Supporting Information

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Table S1. Probability of positive deviations from the regional trend in biomass burning at each site

Site	Before human occupation	After human occupation
L. El Trébol	0.11	0.38
L. Padre Laguna	0.06	0.10
L. Huala Hué	0.01	0.13
L. Cóndor	0.09	0.00
L. Mosquito	0.09	0.01
L. La Zeta	0.11	0.02
L. Theobald	0.05	0.15

Probabilities are not significantly different at the 0.05 alpha level.

Table S2. Model selection results

Model	Family	AIC
Forest taxa data		
$\alpha + f(\text{time}_i) + \text{site}_i + \log(\text{terrestrial pollen sum}^{-1})_i + \varepsilon_i$	Poisson	20,134
$\alpha + f(\text{time}_i) + \log(\text{terrestrial pollen sum}^{-1})_i + \varepsilon_i$	Poisson	29,960
$\alpha + f(\text{time}_i) + \text{site}_i + \log(\text{terrestrial pollen sum}^{-1})_i + \varepsilon_i$	Negative binomial	7,056
$\alpha + f(\text{time}_i) + \log(\text{terrestrial pollen sum}^{-1})_i + \varepsilon_i$	Negative binomial	7,114
$\alpha + \beta \times \text{time}_i + \text{site}_i + \log(\text{terrestrial pollen sum}^{-1})_i$	Negative binomial	7,078
Charcoal data		
$\alpha + f(\text{time}_i) + \text{site}_i + \log(\text{accumulation rate})_i + \varepsilon_i$	Poisson	438,797
$\alpha + f(\text{time}_i) + \log(\text{accumulation rate})_i + \varepsilon_i$	Poisson	240,686
$\alpha + f(\text{time}_i) + \text{site}_i + \log(\text{accumulation rate})_i + \varepsilon_i$	Negative binomial	54,665
$\alpha + f(\text{time}_i) + \log(\text{accumulation rate})_i + \varepsilon_i$	Negative binomial	58,960
$\alpha + \beta \times \text{time}_i + \text{site}_i + \log(\text{accumulation rate})_i$	Negative binomial	56,512

Forest taxa and charcoal have been modeled as smoothing functions of the concatenated time data of all sites [$f(\text{time}_i)$] and the nominal variable site_i. α is the intercept for the baseline site, $\log(\text{terrestrial pollen sum}^{-1})_i$, and $\log(\text{accumulation rate})_i$ are the offsets of the pollen and charcoal models, respectively, and ε_i is the ith residual.

Table S3. Study site information

Site	Position	Elevation, m	Geomorphology	Vegetation	Ref(s).
L. El Trébol	41°15′S, 71°32′W	977	Glacial lake	*N. dombeyi* and *A. chilensis* forest	(1)
L. Padre Laguna	41°30′S, 71°29′W	1,280	Dammed by a broad postglacial alluvial fan	*N. dombeyi* and *A. chilensis* forest	(2)
L. Huala Hué	41°30′S, 71°30′W	849	Blocked by a prominent glacial delta associated with Late Pleistocene meltwater	*N. dombeyi* and *A. chilensis* forest	(2)
L. Cóndor	42°20′S, 71°17′W	818	Dammed by alluvial fans	*A. chilensis* stands/steppe	(3)
L. Mosquito	42°29′S, 71°24′W	551	Dammed by Holocene alluvial fans	*A. chilensis* stands/steppe	(3)
L. La Zeta	43°17′S, 71°20′W	774	Situated on a high plain that was glaciated several times during the Pleistocene	*N. dombeyi* and *A. chilensis*–*Pinus* plantations	(4, 5)
L. Theobald	43°26′S, 71°33′W	678	Formed in either an ice-block depression or glacial scour depression	*N. dombeyi* and *A. chilensis* forest/steppe	(4)

1. Whitlock C, et al. (2006) Postglacial vegetation, climate, and fire history along the east side of the Andes (lat 41-42.5°S), Argentina. *Quat Res* 66(2):187–201.
2. Iglesias V, Whitlock C, Bianchi MM, Villarosa G, Outes V (2012) Climate and local controls of long-term vegetation dynamics in northern Patagonia (lat 41°S). *Quat Res* 78(3):502–512.
3. Iglesias V, Whitlock C, Bianchi MM, Villarosa G, Outes V (2012) Holocene climate variability and environmental history at the Patagonian forest/steppe ecotone: Lago Mosquito (42°29′3.89″S, 71°24′14.57″W) and Laguna del Cóndor (42°20′47.22″S, 71°17′07.62″W). *Holocene* 22:1254–1264.
4. Iglesias V, Whitlock C, Markgraf V, Bianchi MM (2014) Postglacial history of the Patagonian forest/steppe ecotone (41–43°S). *Quat Sci Rev* 94:120–135.
5. Schaebitz F (1994) Vegetation development and volcanism in the Esquel region, Chubut, Argentina. *Quaternary S Am Ant Penin* 10:7–29.

Table S4. Chronology information

Site	Core length, cm	Basal age, cal years B.P.	Total radiocarbon samples	Rejected samples	Age–depth modeling
L. El Trébol	634	>18,500	15	0	Polynomial regression
L. Padre Laguna	397	*ca.* 4,900	4	0	Cubic spline; Monte Carlo resampling
L. Huala Hué	731	*ca.* 13,480	10	2	Cubic spline; Monte Carlo resampling
L. Cóndor	289	>10,200	8	2	Cubic spline; Monte Carlo resampling
L. Mosquito	1,506	*ca.* 9,260	19	4	Cubic spline; Monte Carlo resampling
L. La Zeta	763	>18,500	12	0	Cubic spline; Monte Carlo resampling
L. Theobald	532	*ca.* 12,450	9	2	Cubic spline; Monte Carlo resampling