

Table S1. E_{ri} of soil in the headwater and the mouth of La Carrasquilla dry riverbed

Layer	Depth (cm)	As	Cd	Cr	Cu	Mn	Ni	Pb	Zn
E_{ri} in the headwater									
L1	0-30	426 (63)	3591 (1635)	0.52 (0.18)	33.2 (8.3)	10.5 (0.8)	3.20 (0.85)	3447 (1540)	274 (86)
L2	30-60	354 (146)	3158 (1878)	0.52 (0.18)	25.1 (2.6)	9.0 (2.1)	3.30 (0.35)	4630 (2325)	268 (139)
L3	60-90	722 (115)	3403 (851)	0.34 (0.11)	29.7 (4.5)	8.4 (1.5)	2.10 (0.43)	7261 (2216)	298 (104)
Mean Eri		501 (195)	3384 (217)	0.46 (0.10)	29.3 (4.1)	9.3 (1.1)	2.86 (0.67)	5113 (1953)	280 (3)
E_{ri} in the mouth									
L1	0-30	31.4 (11.2)	184 (56)	0.68 (0.04)	7.55 (0.25)	1.68 (0.38)	3.85 (0.15)	472 (202)	16.5 (5.6)
L2	30-60	31.3 (17.0)	164 (92)	0.64 (0.06)	7.0 (1.4)	1.54 (0.42)	3.90 (0.45)	626 (430)	15.4 (9.6)
L3	60-90	10.2 (5.2)	54.4 (17.4)	0.68 (0.04)	6.45 (0.75)	1.04 (0.18)	4.05 (0.57)	91.6 (11.2)	4.9 (1.9)
Mean Eri		24.3 (12.2)	134 (70)	0.67 (0.02)	6.98 (0.54)	1.42 (0.34)	3.94 (0.11)	396 (275)	12.3 (6.4)

Hakanson [37] categorized the potential ecological risk of individual metals (E_{ri}) into five levels: low (E_{ri} < 40), moderate (40 ≤ E_{ri} < 80), considerable (80 ≤ E_{ri} < 160), high (160 ≤ 282 E_{ri} < 320), and very high (E_{ri} ≥ 320).

Table S2. Metal(loid)s concentrations in soil from the headwater and the mouth of La Carrasquilla dry riverbed

Layer	Depth (cm)	As	Cd	Cr	Cu	Fe	Mn	Ni	Pb	Zn
Headwater (mg kg⁻¹)										
L1	0-30	298 (44)	38.3 (17.4)	10.4 (3.7)	83.7 (20.8)	150850 (2444)	8086 (642)	13.9 (3.64)	6411 (2863)	11326 (3435)
L2	30-60	248 (102)	33.7 (21.0)	10.4 (3.7)	63.1 (6.5)	114799 (26792)	6892 (1612)	14.2 (1.4)	8611 (4324)	11076 (5767)
L3	60-90	505 (81)	36.3 (9.1)	6.9 (2.1)	74.9 (11.1)	147106 (30541)	6491 (1163)	9.1 (1.9)	13506 (4123)	12341 (4321)
Mean		351 (136)	36.1 (2.3)	9.23 (2.01)	73.9 (10.3)	137584 (19822)	7156 (830)	12.4 (2.9)	9510 (3632)	111581 (670)
Mouth (mg kg⁻¹)										
L1	0-30	22.0 (7.85)	1.96 (0.60)	13.8 (0.8)	19.0 (0.7)	22379 (4356)	1295 (292)	16.7 (0.7)	875 (375)	683 (231)
L2	30-60	21.9 (11.9)	1.75 (0.98)	13.1 (1.3)	17.6 (3.6)	21444 (5658)	1185 (326)	16.9 (1.8)	1164 (800)	637 (397)
L3	60-90	7.17 (3.67)	0.58 (0.19)	13.6 (0.8)	16.2 (1.9)	16153 (2471)	802 (132)	17.6 (2.5)	170 (21)	202 (79)
Mean		17.0 (8.5)	1.43 (0.75)	13.5 (0.4)	17.6 (1.4)	19992 (3357)	1094 (258)	17.1 (0.5)	737 (511)	507 (265)
Reference concentration		7.00	0.32	40.4	12.6	-	770*	21.7	9.7	41.4

*Ministère de l'Environnement du Québec. (2001)

Table S3. Sequential extraction of metal(loid)s in soil from the headwater and the mouth of La Carrasquilla dry riverbed

	Layer	Depth (cm)	As (mg kg ⁻¹)	Cd (mg kg ⁻¹)	Cr (mg kg ⁻¹)	Cu (mg kg ⁻¹)	Fe (mg kg ⁻¹)	Mn (mg kg ⁻¹)	Ni (mg kg ⁻¹)	Pb (mg kg ⁻¹)	Zn (mg kg ⁻¹)
Headwater	1 st Fraction	L1 0-30	0.10 (0.17)	0.26 (0.20)	0.00 (0.00)	0.07 (0.02)	0.11 (0.02)	7.84 (11.85)	0.03 (0.00)	0.63 (0.28)	14.1 (12.1)
		L2 30-60	0.20 (0.24)	0.29 (0.39)	0.00 (0.00)	0.09 (0.02)	0.11 (0.03)	1.64 (0.51)	0.03 (0.02)	1.83 (0.95)	18.7 (26.3)
		L3 60-90	0.37 (0.15)	0.07 (0.05)	0.00 (0.00)	0.05 (0.03)	0.06 (0.02)	5.97 (2.63)	0.01 (0.00)	1.24 (0.31)	2.86 (1.34)
	2 nd Fraction	L1 0-30	0.83 (0.86)	12.6 (8.68)	0.04 (0.02)	1.62 (0.73)	20.1 (16.7)	260 (156)	0.59 (0.26)	735 (737)	1407 (1021)
		L2 30-60	1.14 (0.83)	11.0 (8.4)	0.06 (0.02)	1.66 (1.46)	6.20 (1.73)	348 (278)	0.86 (0.64)	2214 (1770)	2288 (2485)
		L3 60-90	2.69 (0.63)	8.13 (5.61)	0.05 (0.03)	1.44 (1.10)	8.28 (3.61)	708 (235)	0.47 (0.13)	2446 (1703)	1340 (1148)
	3 rd Fraction	L1 0-30	73.1 (7.56)	19.0 (9.8)	1.10 (0.33)	10.7 (3.5)	12522 (1579)	5516 (353)	3.72 (1.36)	430 (242)	4322 (1564)
		L2 30-60	52.6 (27.3)	18.3 (10.9)	1.20 (0.40)	6.12 (1.99)	10670 (2836)	5418 (728)	4.36 (0.55)	2318 (1602)	5544 (3240)
		L3 60-90	117 (65)	15.4 (9.3)	1.12 (0.25)	1.10 (0.27)	24970 (5220)	4194 (1011)	2.95 (0.62)	996 (584)	4277 (1923)
	4 th Fraction	L1 0-30	8.83 (4.30)	1.38 (0.87)	0.68 (0.07)	12.0 (4.7)	6041 (1397)	441 (105)	1.89 (0.66)	142 (49)	560 (293)
		L2 30-60	9.14 (1.70)	1.25 (0.48)	0.78 (0.40)	15.7 (4.54)	5549 (3985)	538 (222)	1.77 (0.69)	334 (260)	579 (126)
		L3 60-90	25.4 (8.6)	6.72 (6.65)	0.50 (0.17)	35.0 (22)	6123 (2690)	841 (590)	1.65 (0.37)	233 (151)	1983 (999)
	5 th Fraction	L1 0-30	379 (21)	3.63 (0.49)	10.7 (3.62)	66.7 (14.6)	149697 (15566)	1641 (510)	11.1 (3.3)	4911 (3447)	4466 (802)
		L2 30-60	307 (111)	3.25 (1.43)	14.8 (8.5)	46.8 (3.2)	113557 (33333)	1800 (1437)	8.13 (2.47)	2651 (983)	3076 (337)
		L3 60-90	1013 (387)	27.2 (15.1)	10.9 (4.9)	931 (220)	171236 (55151)	1774 (796)	10.4 (5.7)	9043 (2641)	11078 (4595)
Mouth	1 st Fraction	L1 0-30	0.06 (0.06)	0.00 (0.00)	0.00 (0.00)	0.13 (0.02)	0.03 (0.02)	0.95 (0.98)	0.04 (0.02)	0.12 (0.10)	0.23 (0.03)
		L2 30-60	0.05 (0.05)	0.00 (0.00)	0.00 (0.00)	0.10 (0.02)	0.03 (0.05)	0.34 (0.30)	0.02 (0.01)	0.15 (0.14)	0.24 (0.14)
		L3 60-90	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.06 (0.03)	0.00 (0.00)	0.13 (0.05)	0.01 (0.00)	0.04 (0.02)	0.09 ()
	2 nd Fraction	L1 0-30	0.84 (0.28)	0.68 (0.21)	0.04 (0.00)	0.29 (0.01)	1.74 (0.82)	64.0 (14.8)	0.34 (0.02)	42.0 (25.2)	22.4 (12.7)
		L2 30-60	1.30 (0.75)	0.56 (0.23)	0.04 (0.00)	0.22 (0.04)	2.45 (1.99)	29.3 (13.1)	0.25 (0.02)	59.2 (58.5)	13.1 (10.0)
		L3 60-90	0.22 (0.11)	0.25 (0.10)	0.05 (0.00)	0.20 (0.02)	1.74 (1.00)	7.35 (2.85)	0.14 (0.04)	5.17 (4.21)	2.18 (1.86)
	3 rd Fraction	L1 0-30	7.24 (2.26)	0.94 (0.31)	0.78 (0.09)	1.38 (0.41)	1251 (531)	862 (152)	4.39 (0.48)	512 (226)	256 (119)
		L2 30-60	6.84 (3.18)	0.88 (0.47)	0.94 (0.11)	2.70 (0.91)	1372 (725)	862 (197)	5.40 (0.58)	746 (514)	242 (186)
		L3 60-90	3.25 (1.16)	0.34 (0.16)	1.17 (0.29)	4.23 (1.21)	852 (393)	761 (187)	7.75 (1.04)	147 (74)	61.3 (9.8)
	4 th Fraction	L1 0-30	2.44 (0.68)	0.06 (0.02)	1.05 (0.16)	1.61 (0.32)	589 (305)	49.2 (19.9)	1.34 (0.26)	71.3 (24.2)	37.1 (15.2)
		L2 30-60	2.27 (1.11)	0.06 (0.02)	0.91 (0.07)	1.05 (0.38)	537 (329)	42.4 (14.3)	1.10 (0.07)	73.2 (47.3)	33.0 (19.2)
		L3 60-90	0.56 (0.33)	0.02 (0.01)	1.33 (0.33)	0.58 (0.16)	181 (70)	29.9 (12.1)	1.33 (0.35)	18.6 (7.7)	8.00 (2.84)
	5 th Fraction	L1 0-30	17.9 (3.7)	0.21 (0.08)	9.92 (1.34)	17.1 (0.2)	18551 (4106)	184 (55)	8.16 (1.15)	176 (57)	338 (106)
		L2 30-60	15.0 (9.4)	0.14 (0.08)	8.39 (2.20)	13.4 (3.8)	14457 (4189)	134 (46)	7.21 (1.90)	125 (69)	245 (109)
		L3 60-90	7.73 (3.8)	0.04 (0.02)	9.11 (3.54)	10.4 (3.4)	11691 (6113)	88.3 (40.8)	7.01 (1.51)	43.2 (13.2)	123 (40)

Table S4. Mineralogy of soil from the headwater and the mouth of La Carrasquilla dry riverbed

Compound Name	Formula	S-Q
Soil layer headwater (81% crystallinity)		
Quartz	SiO ₂	13%
Muscovite	KAl ₂ (Si,Al) ₄ O ₁₀ (OH) ₂	58%
Clinochlore. Fe-bearing	(Mg,Fe) ₆ (Si,Al) ₄ O ₁₀ (OH) ₈	10%
Gypsum	Ca(SO ₄)(H ₂ O) ₂	7%
Plumbojarosite	(Pb _{0.34} K _{0.19})Fe ₃ (SO ₄) ₂ (OH) ₆	4%
Calcite.	CaCO ₃	3%
Edenite	Na _{0.76} (Na _{0.46} Ca _{1.46} Fe _{1.4} Mg _{3.68})(Si _{7.04} Al _{0.96})O ₂₂ (OH) ₂	2%
Goethite	FeO(OH)	1%
Dolomite. Fe-bearing	CaMg _{0.6} Fe _{0.4} (CO ₃) ₂	1%
Soil layer mouth (75% crystallinity)		
Quartz	SiO ₂	32%
Muscovite	KAl ₂ (Si,Al) ₄ O ₁₀ (OH) ₂	28%
Montmorillonite	Na _{0.3} (Al,Mg) ₂ Si ₄ O ₁₀ (OH) ₂ ·8H ₂ O	15%
Calcite	CaCO ₃	12%
Microcline. Na-bearing	K _{0.9} Na _{0.1} AlSi ₃ O ₈	3%
Clinochlore. Fe-bearing	(Mg,Fe) ₆ (Si,Al) ₄ O ₁₀ (OH) ₈	3%
Clintonite	Ca ₃ Al(Al ₃ SiO ₁₀)(OH) ₂	3%
Albite	NaAlSi ₃ O ₈	1%
Dolomite. Fe-bearing	CaMg _{0.6} Fe _{0.4} (CO ₃) ₂	1%
Gypsum	Ca(SO ₄)(H ₂ O) ₂	1%
Goethite	FeO(OH)	0.30%

Table S5. MEI of pore water in the headwater and the mouth of La Carrasquilla dry riverbed.

Layer	Depth (cm)	As	Cd	Cr	Cu	Mn	Ni	Pb	Zn
MEI -Pore water headwater									
L1	0-30	0.33 (0.15)	0.07 (0.02)	0.01 (0.01)	0.00 (0.00)	1.23 (0.46)	0.06 (0.02)	0.16 (0.08)	0.02 (0.01)
L2	30-60	0.71 (0.46)	0.12 (0.06)	0.01 (0.01)	0.00 (0.0)	3.26 (1.44)	0.06 (0.02)	0.26 (0.05)	0.04 (0.02)
L3	60-90	0.45 (0.13)	0.15 (0.06)	0.00 (0.00)	0.00 (0.00)	79.6 (3.65)	0.09 (0.03)	0.01 (0.01)	0.03 (0.01)
Mean		0.50 (0.20)	0.11 (0.04)	0.00 (0.00)	0.00 (0.00)	28.0 (44.7)	0.07 (0.02)	0.14 (0.13)	0.03 (0.01)
MEI -Pore water mouth									
L1	0-30	0.47 (0.17)	0.05 (0.02)	0.00 (0.00)	0.00 (0.00)	0.68 (0.48)	0.09 (0.05)	0.05 (0.04)	0.00 (0.00)
L2	30-60	0.19 (0.10)	0.03 (0.01)	0.00 (0.00)	0.00 (0.00)	1.55 (0.79)	0.05 (0.02)	0.00 (0.00)	0.00 (0.00)
L3	60-90	0.11 (0.06)	0.02 (0.01)	0.00 (0.00)	0.00 (0.00)	2.97 (0.75)	0.02 (0.01)	0.00 (0.00)	0.00 (0.00)
Mean		0.26 (0.19)	0.03 (0.02)	0.00 (0.00)	0.00 (0.00)	1.73 (1.16)	0.05 (0.03)	0.02 (0.03)	0.00 (0.00)

MEI < 1 is deemed suitable and MEI >1 not suitable . The classifications of the MEI index are as follows: low (< 10), medium (10 ≤ MEI < 20), and high (> 20) [43].

Table S6. Sequential extraction of metals in sediments from the headwater and the mouth of La Carrasquilla dry riverbed

		As (mg kg ⁻¹)	Cd (mg kg ⁻¹)	Cr (mg kg ⁻¹)	Cu (mg kg ⁻¹)	Fe (mg kg ⁻¹)	Mn (mg kg ⁻¹)	Ni (mg kg ⁻¹)	Pb (mg kg ⁻¹)	Zn (mg kg ⁻¹)
Headwater	1st Fraction	0.03 (0.01)	0.04 (0.00)	0.01 (0.00)	0.16 (0.01)	0.18 (0.06)	1.50 (0.61)	0.03 (0.00)	0.07 (0.01)	1.41 (0.22)
	2nd Fraction	1.45 (0.20)	6.19 (0.77)	0.09(0.01)	1.23 (1.15)	12.9 (1.53)	427 (11)	0.38 (0.02)	149 (8)	1053 (131)
	3rd Fraction	55.4 (3.7)	14.2 (1.45)	1.36 (0.09)	9.96 (5.88)	16078 (945)	5220 (267)	2.23 (0.06)	1799 (20)	3254 (224)
	4th Fraction	11.1 (3.0)	2.25 (0.033)	1.01 (0.01)	22.4 (9.7)	2914 (482)	1292 (135)	3.93 (0.40)	148 (1)	1047 (36)
	5th Fraction	376 (61)	7.15 (0.29)	26.1 (4.3)	90.9 (18.3)	240093 (3143)	2891 (87.0)	26.8 (4.5)	1507 (130)	5999 (519)
Mouth	1st Fraction	0.12 (0.01)	0.00 (0.00)	0.01 (0.00)	0.17 (0.05)	0.16 (0.06)	1.21 (1.09)	0.03 (0.01)	0.04 (0.02)	0.00 (0.00)
	2nd Fraction	0.69 (0.08)	0.70 (0.30)	0.07 (0.01)	0.20 (0.02)	0.42 (0.06)	104 (51)	0.43 (0.13)	29.8 (10.9)	52.8 (41.9)
	3rd Fraction	5.84 (0.56)	1.09 (0.58)	0.79 (0.11)	1.89 (0.48)	1478 (669)	976 (394)	3.45 (0.21)	432 (126)	348 (231)
	4th Fraction	2.78 (0.26)	0.21 (0.14)	1.97 (0.71)	3.34 (2.33)	886 (1226)	123 (25)	2.53 (0.67)	113 (60)	114 (102)
	5th Fraction	17.5 (4.5)	0.65 (0.58)	15.3 (1.33)	16.0 (2.85)	33839 (15034)	311 (184)	11.9 (1.6)	256 (120)	834 (564)

Table S7. Mineralogy of sediments from headwater and the mouth of La Carrasquilla dry riverbed

Compound Name	Formula	S-Q
Sediment from the headwater (79% crystallinity)		
Quartz	SiO ₂	26%
Muscovite	KAl ₂ (Si,Al) ₄ O ₁₀ (OH) ₂	33%
Clinochlore. Fe-bearing	(Mg,Fe) ₆ (Si,Al) ₄ O ₁₀ (OH) ₈	17%
Gypsum	Ca(SO ₄)(H ₂ O) ₂	8%
Calcite	CaCO ₃	5%
Clintonite	Ca ₃ Al(Al ₃ SiO ₁₀)(OH) ₂	3%
Albite	NaAlSi ₃ O ₈	2%
Dolomite. Fe-bearing	CaMg _{0.6} Fe _{0.4} (CO ₃) ₂	2%
Plumbojarosite	(Pb _{0.34} K _{0.19})Fe ₃ (SO ₄) ₂ (OH) ₆	1%
Goethite	FeO(OH)	2%
Bianchite	(Zn,Fe)SO ₄ ·6H ₂ O	1%
Magnetite. Mg-bearing	Mg _{0.4} Ti _{0.03} Fe _{2.47} Al _{0.1} O ₄	1%
Sediment from the mouth (81% crystallinity)		
Quartz	SiO ₂	41%
Muscovite	KAl ₂ (Si,Al) ₄ O ₁₀ (OH) ₂	23%
Montmorillonite	Na _{0.3} (Al,Mg) ₂ Si ₄ O ₁₀ (OH) ₂ ·8H ₂ O	13%
Calcite	CaCO ₃	12%
Microcline. Na-bearing	K _{0.9} Na _{0.1} AlSi ₃ O ₈	4%
Clinochlore. Fe-bearing	(Mg,Fe) ₆ (Si,Al) ₄ O ₁₀ (OH) ₈	3%
Clintonite	Ca ₃ Al(Al ₃ SiO ₁₀)(OH) ₂	3%
Albite	Na(AlSi ₃ O ₈)	1%
Goethite	FeO(OH)	0.4%
Dolomite. Fe-bearing	CaMg _{0.6} Fe _{0.4} (CO ₃) ₂	0.8%

Table S8. Physicochemical characteristics of runoff water from La Carrasquilla dry riverbed

Sample	rain date	pH	EC (ms cm ⁻¹)	SO ₄ ²⁻ (mg L ⁻¹)	Ca ²⁺ (mg L ⁻¹)	Na ⁺ (mg L ⁻¹)	Cl ⁻ (mg L ⁻¹)
Runoff water headwater							
R1		6.51	10.5	2723	337	445	923
R2		6.68	3.87	1773	329	163	357
R3		6.92	1.86	1021	364	23	29
Runoff water mouth							
R1		7.27	3.45	162	65.4	218	304
R2		7.72	0.40	18.9	28.5	191	68.0
R3		7.52	6.48	780	167	724	1293

R1(March 18); R2(March 23); R3(March 28). EC: electrical conductivity; SO₄²⁻: sulphate; Ca²⁺; Na⁺: sodium; Cl⁻: chloride.