Science Advances
AAAS

advances.sciencemag.org/cgi/content/full/5/7/eaav5168/DC1

# Supplementary Materials for

## Intensified vegetation water use under acid deposition

Matthew Lanning, Lixin Wang*, Todd M. Scanlon, Matthew A. Vadeboncoeur, Mary B. Adams, Howard E. Epstein, Daniel Druckenbrod

*Corresponding author. Email: lxwang@iupui.edu

Published 31 July 2019, *Sci. Adv.* **5**, eaav5168 (2019)
DOI: 10.1126/sciadv.aav5168

**The PDF file includes:**



**Other Supplementary Material for this manuscript includes the following:**

(available at advances.sciencemag.org/cgi/content/full/5/7/eaav5168/DC1)

## H2: Supplementary Materials

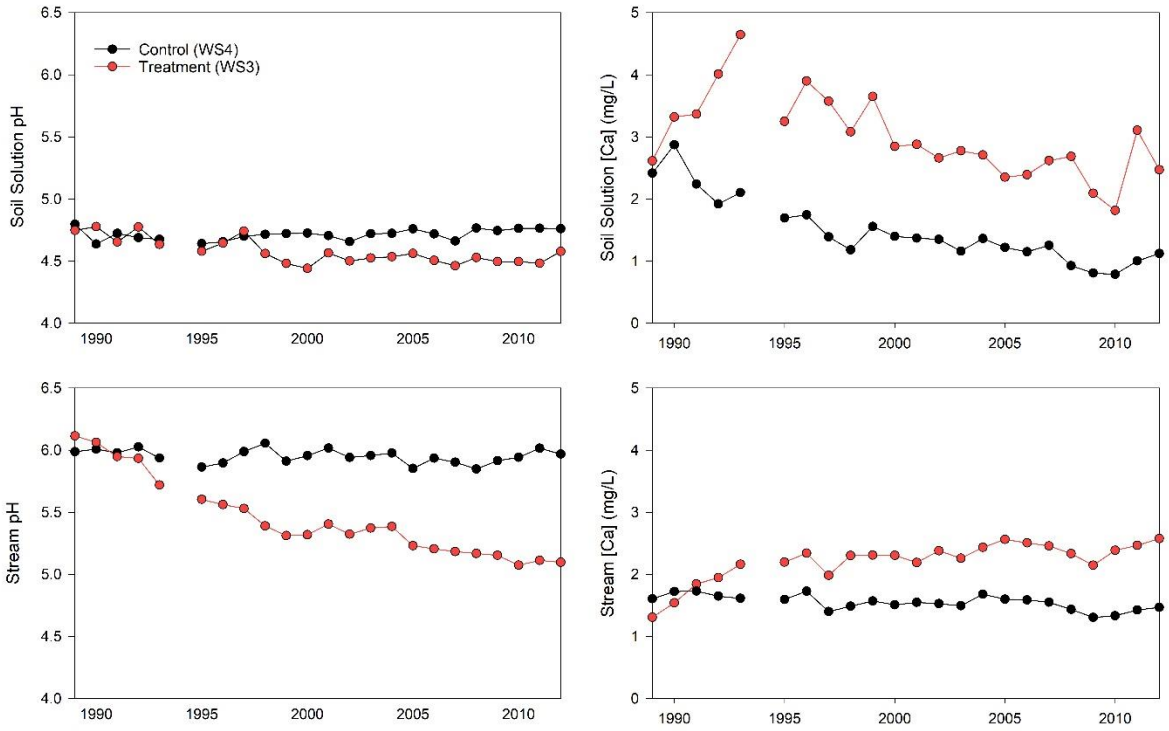



**Fig. S1. Temporal (1989–2012) trends in pH and calcium concentration in stream and soil solution for three soil horizons in the control (WS4) and treatment (WS3) watersheds.** Pre-treatment data (1989, 1990) and outlier year (2004) is included in this figure.

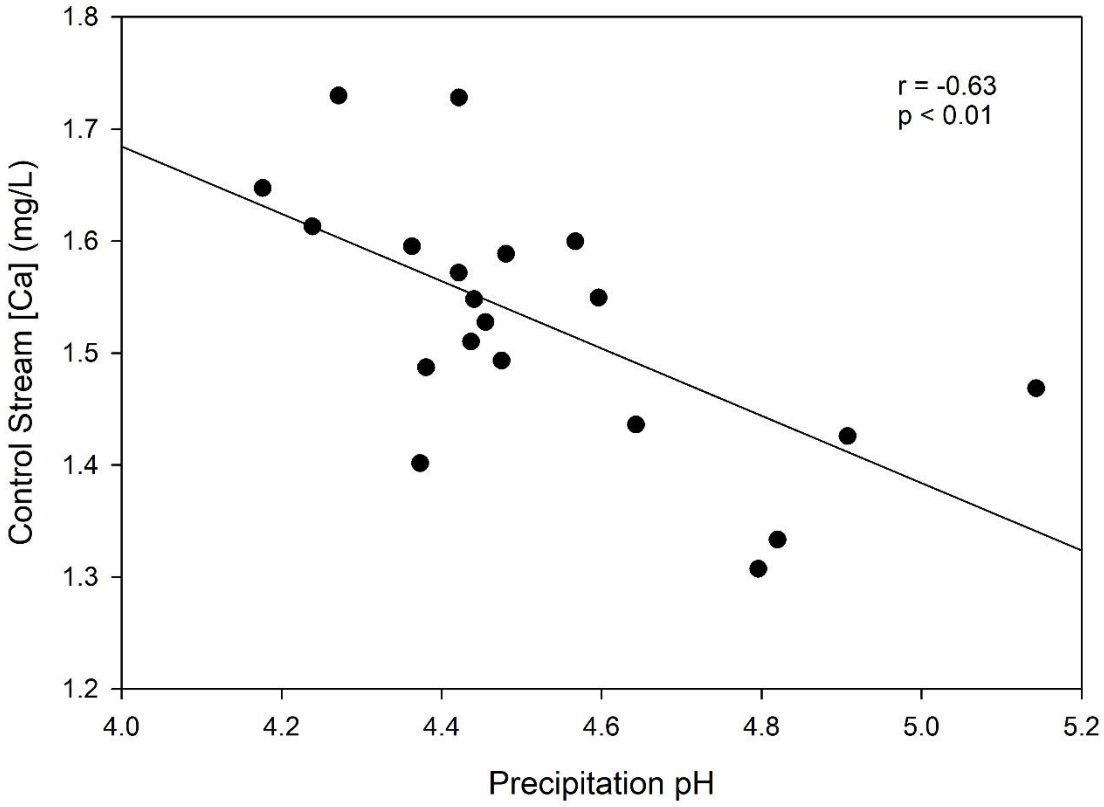



**Fig. S2. Correlation of precipitation pH and control watershed stream [Ca] (mg/liter) during the treatment period (1991–2012).** 2004 was excluded as per the Methods.

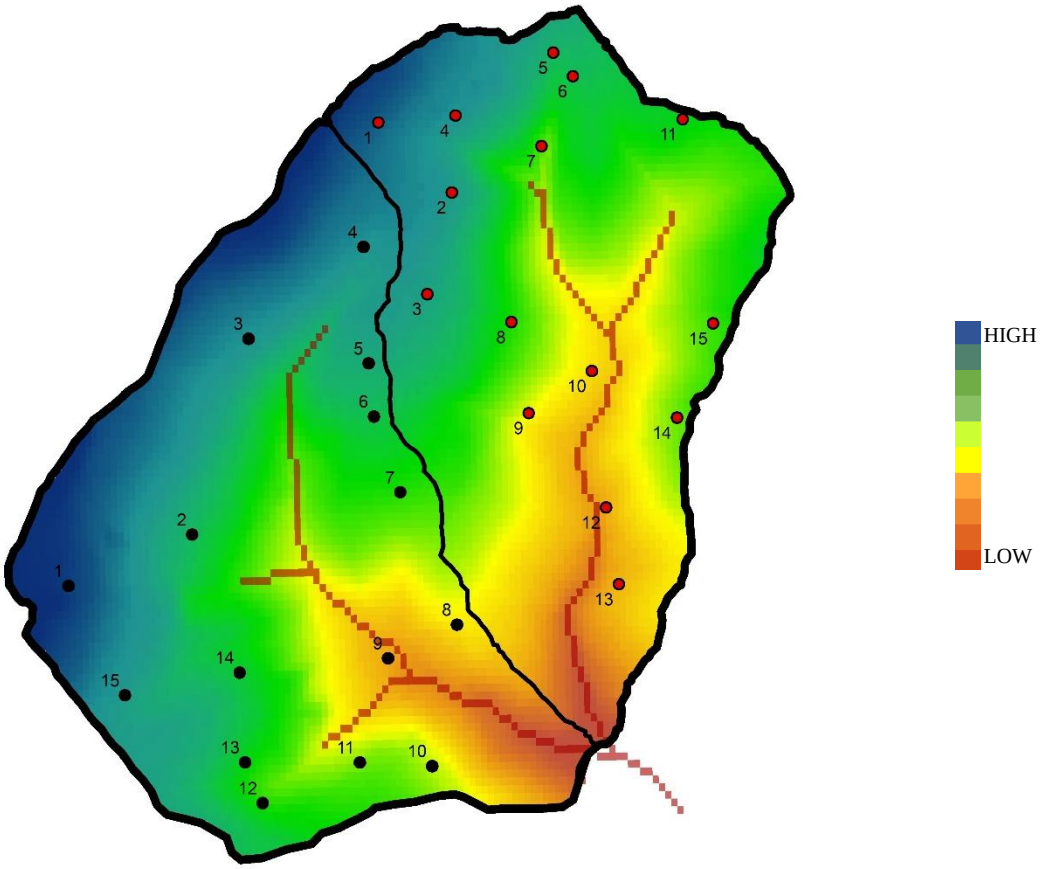



**Fig. S3. Map of lysimeter locations projected onto a map of surface water pooling for control (black points) and treated (red points) watersheds.**

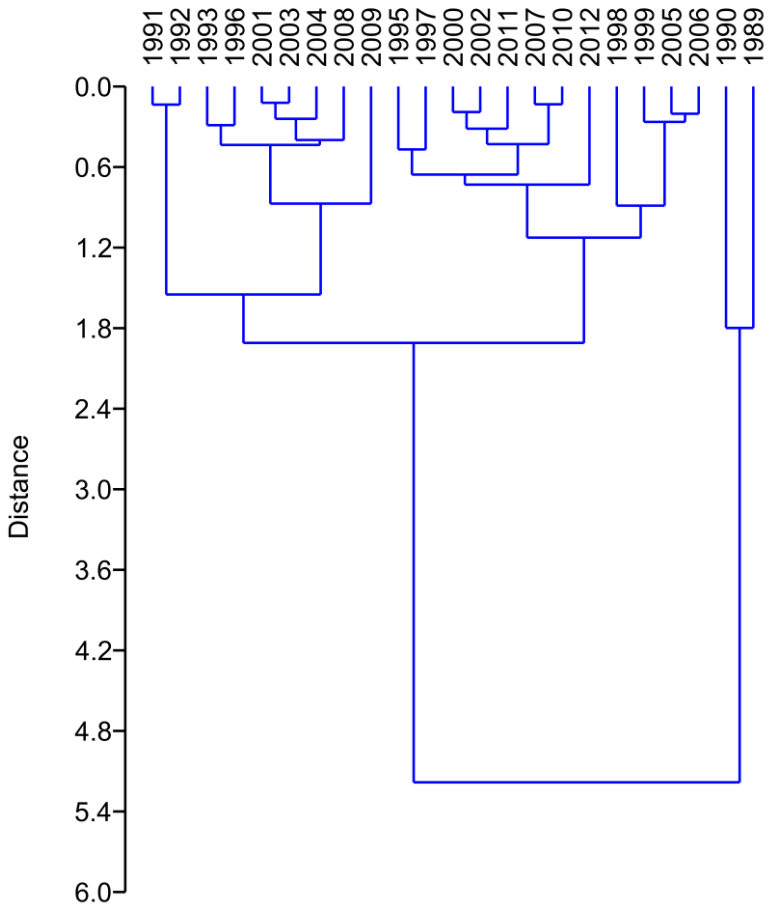



**Fig. S4. Cluster analysis of stream pH, [$NO_3^-$], and [Ca].**

**Table S1. Slopes and coefficient of determination for linear regressions of soil solution [Ca] and stream [Ca] for control (WS4) and treated (WS3) watersheds.**

| Watershed – Soil Horizon | Regression slope (1991-1993) | $R^2$ |
|---|---|---|
| WS3-A | 0.5631 | 0.9398 |
| WS3-B | 0.3057 | 1 |
| WS3-C | 0.1368 | 0.9176 |
| WS4-A | 0.03 | 0.458 |
| WS4-B | 0.1107 | 0.6432 |
| WS4-C | 0.2509 | 0.3034 |

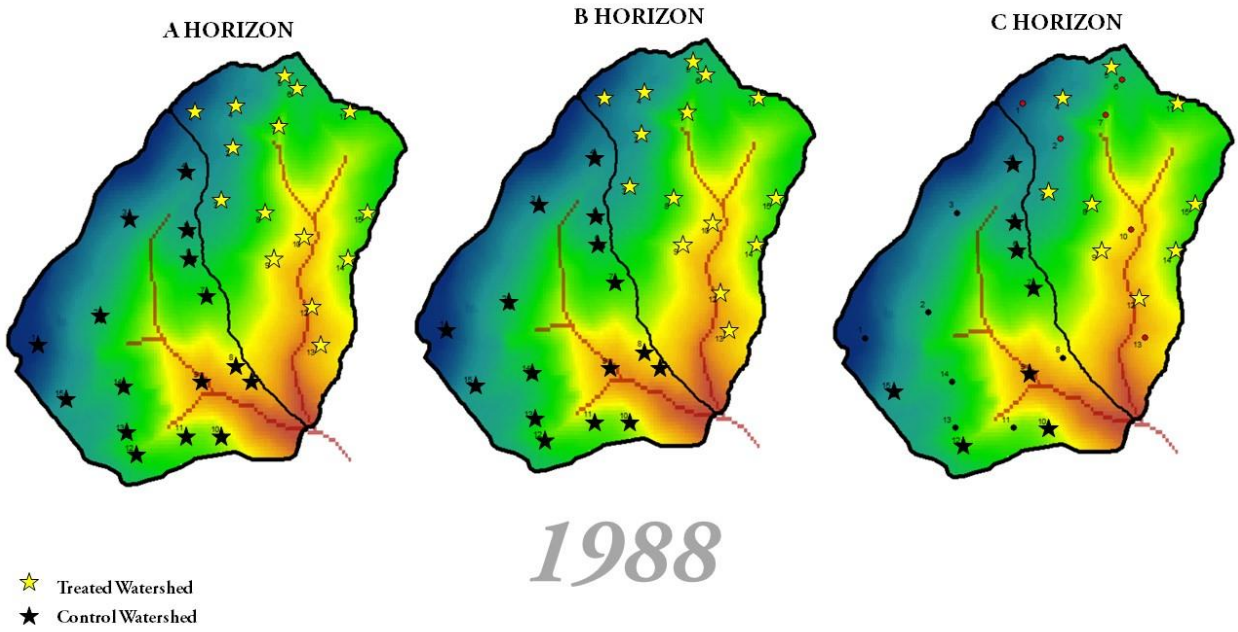
**Table S2. Sampling frequency of lysimeters by soil horizon on both control (WS4) and treatment (WS3) watersheds at annual and monthly resolution for the whole dataset available at the time of analysis.**

| | A | | B | | C | |
|---|---|---|---|---|---|---|
| Month | WS4 | WS3 | WS4 | WS3 | WS4 | WS3 |
| 1 | 194 | 167 | 180 | 162 | 116 | 80 |
| 2 | 166 | 140 | 162 | 132 | 97 | 65 |
| 3 | 214 | 174 | 205 | 177 | 123 | 94 |
| 4 | 122 | 96 | 122 | 105 | 73 | 48 |
| 5 | 136 | 113 | 124 | 108 | 84 | 55 |
| 6 | 52 | 47 | 52 | 41 | 33 | 22 |
| 7 | 13 | 12 | 11 | 11 | 8 | 5 |
| 8 | 12 | 9 | 12 | 7 | 6 | 5 |
| 9 | 31 | 20 | 16 | 9 | 14 | 5 |
| 10 | 20 | 18 | 15 | 15 | 11 | 7 |
| 11 | 89 | 66 | 69 | 62 | 43 | 25 |
| 12 | 103 | 81 | 89 | 83 | 55 | 41 |
| Total | 1152 | 943 | 1057 | 912 | 663 | 452 |

| | A | | B | | C | |
|---|---|---|---|---|---|---|
| Year | WS4 | WS3 | WS4 | WS3 | WS4 | WS3 |
| 1989 | 69 | 44 | 69 | 53 | 53 | 32 |
| 1990 | 75 | 81 | 65 | 71 | 44 | 38 |
| 1991 | 58 | 57 | 47 | 46 | 30 | 24 |
| 1992 | 54 | 45 | 51 | 41 | 29 | 21 |
| 1993 | 28 | 25 | 29 | 23 | 16 | 14 |
| 1994 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1995 | 65 | 60 | 58 | 46 | 36 | 29 |
| 1996 | 62 | 57 | 58 | 59 | 32 | 26 |
| 1997 | 62 | 58 | 52 | 49 | 35 | 25 |
| 1998 | 44 | 45 | 43 | 48 | 28 | 24 |
| 1999 | 80 | 68 | 75 | 65 | 44 | 37 |
| 2000 | 35 | 27 | 29 | 29 | 17 | 13 |
| 2001 | 43 | 23 | 41 | 29 | 19 | 17 |
| 2002 | 66 | 46 | 65 | 57 | 37 | 23 |
| 2003 | 62 | 52 | 54 | 52 | 36 | 24 |
| 2004 | 46 | 35 | 47 | 40 | 31 | 15 |
| 2005 | 48 | 45 | 49 | 38 | 32 | 18 |
| 2006 | 55 | 41 | 42 | 30 | 28 | 15 |
| 2007 | 42 | 32 | 31 | 30 | 22 | 11 |
| 2008 | 32 | 20 | 35 | 21 | 20 | 12 |
| 2009 | 52 | 36 | 46 | 36 | 32 | 15 |
| 2010 | 29 | 23 | 25 | 22 | 19 | 10 |
| 2011 | 21 | 10 | 25 | 12 | 12 | 4 |
| 2012 | 24 | 13 | 21 | 15 | 11 | 5 |
| Total | 1152 | 943 | 1057 | 912 | 663 | 452 |

**Table S3. Pretreatment soil chemistry means and SD (in parenthesis) in the upper mineral soil (0 to 10 cm) for control and treated watersheds.** Data shown as reported by Adams et al., (*1*).

| Analayte | Control (WS4) | Treated (WS3) |
|---|---|---|
| pH | 3.95 | 4.48 |
| Total C (g $kg^{-1}$) | 112 (53) | 91 (54) |
| Total N (g $kg^{-1}$) | 2.6 (1.4) | 4.79 (1.38) |
| Exchangeable Ca (meq $100g^{-1}$) | 0.49 (0.22) | 4.79 (8.72) |
| Exchangeable Mg (meq $100g^{-1}$) | 0.23 (0.10) | 0.59 (0.88) |
| Exchangeable Al (meq $100g^{-1}$) | 8.70 (3.79) | 1.39 (1.81) |
| Base Saturation (%) | 14 (4) | 34 (33) |
| Effective Cation Exchange Capacity (meq $100g^{-1}$) | 9.35 (3.41) | 11.77 (7.86) |




**Movie. S1. Video of lysimeter sampling spatial distribution and water accumulation for each sampling year by horizon.** Video link : https://youtu.be/z8x5iG7zitU