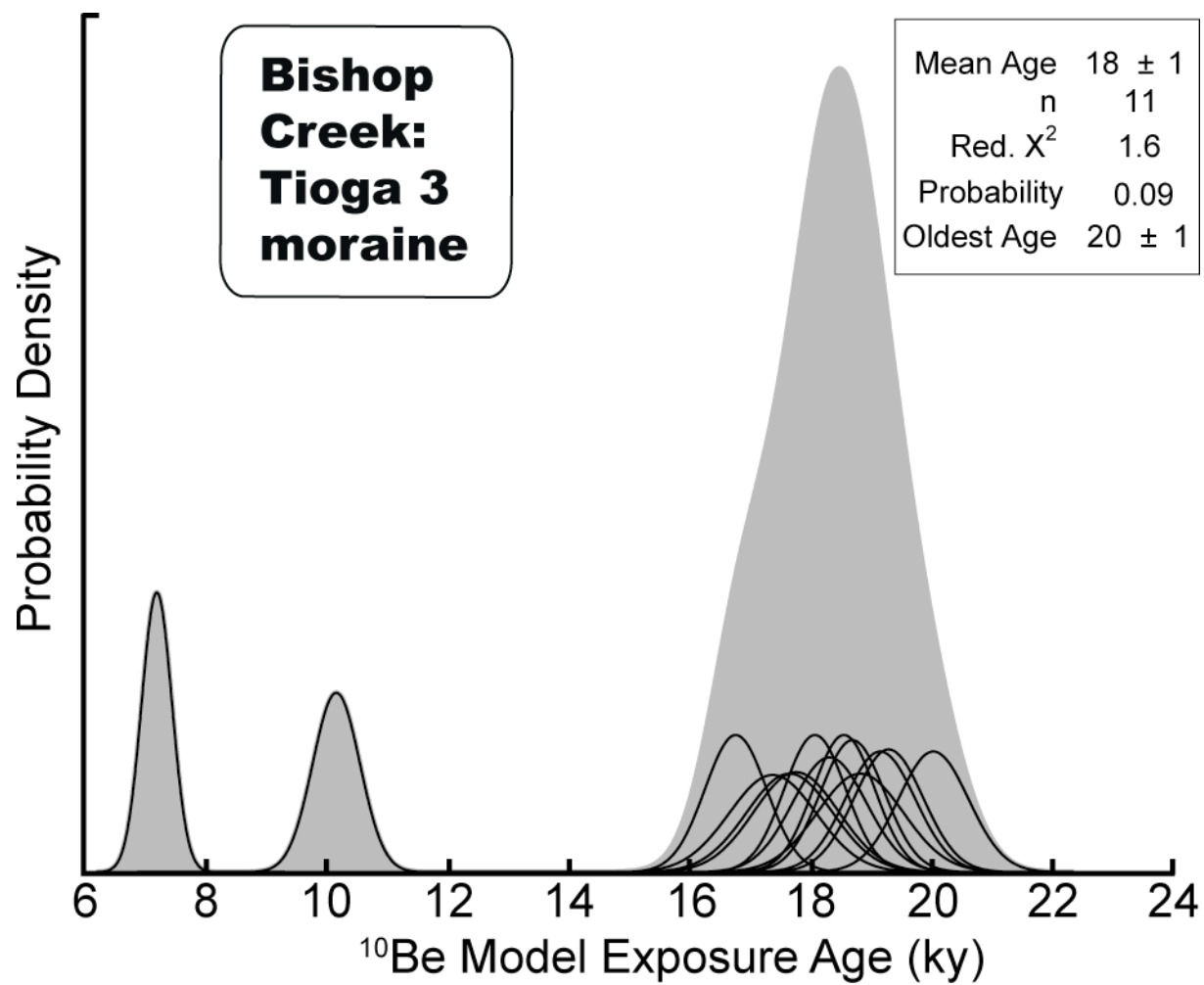


Figure S28. Probability density function and summary statistics for ^{36}Cl boulder ages from the Bishop Creek Tioga 3 moraine from Phillips et al. (2009).

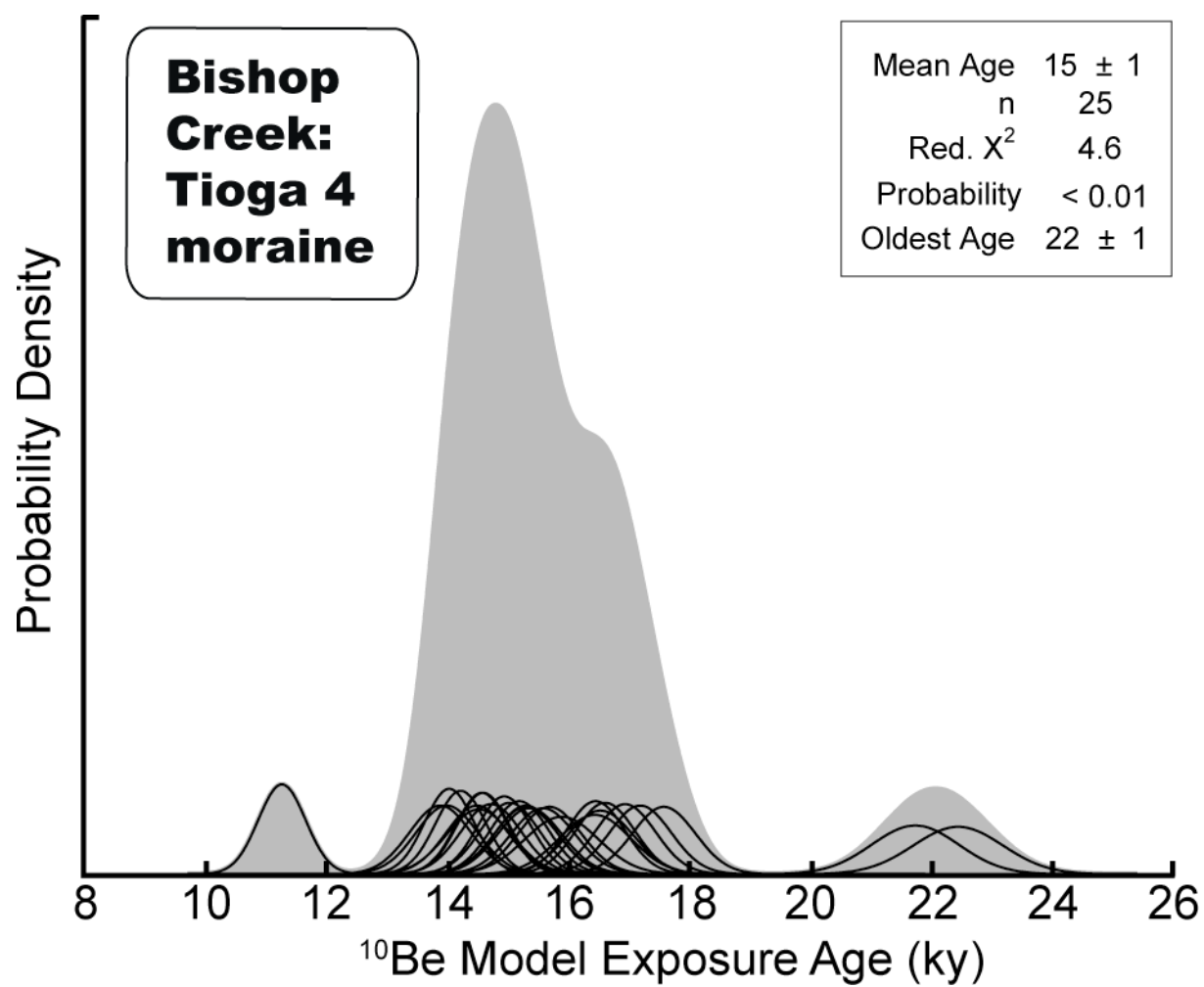


Figure S29. Probability density function and summary statistics for ^{36}Cl boulder ages from the Bishop Creek Tioga 4 moraine from Phillips et al. (2009).

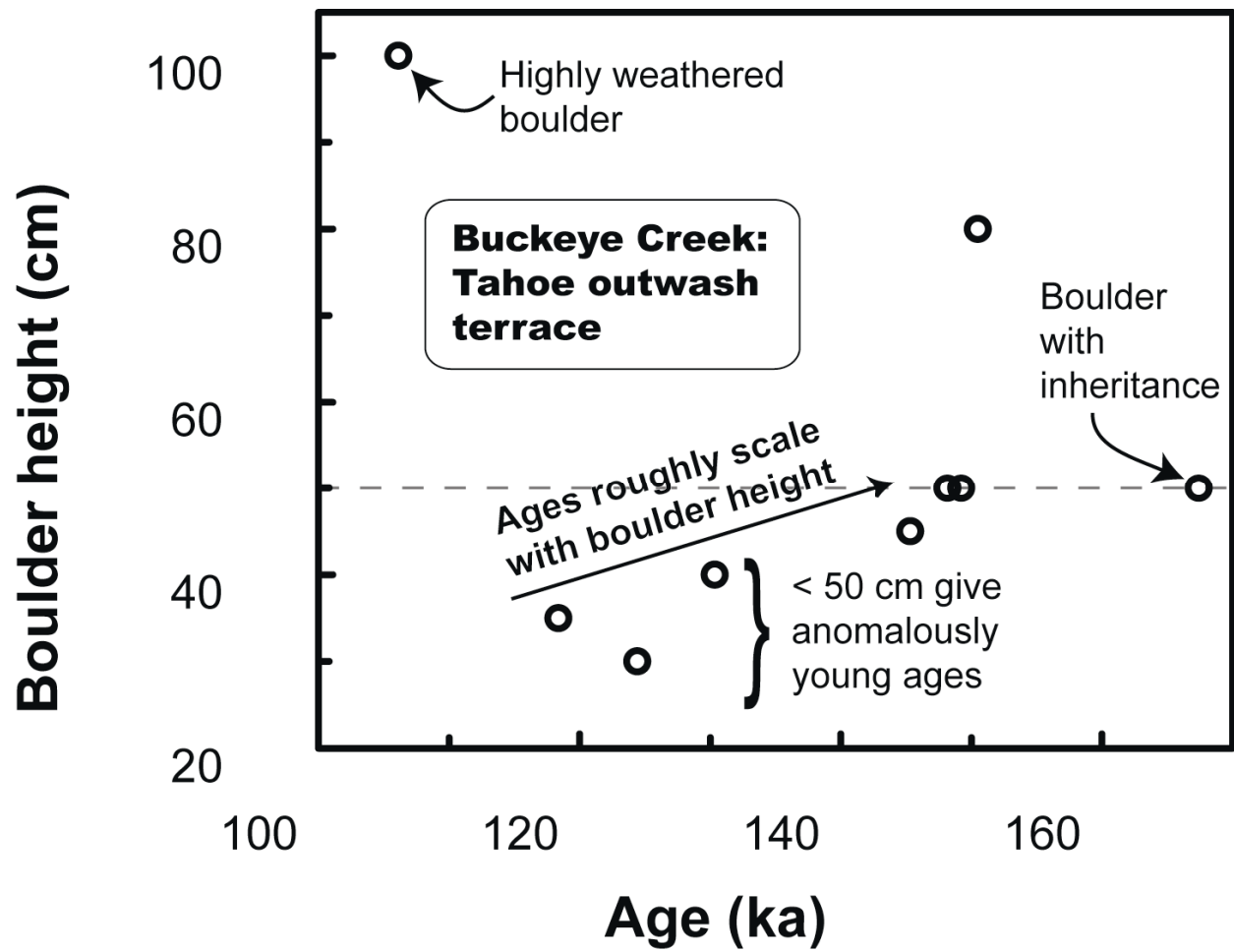


Figure S30. Graph of ^{10}Be boulder age (ka) versus height above modern tread surface (cm) for Buckeye Creek Tahoe outwash terrace (BCTA06).

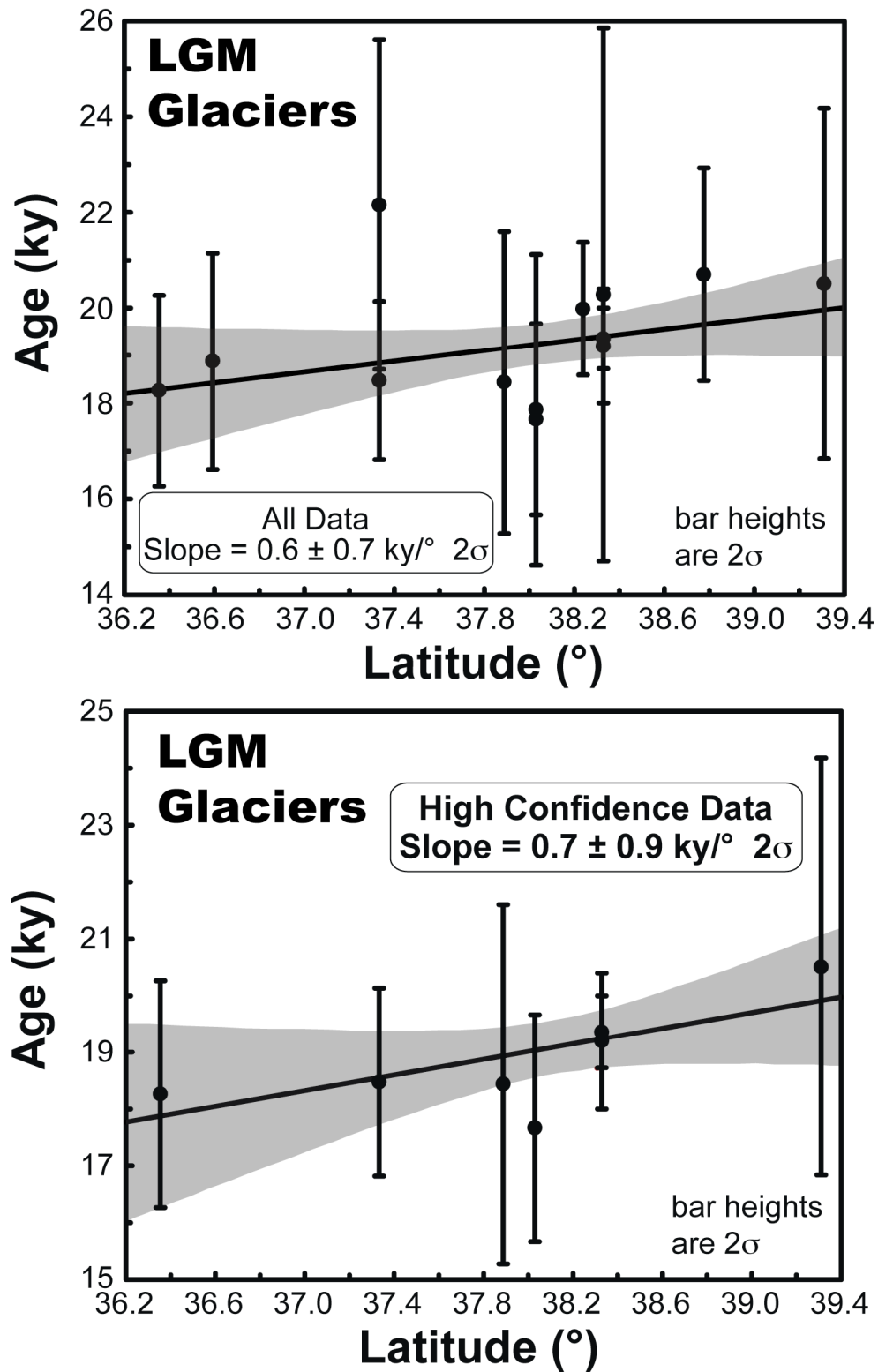


Figure S31. Plot of age (ka) versus latitude (°) for moderate and high confidence data (upper) and only high confidence data (lower). Linear regression and 2σ error envelope (grey) indicate no statistically significant spatial pattern south to north along the Sierra Nevada.