water

Article

Supplementary Materials

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Supplementary Materials:

1. Figure S1. Isohyet lines of average annual precipitation for the Tona watershed. (Reproduced with permission from GRADEX, Plan de Ordenamiento Ambiental Territorial Microcuenca Río Tona; published by Corporación Autónoma Regional para la Defensa de la Meseta de Bucaramanga, 2012.)
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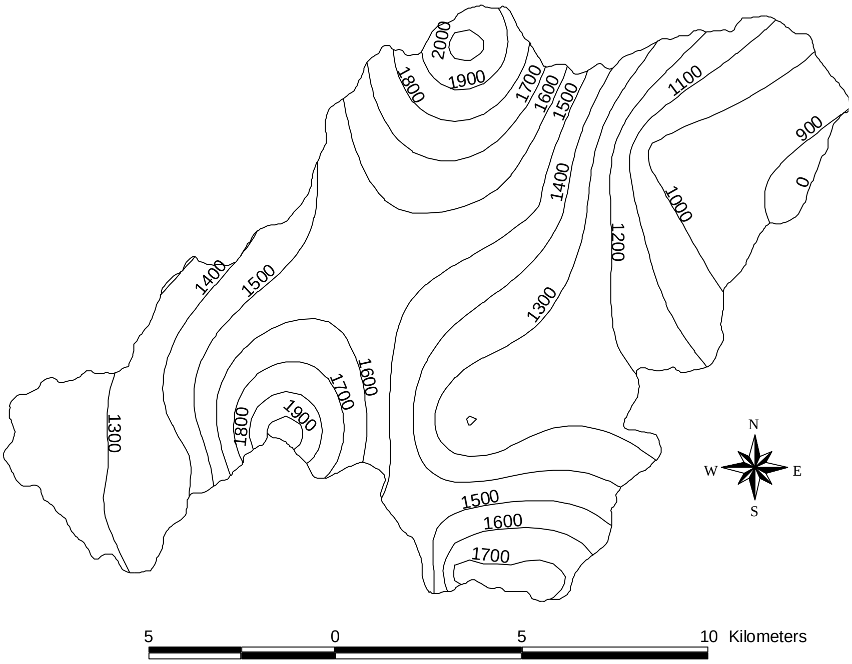


Figure S1. Isohyet lines of average annual precipitation for the Tona watershed [1]. (Reproduced with permission from GRADEX, Plan de Ordenamiento Ambiental Territorial Microcuenca Río Tona; published by Corporación Autónoma Regional para la Defensa de la Meseta de Bucaramanga, 2012.)

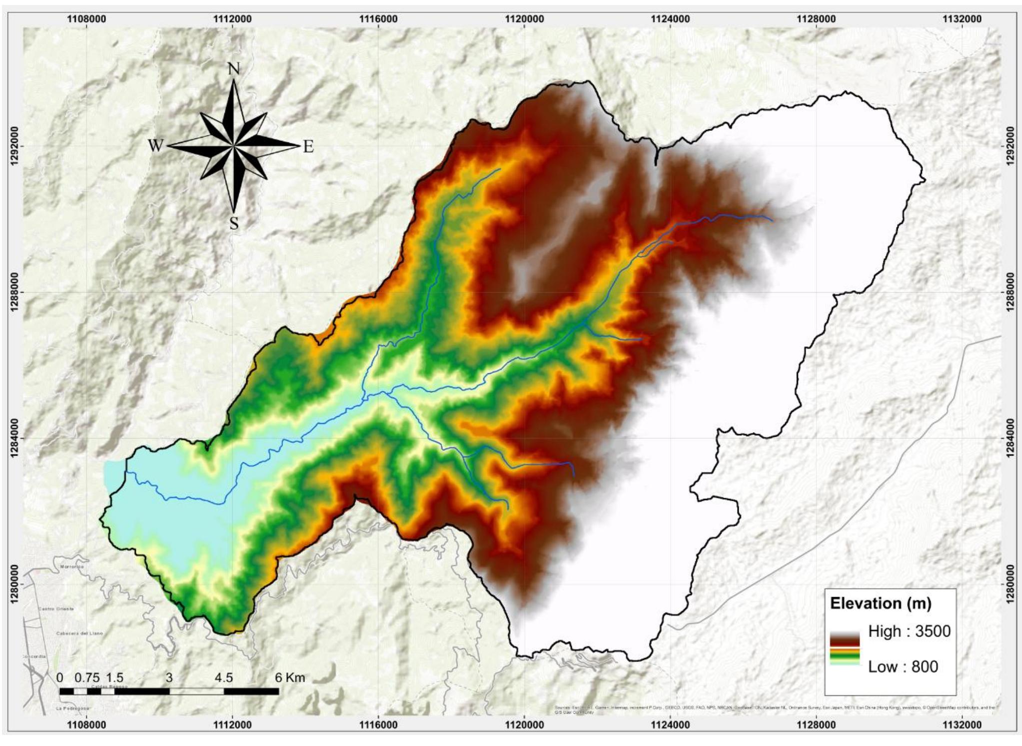


Figure S2. Digital elevation model of the Tona watershed.

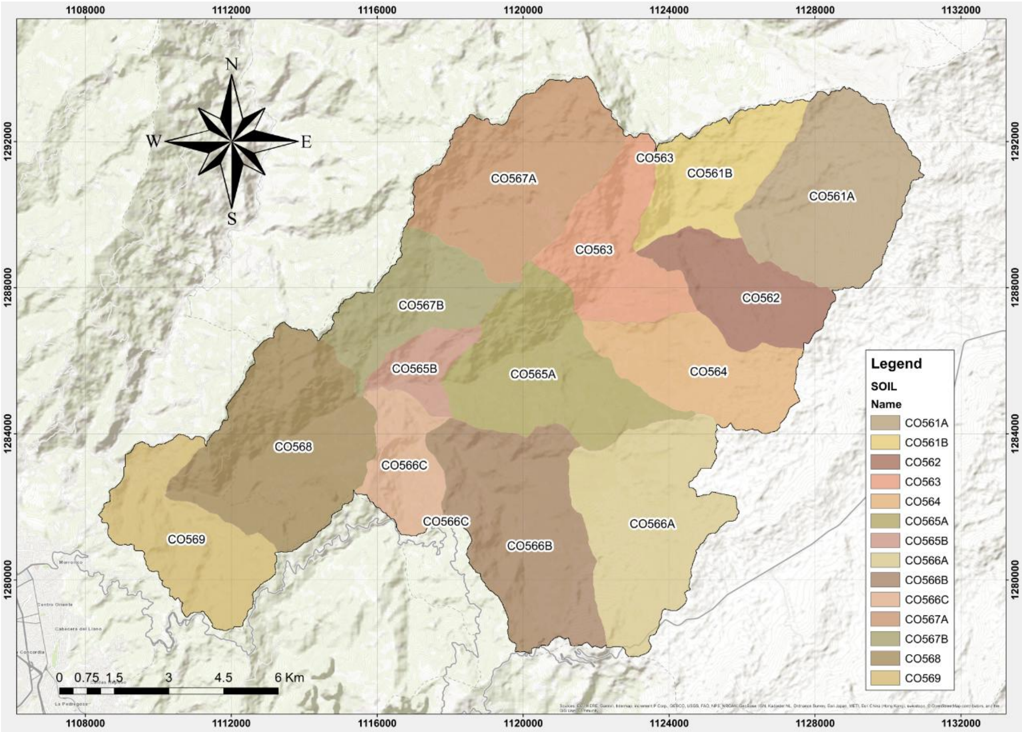


Figure S3. Soils map of the Tona watershed. Table S1 presents the attributes of each one of the soil types.

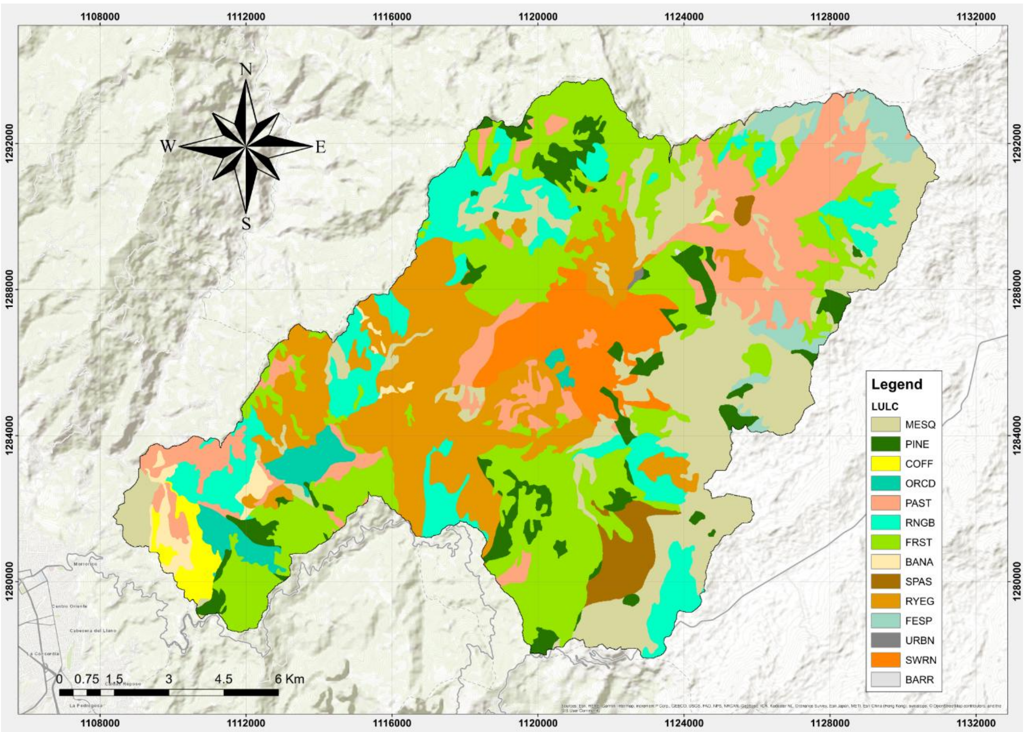


Figure S4. Land use/land cover (LULC) map of the Tona watershed. Table S2 describes each one of the LULC types.

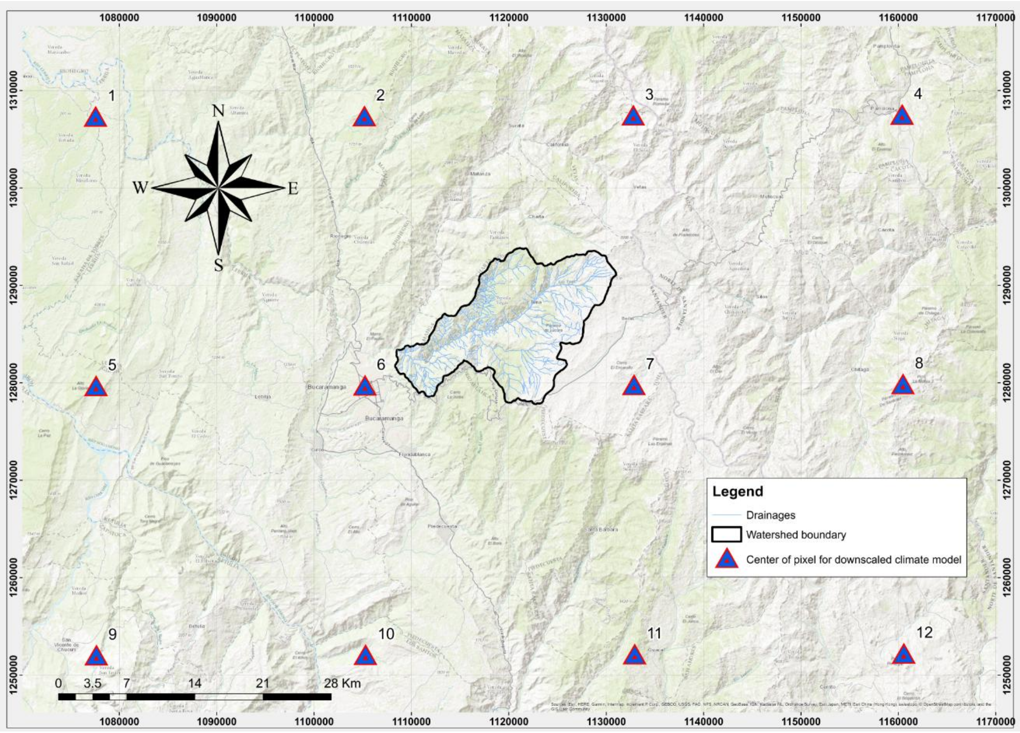


Figure S5. Location of the Tona watershed with respect to centers of pixel of the NEX-GDDP project. The image shows 12 points (centers of pixel) located in the area of influence of the watershed.

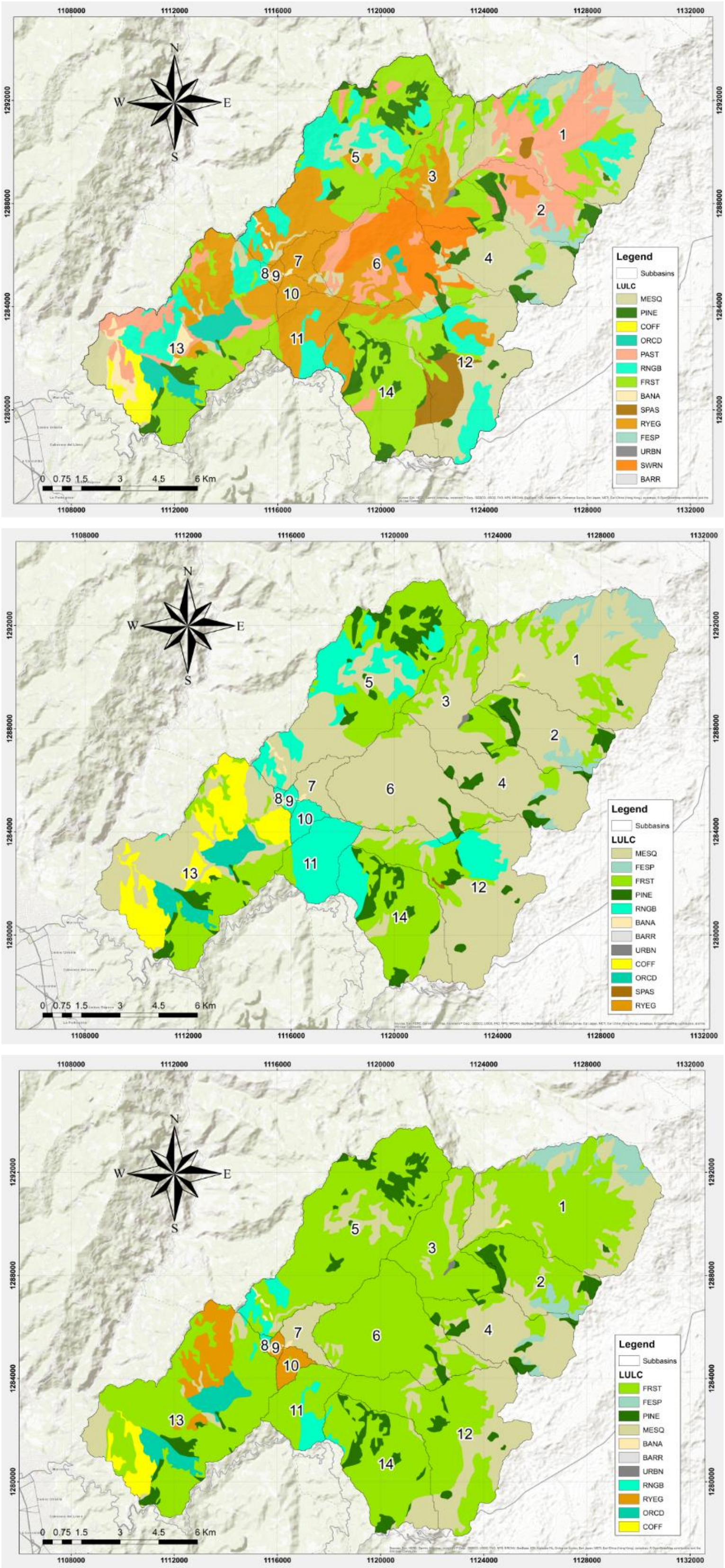
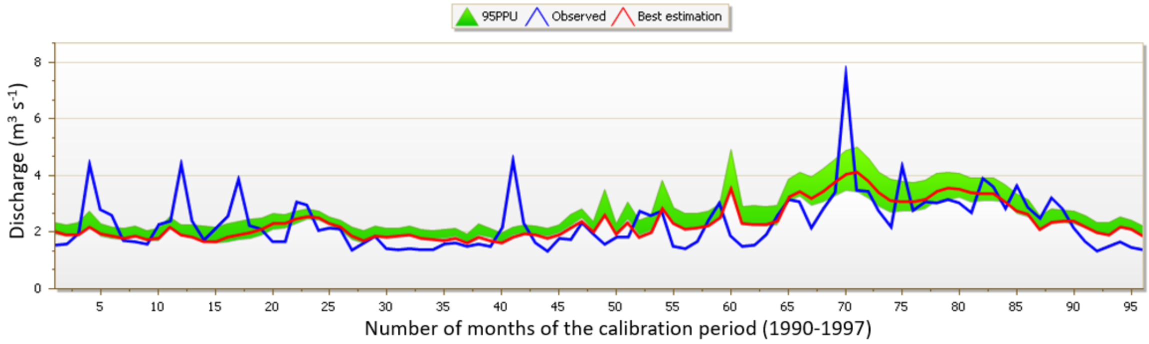


Figure S6. Land Use (LULC) Scenarios A (top), B (center), and C (bottom) for the study.



(**a**)

Goal_type= Nash_Sutcliff	No_sims= 600	Best_sim_no= 317	Best_goal = 3.110810e-001										
Variable	p-factor	r-factor	R2	NS	bR2	MSE	SSQR	PBIAS	KGE	RSR	MNS	VOL_FR
FLOW_OUT_13	0.50	0.58	0.32	0.31	0.1140	6.8e-001	2.2e-001	0.4	0.43	0.83	0.24	1.00

(**b**)

r__CN2.mgt	-0.01619852	-0.110316
v__ALPHA_BF.gw	0.019005	0.026823
v__GW_DELAY.gw	166.827301	227.012939
v__GWQMN.gw	4409.600098	4843.64795
v__GW_REVAP.gw	0.12656	0.158646
v__REVAPMN.gw	298.742157	352.274078
v__RCHRG_DP.gw	0.307675	0.367913
r__SOL_Z().sol	-0.190568	0.01305988
r__SOL_BD().sol	-0.361096	0.10035209
r__SOL_AWC().sol	-0.543651	-0.422517
r__SOL_K().sol	-0.476689	0.04257188
v__CH_N2.rte	0.061254	0.097214
v__SLSUBBSN.hru	99.057419	116.57074
r__OV_N.hru	0.58151	0.827236
v__SLSOIL.hru	118.781509	139.596039
v__ESCO.hru	0.817217	0.859747
v__EPCO.hru	0.581412	0.706348
v__CH_N1.sub	0.199687	0.224569
v__SURLAG.bsn	7.199446	9.166059
v__SHALLST.gw	0	117.528557
r__TLAPS.sub	-0.961783	-0.451777
r__PLAPS.sub	0.259268	0.589612
v__GW_SPYLD.gw	0.284419	0.359789

(**c**)

Figure S7. Results of the last iteration for the automatic calibration of the Tona watershed (Puente Tona Station) using SWAT-CUP. (**a**) Graphical comparison between observed (blue) and best estimation of the iteration (red), the green belt represents the 95PPU; (**b**) Statistics for the last iteration; (**c**) SWAT parameters with their final minimum and maximum ranges according to the defined strategy for parameter variation (relative r__ or replace v__).

Table S1. Fourteen new soil categories added to the SWAT soils database.

OBJECTID	MUID	SEQN	SNAM	S5ID	CMPPCT	NLAYERS	HYDGRP	SOL_ZMX	ANION_EXCL	SOL_CRK	TEXTURE
203	VT097	1	CO561A	CO5601	100	3	B	1500	0.5	0.5	FArAGr-FArGr-ArGr
204	VT098	1	CO561B	CO5602	100	3	B	1500	0.5	0.5	FArGr-FArGr-FArAGr
205	VT099	1	CO562	CO5603	100	2	B	1100	0.5	0.5	FArAGr-FArGr
206	VT100	1	CO563	CO5604	100	4	B	1500	0.5	0.5	FArA-FA-FA-FA
207	VT101	1	CO564	CO5605	100	3	B	1000	0.5	0.5	FA-FLGr-FA
208	VT102	1	CO565A	CO5606	100	2	B	700	0.5	0.5	FAGr-Agr
209	VT103	1	CO565B	CO5607	100	2	B	700	0.5	0.5	FAGr-Agr
210	VT104	1	CO566A	CO5608	100	3	B	1500	0.5	0.5	FArA-FArA-FArA
211	VT105	1	CO566B	CO5609	100	4	B	1500	0.5	0.5	FA-FA-FA-FA
212	VT106	1	CO566C	CO5610	100	4	B	1500	0.5	0.5	FAGr-FAGr-FArA-FArA
213	VT107	1	CO567A	CO5611	100	2	B	1700	0.5	0.5	FArA-ArA
214	VT108	1	CO567B	CO5612	100	2	B	1700	0.5	0.5	FArA-ArA
215	VT109	1	CO568	CO5613	100	3	B	850	0.5	0.5	FAGr-FA-FA
216	VT110	1	CO569	CO5614	100	3	B	850	0.5	0.5	FAGr-FA-FA

OBJECTID	MUID	SEQN	SNAM	S5ID	SOL_Z1	SOL_BD1	SOL_AWC1	SOL_K1	SOL_CBN1	CLAY1	SILT1	SAND1	ROCK1	SOL_ALB1	USLE_K1
203	VT097	1	CO561A	CO5601	310	1.24	0.13	26.96	6.7	22	22	56	1	0.13	0.16
204	VT098	1	CO561B	CO5602	230	1.21	0.15	13.19	6.7	32	32	36	1	0.13	0.16
205	VT099	1	CO562	CO5603	470	1.24	0.14	16.18	6.7	28	26	46	1	0.13	0.16
206	VT100	1	CO563	CO5604	220	1.23	0.13	32.62	6.7	20	22	58	1	0.13	0.16
207	VT101	1	CO564	CO5605	280	1.2	0.14	40.01	6.7	18	26	56	1	0.13	0.17
208	VT102	1	CO565A	CO5606	500	1.24	0.11	46.76	6.7	16	16	68	1	0.13	0.15
209	VT103	1	CO565B	CO5607	500	1.24	0.11	46.76	6.7	16	16	68	1	0.13	0.15
210	VT104	1	CO566A	CO5608	230	1.23	0.13	27.45	6.7	22	24	54	1	0.13	0.16
211	VT105	1	CO566B	CO5609	220	1.19	0.12	56.81	6.7	14	22	64	1	0.13	0.17
212	VT106	1	CO566C	CO5610	250	1.24	0.12	38.72	6.7	18	18	64	1	0.13	0.16
213	VT107	1	CO567A	CO5611	300	1.28	0.12	20.92	6.7	24	17	59	1	0.13	0.15
214	VT108	1	CO567B	CO5612	300	1.28	0.12	20.92	6.7	24	17	59	1	0.13	0.15
215	VT109	1	CO568	CO5613	100	0.95	0.23	79.85	6.7	8	16	76	1	0.13	0.15
216	VT110	1	CO569	CO5614	100	0.95	0.23	79.85	6.7	8	16	76	1	0.13	0.15

OBJECTID	MUID	SEQN	SNAM	S5ID	SOL_Z2	SOL_BD2	SOL_AWC2	SOL_K2	SOL_CBN2	CLAY2	SILT2	SAND2	ROCK2	SOL_ALB2	USLE_K2
203	VT097	1	CO561A	CO5601	670	1.28	0.13	7.1	6.5	36	24	40	1	0.13	0.15
204	VT098	1	CO561B	CO5602	580	1.26	0.14	13.06	6.5	30	26	44	1	0.13	0.16
205	VT099	1	CO562	CO5603	1100	1.2	0.15	18.04	6.5	28	34	38	1	0.13	0.17
206	VT100	1	CO563	CO5604	420	1.22	0.13	38.73	6.5	18	24	58	1	0.13	0.17
207	VT101	1	CO564	CO5605	600	1.16	0.1	115.54	6.5	6	16	78	1	0.13	0.15
208	VT102	1	CO565A	CO5606	700	1.16	0.07	145.25	6.5	4	6	90	1	0.13	0.08
209	VT103	1	CO565B	CO5607	700	1.16	0.07	145.25	6.5	4	6	90	1	0.13	0.08
210	VT104	1	CO566A	CO5608	660	1.25	0.13	26.29	6.5	22	22	56	1	0.13	0.16
211	VT105	1	CO566B	CO5609	500	1.23	0.13	38.46	6.5	18	22	60	1	0.13	0.17
212	VT106	1	CO566C	CO5610	560	1.23	0.11	55.65	6.5	14	18	68	1	0.13	0.16
213	VT107	1	CO567A	CO5611	1700	1.36	0.12	3.5	6.5	38	13	49	1	0.13	0.13
214	VT108	1	CO567B	CO5612	1700	1.36	0.12	3.5	6.5	38	13	49	1	0.13	0.13
215	VT109	1	CO568	CO5613	520	1.02	0.2	92.87	6.5	6	10	84	1	0.13	0.11
216	VT110	1	CO569	CO5614	520	1.02	0.2	92.87	6.5	6	10	84	1	0.13	0.11

OBJECTID	MUID	SEQN	SNAM	S5ID	SOL_Z3	SOL_BD3	SOL_AWC3	SOL_K3	SOL_CBN3	CLAY3	SILT3	SAND3	ROCK3	SOL_ALB3	USLE_K3
203	VT097	1	CO561A	CO5601	1500	1.24	0.12	3.65	6.1	50	30	20	1	0.13	0.16
204	VT098	1	CO561B	CO5602	1500	1.26	0.14	21.35	6.1	24	24	52	1	0.13	0.16
205	VT099	1	CO562	CO5603	0	0	0	0	0	0	0	0	0	0	0
206	VT100	1	CO563	CO5604	740	1.21	0.12	63.51	6.1	12	24	64	1	0.13	0.17
207	VT101	1	CO564	CO5605	1000	1.14	0.11	124.85	6.1	4	26	70	1	0.13	0.18
208	VT102	1	CO565A	CO5606	0	0	0	0	0	0	0	0	0	0	0
209	VT103	1	CO565B	CO5607	0	0	0	0	0	0	0	0	0	0	0
210	VT104	1	CO566A	CO5608	1500	1.3	0.13	16.4	6.1	26	20	54	1	0.13	0.16
211	VT105	1	CO566B	CO5609	840	1.19	0.11	91.02	6.1	8	22	70	1	0.13	0.17
212	VT106	1	CO566C	CO5610	860	1.33	0.13	8.3	6.1	32	18	50	1	0.13	0.15
213	VT107	1	CO567A	CO5611	0	0	0	0	0	0	0	0	0	0	0
214	VT108	1	CO567B	CO5612	0	0	0	0	0	0	0	0	0	0	0
215	VT109	1	CO568	CO5613	850	1.07	0.2	65.11	6.1	10	14	76	1	0.13	0.14
216	VT110	1	CO569	CO5614	850	1.07	0.2	65.11	6.1	10	14	76	1	0.13	0.14

OBJECTID	MUID	SEQN	SNAM	S5ID	SOL_Z4	SOL_BD4	SOL_AWC4	SOL_K4	SOL_CBN4	CLAY4	SILT4	SAND4	ROCK4	SOL_ALB4	USLE_K4
203	VT097	1	CO561A	CO5601	0	0	0	0	0	0	0	0	0	0	0
204	VT098	1	CO561B	CO5602	0	0	0	0	0	0	0	0	0	0	0
205	VT099	1	CO562	CO5603	0	0	0	0	0	0	0	0	0	0	0
206	VT100	1	CO563	CO5604	1500	1.22	0.12	63.87	6.1	12	22	66	1	0.13	0.17
207	VT101	1	CO564	CO5605	0	0	0	0	0	0	0	0	0	0	0
208	VT102	1	CO565A	CO5606	0	0	0	0	0	0	0	0	0	0	0
209	VT103	1	CO565B	CO5607	0	0	0	0	0	0	0	0	0	0	0
210	VT104	1	CO566A	CO5608	0	0	0	0	0	0	0	0	0	0	0
211	VT105	1	CO566B	CO5609	1500	1.17	0.11	106.9	6.1	6	24	70	1	0.13	0.17
212	VT106	1	CO566C	CO5610	1500	1.28	0.12	36.37	6.1	18	18	64	1	0.13	0.16
213	VT107	1	CO567A	CO5611	0	0	0	0	0	0	0	0	0	0	0
214	VT108	1	CO567B	CO5612	0	0	0	0	0	0	0	0	0	0	0
215	VT109	1	CO568	CO5613	0	0	0	0	0	0	0	0	0	0	0
216	VT110	1	CO569	CO5614	0	0	0	0	0	0	0	0	0	0	0

Field	**Field definition**
OBJECTID	
MUID	Unique code identifier
SEQN	Sequential number assigned
SNAM	Soil Name
S5ID	
CMPPCT	Not defined
NLAYERS	Number of soil layers
HYDGRP	Soil Hydraulic Group (A,B,C,or D)
SOL_ZMX	Maximum rooting depth of soil profile (mm)
ANION_EXCL	Fraction of porosity (void space) from which anions are excluded
SOL_CRK	Potential or maximum crack volume of the soil profile
TEXTURE	Texture of soil layer

Field	**Field definition**
SOL_Z	Depth from soil surface to bottom of layer (mm)
SOL_BD	Moist bulk density (Mg/m3 or g/cm3).
SOL_AWC	Available water capacity of the soil layer - plant available water (mm H2O/mm soil)
SOL_K	Saturated hydraulic conductivity (mm/hr)
SOL_CBN	Organic carbon content (% soil weight)
CLAY	Clay content (% soil weight)
SILT	Silt content (% soil weight)
SAND	Sand content (% soil weight)
ROCK	Rock fragment content (% soil weight)
SOL_ALB	Moist soil albedo
USLE_K	USLE equation soil erodibility (K) factor (units: 0.013 (metric ton m2 hr)/(m3-metric ton cm))
SOL_EC	Electrical conductivity (dS/m)

Table S2. Stations with climatic and hydrological data available for the Tona watershed.

Station	Agency[1]	North[2]	East[2]	Elevation (m.a.s.l.)	Data type [3]	Period of available data [4]
El Roble	CDMB	1,295,189.9	1,123,241.3	2270	P	2011–2016
El Brasil	AMB	1,280,326.7	1,106,946.7	1662	P	1983–2016
El Gualilo	AMB	1,281,711.6	1,113,007.2	1249	P	2007–2016
Martín Gil	AMB	1,291,529.4	1,119,222.5	2000	P	1983–1996–2007–2016
El Pajal	AMB	1,281,171,1	1'119,017,8	2200	P	2001–2015
La Galvicia	IDEAM	1,278,854.4	1,113,512.2	1779	P	1969–2016
Tona	IDEAM	1,286,249.8	1,122,701.6	1910	P	1967–2016
Berlín	IDEAM	1,286,676.7	1,133,533.1	3214	T-P	1986–2016–1971–2016
UIS	IDEAM	1,281,940.4	1,105,526.4	1018	T-P	1985–2003–1970–2002
Arnania	AMB	1,285,661.1	1,115,615.7		Q	1990–2016
Carrizal	AMB	1,285,289.4	1,117,554.8		Q	1990–2016
Golondrinas	AMB	1,284,445.5	1,117,109.5		Q	1990–2016
Confluencia	AMB	1,284,894.1	1,115,471.9		Q	2011–2014
Puente Tona	AMB	1,283,102.7	1,109,072.9		Q	1984–2015

[1] CDMB: Corporación Autónoma Regional para la Defensa de la Meseta de Bucaramanga; AMB: Acueducto Metropolitano de Bucaramanga; IDEAM: Instituto de Hidrología, Meteorología y Estudios Ambientales. [2] Coordinate system: MAGNA_Colombia_Bogota. [3] P: Daily precipitation, T: Daily maximum and minimum Temperature, Q: mean daily flow. [4] For some stations, data was incomplete or missing at certain intervals within the reported period.

Table S3. Initial calibration parameters used for SWAT-CUP.

No.	Parameter	Type	Lower value	Upper value	Method	Description
1	CN2	.mgt	35	98	r__	SCS runoff curve number
2	ALPHA_BF	.gw	0	1	v__	Baseflow alpha factor (days)
3	GW_DELAY	.gw	0	500	v__	Groundwater delay (days)
4	GWQMN	.gw	0	5000	v__	Treshold depth of water in the shallow aquifer required for return flow to occur (mm)
5	GW_REVAP	.gw	0.02	0.2	v__	Groundwater revap coefficient
6	REVAPMN	.gw	0	500	v__	Threshold depth of water in the shallow aquifer for revap to occur (mm)
7	RCHRG_DP	.gw	0	1	v__	Deep aquifer percolation fraction
8	SOL_Z	.sol	0.00	3500	r__	Depth from soil surface to bottom of layer
9	SOL_BD	.sol	0.9	2.5	r__	Moist bulk density
10	SOL_AWC	.sol	0	1	r__	Available water capacity of the soil layer
11	SOL_K	.sol	0	2000	r__	Saturated hydraulic conductivity
12	CH_N2	.rte	0.01	0.3	v__	Manning's n value for the main channel
13	SLSUBBSN	.hru	10	150	v__	Average slope length
14	OV_N	.hru	0.01	30	r__	Manning's n value for overland flow
15	SLSOIL	.hru	0	150	v__	Slope length for lateral subsurface flow
16	ESCO	.hru	0	1	v__	Soil evaporation compensation factor
17	EPCO	.hru	0	1	v__	Plant uptake compensation factor
18	CH_N1	.sub	0.01	30	v__	Manning's n value for the tributary channels
19	SURLAG	.bsn	0.05	24	v__	Surface runoff lag time
20	SHALLST	.gw	0	50000	v__	Initial depth of water in the shallow aquifer (mm)
21	TLAPS	.sub	-10	10	r__	Temperature lapse rate
22	PLAPS	.sub	-1000	1000	r__	Precipitation lapse rate
23	GW_SPYLD	.gw	0	0.4	v__	Specific yield of the shallow aquifer (m^3/m^3)

This table contains the list of the 23 initial parameters for the automatic calibration using SWAT-CUP. The “Parameter” and “Description” columns contain the name of each of the 23 parameters along with their description; the “Type” column contains the extension of the table where the parameter values are stored within the SWAT database; the “Lower value” and “Upper value” columns contain the minimum and maximum suggested values for each parameter. These values are in the “SWAT Absolute Values” table of SWAT-CUP. The “Method” column contains the planned operation for the variation of each parameter, where “v__” indicates the replacement of the current value for a new one that is randomly selected from within the range of values established during the calibration process, while "r__" indicates the scaling (relative change) of the current value by a number that falls within the 1+Lower relative value and 1+Upper relative value, also randomly selected from within the specified range.

Table S4. Areas (ha) by subwatershed of LULC Scenario A (current LULC).

Sub-watershed	BANA	COFF	PAST	SPAS	RYEG	SWRN	RNGB	ORCD	FRST	PINE	FESP	MESQ	TOTAL (ha)
1			921.4	34.6			253.0		473.1		306.2	803.2	**2791.5**
2			432.2		61.7				103.7	134.2	101.3	133.6	**966.7**
3			29.7		282.8	177.9			476.5			169.7	**1136.7**
4						139.6			82.5	112.9	53.3	804.0	**1192.2**
5			94.7		589.4		716.4		1005.8	235.5		245.1	**2886.8**
6			301.1		333.8	747.9		35.7	162.0			184.3	**1764.7**
7					236.9							19.1	**256.1**
8					6.8		15.8						**22.6**
9	8.9				38.3								**47.2**
10					129.3				7.8				**137.1**
11					425.4		138.2		57.5				**621.0**
12				284.3	235.1		413.8		429.0		0.6	852.3	**2215.0**
13	192.9	231.1	449.4		647.8		398.3	375.7	825.7			245.0	**3365.9**
14			44.9	60.1	173.4		16.3		843.2	204.2		139.8	**1482.0**
Total (ha)	**201.8**	**231.1**	**2174.5**	**284.3**	**3215.5**	**1077.6**	**1959.8**	**375.7**	**4608.5**	**713.0**	**461.4**	**3592.2**	**18885.4**
(%)	**1.07%**	**1.22%**	**11.51%**	**1.51%**	**17.03%**	**5.71%**	**10.38%**	**1.99%**	**24.40%**	**3.78%**	**2.44%**	**19.02%**	**100.0%**

Table S5. Areas (ha) by subwatershed of LULC Scenario B.

Sub-watershed	BANA	COFF	PAST	SPAS	RYEG	SWRN	RNGB	ORCD	FRST	PINE	FESP	MESQ	TOTAL (ha)
1			0.0	0.0			0.0		473.1		306.2	2012.2	**2791.5**
2			0.0		0.0				103.7	134.2	101.3	627.5	**966.7**
3			0.0		0.0	0.0			476.5			660.2	**1136.7**
4						0.0			82.5	112.9	53.3	943.6	**1192.2**
5			0.0		0.0		0.0		1005.8	330.2		1550.8	**2886.8**
6			0.0		0.0	0.0		0.0	162.0			1602.8	**1764.7**
7					0.0							256.1	**256.1**
8					0.0		22.6						**22.6**
9	8.9				0.0		38.3						**47.2**
10					0.0		129.3		7.8				**137.1**
11					0.0		563.6		57.5				**621.0**
12				0.0	0.0		235.1		429.0		0.6	1550.4	**2215.0**
13	0.0	1071.8	0.0		0.0		0.0	375.7	825.7			1092.7	**3365.9**
14			0.0	0.0	0.0		189.7		843.2	204.2		244.9	**1482.0**
Total (ha)	**8.9**	**1071.8**	**0.0**	**0.0**	**0.0**	**0.0**	**1178.5**	**375.7**	**4466.5**	**781.5**	**461.4**	**10541.0**	**18885.4**
(%)	**0.05%**	**5.68%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**6.24%**	**1.99%**	**23.65%**	**4.14%**	**2.44%**	**55.82%**	**100.0%**

Table S6. Areas (ha) by subwatershed of LULC Scenario C.

Sub-watershed	BANA	COFF	PAST	SPAS	RYEG	SWRN	RNGB	ORCD	FRST	PINE	FESP	MESQ	TOTAL (ha)
1			0.0	0.0			0.0		1682.1		306.2	803.2	**2791.5**
2			0.0		0.0				597.6	134.2	101.3	133.6	**966.7**
3			0.0		0.0	0.0			967.0			169.7	**1136.7**
4						0.0			222.1	112.9	53.3	804.0	**1192.2**
5			0.0		0.0		0.0		2406.3	235.5		245.1	**2886.8**
6			0.0		0.0	0.0		0.0	1580.5			184.3	**1764.7**
7					0.0							256.1	**256.1**
8					0.0		22.6						**22.6**
9	8.9				38.3								**47.2**
10					129.3				7.8				**137.1**
11					0.0		138.2		482.9				**621.0**
12				0.0	0.0		0.0		1362.1		0.6	852.3	**2215.0**
13	0.0	231.1	0.0		0.0		0.0	375.7	2514.1			245.0	**3365.9**
14			0.0	0.0	0.0		16.3		1121.6	204.2		139.8	**1482.0**
Total (ha)	**8.9**	**231.1**	**0.0**	**0.0**	**167.6**	**0.0**	**177.1**	**375.7**	**12944.0**	**686.8**	**461.4**	**3832.9**	**18885.4**
(%)	**0.05%**	**1.22%**	**0.00%**	**0.00%**	**0.89%**	**0.00%**	**0.94%**	**1.99%**	**68.54%**	**3.64%**	**2.44%**	**20.30%**	**100.0%**

Table S7. Parameter multipliers for the manual calibration process in ArcSWAT.

Parameter	**Subwatersheds**													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CN2	0.75	0.75	0.75	0.75	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.60	0.64
ALPHA_BF	0.24	0.24	0.24	0.24	0.24	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
GW_DELAY	2.58	2.58	0.16	2.58	5.16	8.06	8.06	3.87	3.87	3.87	8.06	0.32	8.06	2.58
GWQMN	1.33	1.33	1.70	1.36	1.29	1.29	1.36	1.29	1.29	1.29	1.29	2.00	1.29	2.80
GW_REVAP	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
REVAPMN	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
RCHRG_DP	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60
SOL_Z	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.27	0.27	0.38	0.38	0.38	0.27	0.38
SOL_AWC	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
SOL_K	0.75	0.75	0.60	0.75	0.60	0.60	0.60	0.10	0.10	0.60	0.60	0.75	0.10	0.60
CH_N2	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
SLSUBBSN	1.10	1.10	4.20	1.10	19.60	18.20	12.32	22.40	16.80	11.76	15.40	1.40	16.80	2.80
ESCO	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
EPCO	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TLAPS	1/3	1/3	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6
CANMX	15	20		5							5	10		10
ALPHA_BF_D	0.10	0.10	0.10	0.10									0.005	

We did 34 simulations, changing one by one the model´s default values, based on the SWAT-CUP´s final iteration. For all the cases (except CANMX), we scaled the parameters (r__), always looking for the best fit between the observed and modeled monthly discharge values (we calculated de NSE, PBIAS and R^2 statistics for each run).

Table S8. Water yield (WYLD) by subwatershed for the future scenarios.

	Climate Scenario									
	RCP 4.5 (P = 1334.80 mm)					RCP 8.5 (P = 1400 mm)				
Sub-watershed	WYLD {1}	WYLD {3}	% Change[1]	WYLD {5}	% Change	WYLD {2}	WYLD {4}	% Change	WYLD {6}	% Change
1	562.6	700.6	24.5%	646.9	15.0%	603.2	743.6	24.9%	692.0	15.8%
2	597.7	744.4	24.5%	702.4	17.5%	641.4	788.6	24.6%	748.6	17.9%
3	407.8	406.0	−0.4%	407.3	−0.1%	442.4	439.3	−0.7%	442.1	−0.1%
4	674.7	692.5	2.6%	675.3	0.1%	714.7	732.9	2.7%	715.2	0.1%
5	662.4	652.7	−1.5%	645.8	−2.5%	728.2	720.3	−1.2%	718.7	−1.4%
6	186.1	179.8	−3.4%	178.7	−4.0%	196.9	190.5	−3.5%	189.4	−4.1%
7	303.8	298.9	−1.6%	298.9	−1.6%	326.1	320.7	−1.8%	320.7	−1.8%
8	372.5	374.4	0.5%	374.4	0.5%	426.0	428.2	0.6%	428.2	0.6%
9	258.8	258.8	0.0%	258.8	0.0%	288.7	288.7	0.0%	288.7	0.0%
10	569.1	569.1	0.0%	569.1	0.0%	609.1	609.1	0.0%	609.1	0.0%
11	565.0	559.7	−0.9%	551.0	−2.5%	603.2	597.6	−1.0%	588.5	−2.6%
12	532.6	602.3	13.1%	563.1	5.7%	555.8	624.9	13.0%	584.6	5.4%
13	886.4	885.2	−0.1%	882.7	−0.4%	934.6	933.1	−0.2%	930.3	−0.5%
14	510.5	510.5	0.0%	509.6	−0.2%	536.9	536.9	0.0%	534.7	−0.4%

[1] Percent change of WYLD of scenarios {3} and {5} with respect to {1} and of scenarios {4} and {6} with respect to {2}.