

*Supplementary materials*

# Influence of Historical Land-Use Change on Contemporary Channel Processes, Form, and Restoration

Jerry R. Miller <sup>1,\*</sup>, David Grow <sup>2</sup>, and L. Scott Philyaw <sup>3</sup>

<sup>1</sup> Department of Geosciences & Natural Resources, Western Carolina University, Cullowhee, NC 28723, USA

<sup>2</sup> P.O. Box 215, English, IN 47118, USA; [dgrow@coopsonline.com](mailto:dgrow@coopsonline.com)

<sup>3</sup> Department of History, Western Carolina University; Cullowhee, NC 28723, USA; [philyaw@wcu.edu](mailto:philyaw@wcu.edu)

\* Correspondence: [jmiller@wcu.edu](mailto:jmiller@wcu.edu); 1-828-227-2269

**Citation:** Miller, J.R.; Grow, D.; Philyaw, L. S. Influence of Land-Use Change on Contemporary Channel Processes, Form, and Restoration. *Geosciences* **2021**, *11*, 423. <https://doi.org/10.3390/geosciences11100423>

Academic Editor: Luca Mao and Jesus Martinez-Frias

Received: 21 August 2021

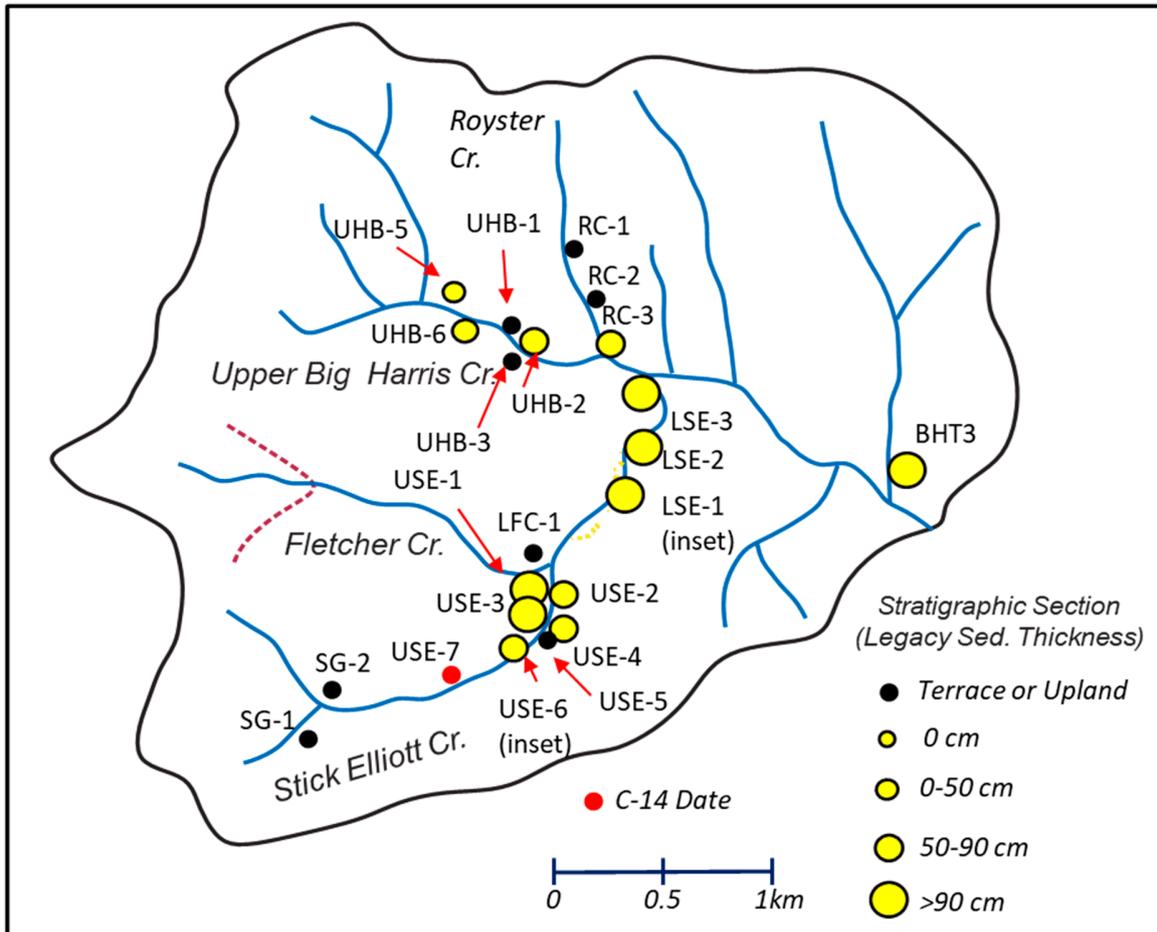
Accepted: 10 October 2021

Published: 15 October 2021

**Publisher's Note:** MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Copyright:** © 2021 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).



**Figure S1.** Location of described alluvial stratigraphic sections, and the general thickness of the legacy sediments. Radiocarbon dates were obtained on samples collected at USE-7 and USE-2 (see Table S3).

**Table S1.** Descriptions of Stratigraphic Profiles.

**Note:** Delineation and characterization of the stratigraphic units and facies focused on parameters that were found in previous studies to be useful for the delineation of legacy and precolonial deposits, including (1) color, (2) organic matter content, (3) grain size (texture), (4) stratification, and (5) degree of weathering. The vertical character of the units was described along a narrow (<50 cm) profile that extended from the ground surface to the channel bed, and were based on the nomenclature outlined in the U.S. Soil Survey Manual (Soil Survey Division Staff, 1993. Soil Survey Manual. USDA-NRCS Agricultural Handbook 18, Washington D.C., U.S. Government Printing Office).

<b>USE-1 (Stick Elliott Creek); 17S 0444818, 3917479</b>	
<b>Geomorphic Setting:</b> Bank exposure along entrenched alluvial channel	
<b>Interpreted Units:</b> Legacy sediments (0–113 cm) over pre-colonial deposits; large, well-define paleochannel adjacent to described profile. Paleochannel width about 5 m; depth about 1.5 m; bed of paleochannel about 20 cm above modern channel bed. Paleochannel filled with black to dark grey loamy sediments interpreted to be precolonial sediments. Paleochannel is overlaying by legacy sediments. Channel bed at about 190 cm below valley floor.	
<b>Depth</b>	<b>General Unit Characteristics</b>
0–25	Light reddish brown, loamy fine to medium sand; weak crumb to massive structure; common fine to medium gradational lower boundary.
25–67	Dark brown to reddish brown loam, some grey mottling; locally micaceous; weak subangular block structure; 1 cm thick, discontinuous sand lenses; clay films along root pores; wavy irregular lower boundary.
67–97	Mixture of coarse red (rusty orange) sand and light grey to reddish grey, medium to coarse sandy loam, slightly micaceous; some discontinuous sand layers; others continuous over several meters; sand layers laminated and/or locally cross bedded; coarser brownish yellow to red (rusty orange) sand; abrupt lower boundary.
97–113	Unit locally pinches out laterally; dominated by reddish brown loamy sediments that includes rare >1cm pebbles dispersed throughout, along with some thin discontinuous, poorly sorted sand lenses; locally reworked black sandy loam material from underlying unit forms clast-like feature in unit; abrupt lower boundary.
113–175	Significant change from above; unit characterized by massive, black, sandy loam that forms erosionally resistant “ledge” along bank; locally, dark grey, medium sandy loam lenses which pinch out laterally; rare >1cm pebbles.
175–187	Dominated by sandy loam; similar to overlying unit, but possesses finer-grained and lighter grey (dark to light grey) in color with local mottling; subangular blocky structure; slightly sticky, slightly plastic, clear lower boundary.
187+	Loose gravel containing a loam to loamy sand matrix; some thin loamy sand lenses in gravel. Intermediate gravel diameters up to ~10 cm.
<b>USE-2 (Stick Elliott Creek); 17S 0444613, 3917326</b>	
<b>Geomorphic Setting:</b> Bank exposure along entrenched alluvial channel; small gully downstream of described profile allows for three-dimensional view of deposits.	
<b>Interpreted Units:</b> Legacy sediments (83 cm) over pre-colonial deposits. Channel bed at 140 cm.	
<b>Depth</b>	<b>General Unit Characteristics</b>
0–22	Massive, dark reddish brown fine-sandy loam; micaceous; crumb structure.
22–83	Stratified fine to medium sand; sand layers range in thickness from ~1–3 cm; two colors present – light reddish grey to brownish yellow to reddish brown in color; sand is generally well-sorted and loose; layer boundaries are wavy; some are laterally discontinuous over a few 10s of cm; occasional sand layers

	contain lens of loamy/clayey sediment; unit easily eroded and forms concaved-in section within the bank profile; locally burrowed; light grey mottling occurs between 76–83 cm, along with local clay drapes; abrupt lower boundary.
83–130	Massive, black unit; locally mottled grey; contains laterally discontinuous sand lens (grey); abundance of sand size sediments and fine gravel increases with depth; wavy lower boundary.
130–140	Medium to coarse sandy gravel; intermediate gravel diameter up to ~ 8 cm; matrix is grey in color and locally contains significant clay and wood.

**USE-3 (Stick Elliott Creek); 17S 0444782, 3917198**

**Geomorphic Setting:** Bank exposure along entrenched alluvial channel

**Interpreted Units:** Legacy sediments (90 cm) over Pre-colonial deposits; pre-colonial unit rests on saprolite about 2 m downstream of where profile was described. Channel bed at about 190 cm below valley floor.

<i>Depth</i>	<i>General Unit Characteristics</i>
0–15	Massive, greyish brown fine-sandy loam; loose to weak crumb structure; smooth, planar lower boundary
15–44	Reddish brown, loam to clay loam; subangular blocky structure; no stratification; some rare clasts <.5cm in diameter disseminated throughout unit; clear lower boundary
44–77	Reddish brown loam containing laterally discontinuous, locally cross bedded, fine to medium sand lenses; laterally, lenses are about 6 cm long and 1 cm thick, but frequency and thickness of sand lenses increase with depth; sand-layers are wavy in nature, with clear boundaries; unit is locally burrowed, and easily eroded; grey mottling occurs near base of unit; clear, wavy lower boundary.
77–90	Tan to reddish brown, loose, well-sorted, medium to coarse sand; locally laminated and cross bedded; abrupt lower boundary
90–177	Black to greyish black, massive, organic rich, loam; locally sandy; sand content increases with depth; gradational lower boundary
>177	Gravel; dominant clast size ranges from about 3.5 to 2 cm in intermediate diameter; gravel is surrounded by grey sandy matrix; saprolite visible about 2 m downstream under gravel unit.

**USE-4 (Stick Elliott Creek); 17S 0444788, 3917220**

**Geomorphic Setting:** Bank exposure along entrenched alluvial channel.

**Interpreted Units:** Legacy sediments (65 cm) over pre-colonial deposits; pre-colonial sediments less distinct than at many other sites. Channel bed at about 184 cm below valley floor.

<i>Depth</i>	<i>General Unit Characteristics</i>
0–10	Grey, fine sandy silt; loose to weak crumb structure; clear smooth, wavy boundary.
10–37	Massive, reddish brown, slightly micaceous, loam; subangular block structure; clear lower boundary.
37–65	Fine to medium sand; a few lenses consisting of silty to clayey loam and loamy medium sand; one 5 cm long, 1 cm thick gravel lens present; gavel in lens is poorly sorted and loose; clasts generally < 1 cm in intermediate diameter; abrupt lower boundary.
65–102	Grey, cohesive, medium sandy loam; subangular block structure; no stratification; small granules throughout unit; reddish brown clay films on ped surfaces; locally mottled; clear, smooth boundary.
102–137	Clast supported gravel; gravel size ranges from about 2 to 4 cm intermediate diameter and increases with depth; no apparent imbrication; some clasts of saprolite contained in lower part of unit.
137–169	Grey, coarse loamy sand; micaceous.
>169	Saprolite; bedrock observed downstream of site of profile.

**USE-5 (Stick Elliott Creek); 17S 0441830, 3916541**

**Geomorphic Setting:** Bank exposure along entrenched alluvial channel; weathered upland terrace that pre-dates precolonial sediments in valley floor; terrace is not well preserved in study area; terrace tread is overlain by colluvial sediment from hillslope.

**Interpreted Units & comments:** Older terrace sediments

<i>Depth (cm)</i>	<i>General Unit Characteristics</i>
0-14	Reddish brown, loose, loamy medium to coarse sand; clear lower boundary.
14-110	Dark reddish-brown, massive (non-stratificied) loam; becomes mottled (grey) below 65 cm; subangular block structure; gradational lower boundary.
110-145	Grey, coarse sandy loam; gravels dispersed throughout unit and increase in abundance with depth; clear lower boundary.
145->175	Gravel; clast size ranges between 7 to 10 cm in intermediate diameter; mostly clast supported; sand to loam matrix; lots of subrounded quartz clasts; color changes to white gravel below 175 cm.

**USE-6 (Stick Elliott Creek); 17S 441803, 3917092 (approximate)**

**Geomorphic Setting:** Bank exposure along entrenched alluvial channel immediately upstream of meander bed.

**Interpreted Units:** Inset terrace set within the entrenched channel; terrace tread is about 75 cm below valley floor; terrace is laterally discontinuous – it cannot be identified downstream; upstream, eroded remnants are locally present for about 200 m.

<i>Depth (cm)</i>	<i>General Unit Characteristics</i>
0-109	Light brown to pale yellow, stratified, loose medium to coarse sand; stratification created by discontinuous sand lenses of varying grain size, along with local laminations. Some granules disseminated throughout unit below a depth of 99 cm; abrupt lower boundary.
109-165	Dark reddish brown, silty medium to coarse loamy sand interbedded with lighter (pale yellow) coarse sand; loose, moderate sorted coarse sand with granules at bottom of unit; clear lower boundary.
>165	Clast supported gravel unit; clasts range up to 5 cm in maximum diameter; many clasts composed of quartz; no imbrication.

**SG-1 (School Yard Gully); 17S 0443612, 3916659**

**Geomorphic Setting:** Exposure along deep active gully, about 15 m downstream of headcut and about 20 m upstream of Upper Stick Elliott Creek; gully cut primarily into hillslope at this site; headcut extends into unincised alluvial channel (linear depression).

**Interpreted Units:** Colluvium overlying upland sediments; well-developed soil in deposit, including thick B-horizon.

<i>Depth</i>	<i>Unit</i>
0-20	Strongly weather sediment; Pale yellow to dark brown, loam; very plastic; very sticky; subangular block structure; some small fragments present up to 1 cm in size; highly indurated (very difficult to remove with a knife).
20-75	Dark reddish brown to pale yellow clay loam; sticky; plastic; block structure; angular rock fragments disseminated throughout (~0.3 cm); indurated; clear lower boundary.
123-490+	Moderately weathered loamy, dark brown to tan (pale yellow) sands; grades downward into light grey sands; contains highly weathered rock fragments; massive; well-indurated (very difficult to remove with a knife).

**SG-2 (School Yard Gully); 17S 0443630, 3916737**

**Geomorphic Setting:** Bank exposure along highly incised channel immediately below gully-Upper Stick Elliott Creek confluence; alluvial valley fill is very limited in area and merges with hillslope colluvium.

**Interpreted Units:** Precolonial deposits on valley floor deposits that merge with soils beneath lower hillslope colluvium; overlies Holocene alluvial deposits and saprolite at depth.

<i>Depth (cm)</i>	<i>Unit</i>
0-15	Loose, dark brown fine to medium sand interbedded with grey, fine to medium sand; micaceous; clear lower boundary (colluvium).
15-57	Black loam; plastic, sticky, angular blocky structure; a few clasts throughout up 0.5 cm in diameter; abundant organics; lower boundary is wavy and irregular (precolonial, organic rich A-horizon found downstream with precolonial sediments).
57-90	Loose, dark grey, loamy fine sand with rock fragments up to 3 cm in diameter; angular blocky structure; lenses of black unit in upper part of horizon; highly indurated (difficult to remove sediment with a knife); lower boundary is wavy and irregular.
90->100	Poorly sorted gravel containing clasts up to 10 cm in diameter overlying saprolite; dark grey to black lenses of organic sediments in unit; subangular block structure; medium sand matrix; highly indurated; a few clasts about 1 cm in diameter throughout unit.

**LFC-1** (Lower Fletcher Creek, upstream of Stick Elliott Cr.); 17S 0441772, 391657

**Geomorphic Setting:** Bank exposure of upland, hillslope sediments

**Interpreted Units:** Highly weathered upland, hillslope sediments of Quaternary age

<i>Depth</i>	<i>Unit</i>
0-30	Reddish brown to grey fine sandy loam; weak crumb structure; heavily rooted, forms overhanging slab; abrupt lower boundary.
30-80	Dark red, clay loam; angular blocky structure; many large clasts about 1-3 cm in intermediate diameter throughout unit; local loamy sands present; highly indurated; gradational lower boundary.
80-185	Dark red, clay loam; very common pebbles about 1 cm in diameter throughout unit; some pale yellow (tan) sand lenses present; 1 to 3 cm clasts in unit from 73-80 cm; angular block structure; locally mottled below 115 cm; clay coatings on ped faces and root pores; gradational lower boundary.
<185	Loose, well-sorted pale yellow sand with some large (10-15 cm intermediate diameter) clasts resting on saprolite.

**LSE-1** (Lower Stick Elliott Creek); 17S 0442171, 3915828

**Geomorphic Setting:** Inset terrace near R17 groundwater wells; surface is about 0.75 m below valley floor; bedrock exposed in channel; channel incision is limited (~2 m).

**Interpreted Units:** Inset terrace deposited following channel incision around mid-1900s.

<i>Depth (cm)</i>	<i>Unit</i>
0-47	Brown to light reddish brown, micaceous, very fine sandy loam; massive at top; thin, reddish brown to pale yellow, fine sand lenses interbedded with finer-grained layers below 20 cm; lenses 'pinch out' laterally; wavy, irregular boundary.
47-110	Loamy fine to medium sand; becomes mottled below 66 cm; locally, unit characterized by interbeds of grey and black sand, especially below 78 cm.

**LSE-2** (Lower Stick Elliott Creek); 17S 0442157, 3916033

**Geomorphic Setting:** Bank exposure along entrenched channel; wide valley floor.

**Interpreted Units:** Legacy sediments (~1 m) resting on precolonial gravel deposits; dark, organic rich buried A horizon is missing.

<i>Depth</i>
--------------

<i>(cm)</i>	<i>Unit</i>
0-10	Loose, reddish brown fine sandy loam; massive, clear lower boundary.
10-35	Reddish brown loam; no stratification; few granules disseminated throughout unit; clear irregular boundary.
35-100	Loose, fine to medium sand; grain size increases with depth and becomes better sorted, eventually reaching well-sorted status; becomes mottled below about 50 cm; abrupt, erosional contact with underlying gravels.
>100	"Indurated" gravel containing grey sandy matrix; most clasts range between 4-5 cm, but some up to 20 cm intermediate diameter; gravel rests on saprolite/bedrock.

**LSE-3 (Lower Stick Elliott Creek, immediately upstream of Big Harris Cr.; 17S 442277, 3915911)**

**Geomorphic Setting:** Bank exposure along entrenched channel (~2 m deep); relatively narrow valley floor.

**Interpreted Units:** Legacy sediments immediate beneath valley floor that overlies precolonial deposits.

<i>Depth (cm)</i>	<i>Unit</i>
0-9	Loamy fine to medium sand; a few granules dispersed throughout; clear lower boundary.
9-163	Loose, pale yellow to reddish brown fine to medium interbedded sand lenses; sand lenses locally discontinuous over distances of 1 to 2 m; locally micaceous and contains a lot of organic debris; becomes mottled below about 150 cm; clear lower boundary.
163-195	Black, organic rich, very fine sandy loam; massive (non-stratified); subangular block structure; plastic and slightly sticky; locally mottled, abrupt lower boundary.
>195	Gravel layer composed of large clasts, exceeding 15 cm in maximum diameter; clast supported; brownish grey coarse sand matrix.

**RC-1 (Royster Creek); 17S 0444977, 3918713**

**Geomorphic Setting:** Bank exposure along lower part of channel bank; channel cross-section is V-shaped and deeply cut into hillslope materials; ground surface slopes toward channel.

**Interpreted Units:** Colluvium overlying upland sediments, which then overlies saprolite.

<i>Depth (cm)</i>	<i>Unit</i>
0-22	Loose, dark grey to reddish brown, fine to medium sand containing highly weathered gneiss; local clasts of feldspar and quartz present; very micaceous; probably colluvial sediments.
22-100	Highly weathered bedrock characterized by lenses of light grey to oxidized loamy sands and clay loams; laminations appear to represent remnants of bedrock, some possibly consisting of amphibolite and other highly micaceous metamorphic rocks; materials are well-indurate, and are difficult to penetrate with a knife; sediments are very sticky and plastic.

**RC-2 (Royster Creek); 17S 0445053, 3918554**

**Geomorphic Setting:** Bank exposure along lower part of channel bank; channel cross-section is V-shaped and deeply cut (>5-6 m) into hillslope materials; only the lower part of the bank adjacent to channel could be described; upper part was too steep and covered by vegetation; ground surface slopes toward channel; only lower most bank sediments were exposed.

**Interpreted Units:** Colluvium overlying upland sediments, which in turn overlies saprolite

<i>Depth (cm)</i>	<i>Unit</i>
-------------------	-------------

0-70	Highly weathered bedrock characterized by lenses of light grey to oxidized (reddish brown to red) loamy sands and clay loams; laminations appear to represent remnants of bedrock, some possibly consisting of amphibolite and other highly micaceous metamorphic rocks; materials are well-indurate, and are difficult to penetrated with a knife; sediments are very sticky and plastic.
------	--

**RC-3 (Royster Creek)** (exact coordinates missing)

*Geomorphic Setting:* About 100 m upstream of confluence with Upper Big Harris Creek and immediately downstream of highly incised channel; valley floor relatively narrow and not well-defined.

*Interpreted Units:* Legacy sediments (~53 cm) overlying precolonial deposits; lower boundary of legacy sediments is difficult to define as the dark, organic rich buried A-horizon is missing.

<i>Depth (cm)</i>	<i>Unit</i>
0-17	Brown, micaceous coarse to fine sandy loam, subangular block structure; massive, abrupt lower boundary.
17-23	Reddish brown medium sand; loose to weak crumb structure; clear, irregular boundary.
23-108	Brown very fine sandy loam; granules and clasts up to 2 cm in diameter through out unit; becomes mottled (grey) with depth, particularly below 53 cm; indurated; gradational, irregular lower boundary.
108-139	Light grey, fine to medium sandy loam; very abundant mottling; very plastic; sticky; indurated; clear lower boundary.
139-155	Grey, medium to coarse loamy sand; fragments up to 1 cm in diameter throughout unit.
<155	Gravel, clast supported with poorly sorted sand matrix.

**UBH-1 (Upper Big Harris Creek);** 17S 0444781, 3918455

*Geomorphic Setting:* Bank exposure along outside bend of meander; profile on lower part of high upland surface sloping toward channel.

*Interpreted Units:* Weathered upland Quaternary sediments covered by thin layer of colluvium.

<i>Depth (cm)</i>	<i>Unit</i>
0-10	Light grey to black silty loam containing organic matter (A-horizon).
10-28	Brown, loose, loamy fine to medium sand with up to 1 cm clasts disseminated throughout; massive; breaks into subangular blocky structure; gradational lower boundary.
28-71	Reddish brown, medium sandy loam with granules up to 1 cm in diameter; some organic matter fragments; well indurated; gradational lower boundary.
71-150	Reddish brown to dark brown, clayey loam with granules up to 1.5 cm; indurated; overlies saprolite.

**UBH-2 (Upper Big Harris Creek);** 17 S 0444818, 3918434

*Geomorphic Setting:* Bank exposure along slightly entrenched valley floor; wide valley with bedrock exposures along channel that inhibit incision; significant lateral migration has created wide inset floodplain at meander.

*Interpreted Units:* Legacy sediments overlying pre-colonial deposits.

<i>Depth (cm)</i>	<i>Unit</i>
0-18	Organic debris overlying loose, brown fine to medium sandy loam; a few clasts up to 3 mm in size disseminated throughout; massive or breaks into small crumbs; clear lower boundary
18-37	Loose, light brown (buff), well-sorted fine to medium sand; a few clasts up to 0.5 cm in diameter; clear lower boundary.

37–61	Greyish brown, micaceous, fine to medium sandy loam; massive; breaks into subangular blocks; abrupt lower boundary.
61–79	Dark reddish brown to dark grey, mottled, loamy fine sand; breaks into subangular blocks; clear to abrupt wavy boundary.
79–131	Black, fine sandy loam; massive; breaks into subangular blocks; unit more erosionally resistant than upper unit (forms ledge along bank); clay films on root pores; abrupt lower boundary.
131+	Clast supported, poorly sorted gravel; clasts range between about 5 and 15 cm in maximum diameter; brownish grey, poorly sorted, sandy matrix.

**UBH-3 (Upper Big Harris Creek); 17S 0444870, 3918380**

*Geomorphic Setting:* Bank exposure along shallow gully that extends from Big Harris Creek.

*Interpreted Units:* Upland Quaternary sediments.

<i>Depth</i>	<i>Unit</i>
0–10	Loose, silt containing organic debris.
10–48	Greyish brown (mottled), loose well-sorted fine to medium sand; clay films on subangular blocky peds and root pores; indurated; abrupt lower boundary.
48–100	Grey, fine sandy loam; indurated; massive; breaks into subangular blocks; some coarser sand lenses present which are lateral discontinuous over distances of a few 10s cm.
100+	Gravel with clasts ranging between 5 and 20 cm in maximum diameter; grey sandy matrix.

**UBH-5 (Upper Big Harris Creek); S17 0444609; 3918602**

*Geomorphic Setting:* Bank exposure along moderately entrenched channel in moderately wide valley.

*Interpreted Units:* Thin layer (~48 cm) of legacy sediments overlying precolonial deposits.

<i>Depth</i>	<i>Unit</i>
0–3	Dark, loose silt with undecomposed organic debris; clear lower boundary.
3–48	Thin (1-2 cm) layers of reddish brown, loamy medium sand; micaceous; breaks into weak blocky structure alternating with light brown (buff) loose medium sand with some granules; crumb structure; abrupt lower boundary.
48–101	Black to grey coarse sandy loam with lenses of reddish-brown sand; color changes to grey at 71 cm depth; some 2 cm pebbles and granules disseminated throughout unit; massive; breaks into subangular block structure; clear lower boundary.
101–132	Dark grey, loamy fine to medium sand; subangular blocky; slightly micaceous; lenses of well-sorted light grey sand; clear lower boundary.
>132	Clast supported gravel; clasts up to 20 cm in maximum diameter.

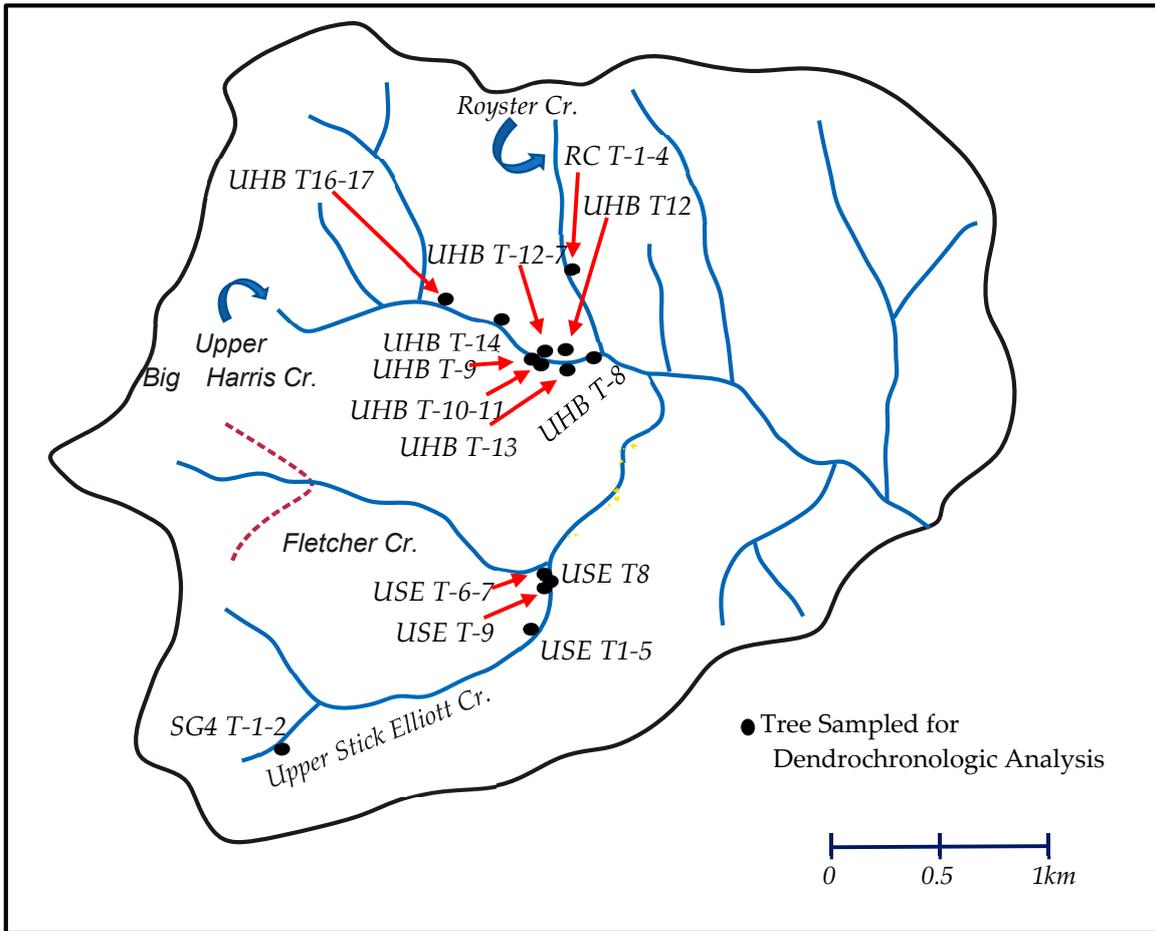
**UBH-6 (Upper Big Harris Creek); S17 0444652; 3918504**

*Geomorphic Setting:* Bank exposure along moderately entrenched channel in moderately wide valley.

*Interpreted Units:* Thin (~33 cm) of legacy sediments overlying precolonial deposits.

<i>Depth</i>	<i>Unit</i>
0–16	Thin dark soil overlying reddish brown to tan loamy sand; a few coarse granules dispersed throughout unit; locally burrowed; generally massive; clear lower boundary.
16–33	Reddish brown fine sandy loam that grades with depth to grey mottled medium sandy loam; contains reddish brown sand lenses; slightly micaceous; subangular block structure; abrupt wavy to irregular boundary.
33–65	Black, organic rich, medium to coarse sandy loam; massive; 2 cm clasts dispersed throughout unit; clear lower boundary.

<65	Clast supported gravel (5-10 cm in intermediate diameter) overlying slightly weathered bedrock.
<b>BHT-3</b> (Tributary to Lower Big Harris Creek; immediate upstream of lower project boundary, or study area); 17S 0441803, 3917092	
<i>Geomorphic Setting:</i> Bank exposure along moderately entrenched (~2 m) tributary about 50 m upstream of Big Harris Creek; wide valley floor.	
<i>Interpreted Units:</i> Legacy sediments (165 cm) overlying pre-colonial deposits	
<b>Depth</b>	<b>Unit</b>
0-55	Reddish brown to Greyish brown, well-sorted, loose to crumby fine sand; a few 1-2 cm, subangular clasts.
55-63	Reddish brown fine sandy loam; massive, breaks into subangular blocky "peds"; stands out in relief along bank profile.
63-75	Reddish brown loamy fine sand; weak, subangular block structure. Abrupt lower boundary.
75-85	Reddish brown fine sandy loam; massive, breaks into subangular blocky "peds"; stands out in relief along bank profile.
85-165	Reddish brown, loose well-sorted fine to medium sand interbedded with loamy, poorly sorted sand layers; 85-87 cm depth characterized by coarse sand and small gravels draped over existing topography; sandy layers are laterally discontinuous and may interfinger with layers both above and below lens; abrupt lower boundary.
165-210+	Black loamy clay; massive, breaks into subangular blocks; a few quartz clasts about 0.5 cm in diameter dispersed throughout; micaceous; extended below channel bed; much more indurated than overlying sediments; interpreted as buried A-horizon.



**Figure S2.** Location of trees cored for dendrochronologic analysis; see Table S2 for tree descriptions.

**Table S2.** Summary of dendrochronologic data; ages determine on cores taken at about chest height; ages relative to 2017; all samples were of poplar trees.

Sample	Location	Core A		Core B		Bank Erosion (cm) <sup>1</sup>	Erosion Rate (cm/yr) <sup>2</sup>	Geomorphic Position
		Inner Date	Age	Inner Date	Age			
UBH T-1	17S 0444781 3918455	1969	48	1975	42	NA	NA	Located on surface of an inset terrace at a meander bend (terrace shown on Fig. 3d); terrace is inset about 1 m below valley floor; tree adjacent to sites UBH T-2 and UBH T-3.
UBH T-2	17S 0444774 3918251	1974	43	1971	46	NA	NA	Located on surface of an inset terrace at a meander bend (terrace shown on Fig. 3d); terrace is inset about 1 m below valley floor; tree adjacent to sites UBH T-1 and UBH T-3.
UBH T-3	17S 0444774 3918251	1968	49	1972	45	NA	NA	Located on surface of an inset terrace at a meander bend (terrace shown on Fig. 3d); terrace is inset about 1 m below valley floor; tree adjacent to sites UBH T-1 and UBH T-2.
UBH T-4	17S 0444774 3918251	1964	53	Rotten heartwood	.	327	6.17	Located on valley floor at the top edge of the bank near trees UBH T-1 to UBH T-3; bank erosion around roots allowed for the estimation of bank erosion rates.
UBH T-5	17S 0444774 3918251	1949	68	Extreme suppression	.	NA	NA	Located on stable valley floor adjacent to inset terrace where trees UBH T-1 to UBH T-3 were cored. Note age of three are about 10-20 years older than those on inset terrace.
UBH T-6	17S 0444774 3918251	1956	61	1973	44	NA	NA	Located on stable valley floor adjacent to inset terrace where trees UBH T-1 to UBH T-3 were cored. Note age of three are about 10-20 years older than those on inset terrace.
UBH T-7	17S 0444774 3918251	Water Pocket	.	1961	56	180	3.21	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.
UBH T-8	17S 0445034 3918180	1973	44	1956	61	NA	NA	Located on stable valley floor surface.

UBH T-9	17S 0444736 3918445	1928	89	1929	88	90	1.02	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.
UBH T-10	17S 0444747 3918447	1968	49	Rot	.	190	3.88	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.
UBH T-11	17S 0444747 3918447	1969	48	1969	48	NA	NA	Located on stable valley floor surface.
UBH T-12	17S 0444848 3918435	1956	61	Rot	.	140	2.30	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.
UBH T-13	17S 0444973 3918368	1956	61	1963	54	114	1.87	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.
UBH T-14	17S 0444667 3918503	1956	61	1932	85	107	1.26	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.
UBH T-16	17S 0444609 3918602	1971	46	Rot	.	140	3.04	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.
UBH T-17	17S 0444609 3918602	1949	61	1963	54	NA	NA	Located on stable part of valley floor, adjacent to UBH T-16.
Corn T-1		1982	35	.	.	97	2.77	
RC T-1	N 35.41052 W 81.60596	1952	61	1946	71	377	5.81	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates. Trees RC T-2 through RC T-4 were collected adjacent to one another.
RC T-2	17S 0444981 3918540	1981	36	.	.	79	2.19	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.
RC T-3	17S 0444981 3918540	1939	78	.	.	162	2.08	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.

RC T-4	17S 0444981 3918540	1944	73	.	.	103	1.41	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.
USE T-1	17S 0444642 3916918	1979	38	1985	32	NA	NA	Located on stable part of valley floor; USE T1 through USE T5 represent trees that form a transect across valley floor, perpendicular to the channel.
USE T-2	17S 0444642 3916918	1981	36	1973	44	NA	NA	Located on stable valley floor surface.
USE T-3	17S 0444642 3916918	1960	57	1958	59	NA	NA	Located on stable valley floor surface.
USE T-4	17S 0444642 3916918	1980	37	1975	42	NA	NA	Located on stable valley floor surface.
USE T-5	17S 0444642 3916918	Undatable	.	Undatable	.	NA	NA	Located on stable valley floor surface.
USE T-6	17S 0444818 3917479	1963	54	1965	52	77	1.43	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.
USE T-7	17S 0444818 3917479	1965	52	1957	60	76	1.27	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.
USE T-8	17S 0444843 3917398	1964	53	1957	60	260	4.33	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.
USE T-9	17S 0444833 3917345	1962	55	1954	63	154	2.44	Located on valley floor at the top edge of the bank; bank erosion around roots allowed for the estimation of bank erosion rates.
SG4 T-1	17S 0443584 3916731	1945	70	.	.	NA	NA	Surface of inset terrace; terrace tread located about 2 m below valley floor along deeply incised channel
SG4 T-2	17S 0443584 3916731	1952	65	.	.	NA	NA	Surface of inset terrace; terrace tread located about 2 m below valley floor along deeply incised channel; tree adjacent to SG4-T1.
<sup>1</sup> Bank erosion based on the maximum distance between exposed tree root and bank; <sup>2</sup> Bank erosion rates were determined by dividing the amount of eroded bank determined on the basis of the exposed tree roots by the age of the tree. The estimates represent a conservative (minimum) value as the dated tree cores were taken at chest height.								

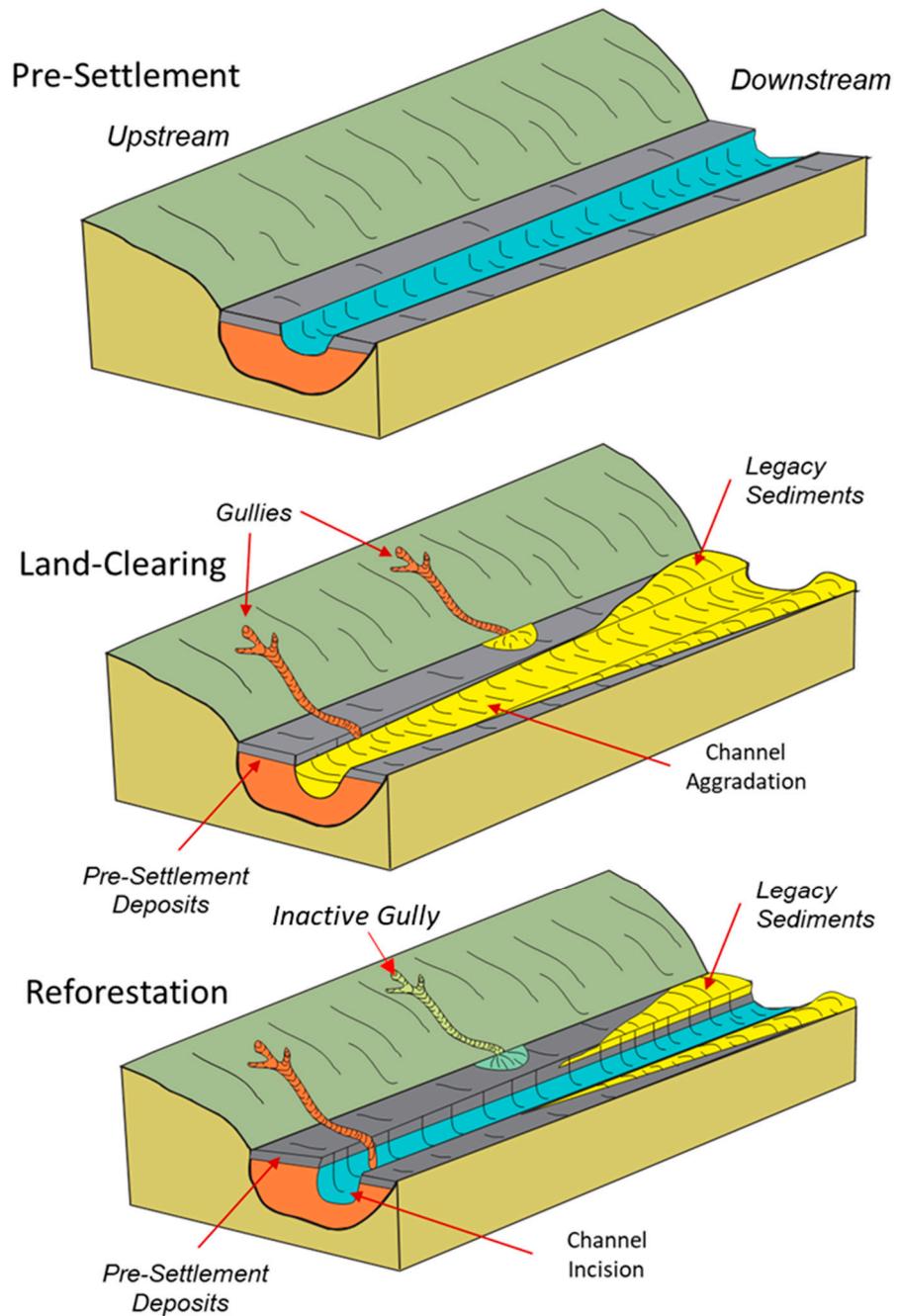
**Table S3.** Summary of radiocarbon samples and dates obtained on inferred precolonial deposits; sample locations shown on Figure S1. Radiocarbon analyses conducted by International Chemical Analysis, Inc., Sunrise, Florida.

Sample	ICA ID	Conventional	Calibrated	Material and comments
		Age (YBP)	Age*	
USE-2 (90-100 cm)	180S/0510	1890 +/- 30	Cal 50-220 AD	Organic sediment collected about 7-17 cm below contact between inferred legacy and pre-colonial deposits. Upper surface of precolonial deposit is erosional, indicating some removal of precolonial sediments prior to deposition of legacy sediments; ripped up 'clasts' of organic-rich (black) precolonial sediments in lower most layer of legacy sediments.
USE-2 (125-135 cm)	180S/0511	3760 +/- 30	Cal 2290-2120 BC (83.2 %) Cal 2100-2040 BC (12.2 %)	Organic sediment near the base of the black organic-rich precolonial sediments; precolonial sediments grade downward into coarser sand and gravels.
USE-7	18W/0512	290 +/- 30	Cal 1490-1670 AD	Wood; sample consisted of a 1.5 m long x 10 cm diameter log buried immediately below the inferred legacy-precolonial deposit contact (i.e., at a depth of ~75 cm and from the top of pre-colonial deposits). Minor erosion of precolonial deposits may have occurred. Location: 17S 0441502, 3916921

\*Calibrated ages were attained using IntCal13 and Marine13 radiocarbon age calibration curves; YBP = years before 1950 AD



**Figure S3.** Exposure of tree roots caused by bank erosion. Rates of erosion based on (a) determined age of the trees, and (b) using the roots as an indicator of the minimum amount of bank erosion that has occurred since germination of the tree (illustrated by the red arrow). The rates of bank erosion that were determined represent conservative estimates.



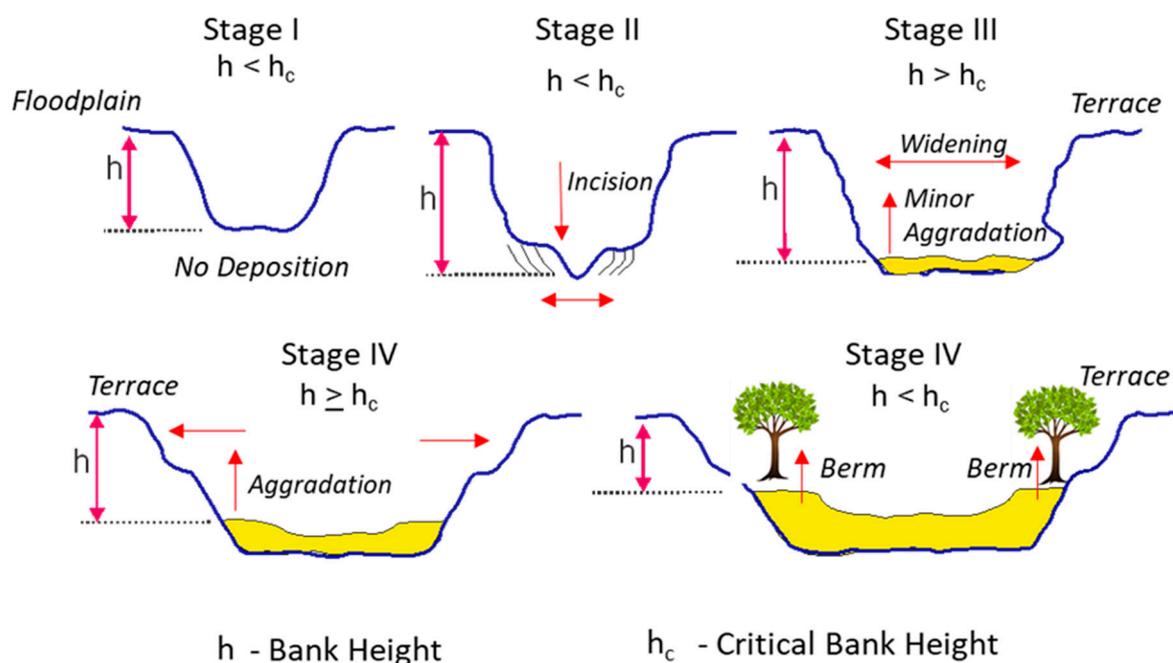
**Figure S4.** Schematic diagram of the spatial variations in geomorphic responses to land clearing during the late 1800s and early 1900s. Upstream incision, combined with gully development, led to the formation of terraces in headwater areas and to channel and floodplain aggradation further downstream. Subsequent conservation practices, including terracing and reforestation, led to channel incision along the entire drainage network, exposing legacy sediments that buried precolonial (pre-settlement) deposits along downstream reaches.



**Figure S5.** Photograph of typical inactive gully that has been stabilized by vegetation. This inactive gully is located within the upper Big Harris Creek subbasin (Figure 1).



**Figure S6.** Typical bedrock-controlled channel found along entrenched alluvial channels. These resistant bedrock units form local base level controls along the channel which dictate the depth of upstream incision that can occur. Photograph taken along Upper Big Harris Creek, immediately upstream of its confluence with Royster Creek.



**Figure S7.** Schematic diagram of the classical channel evolution model as envisioned by Schumm et al. (1984) and Simon and Hupp (1986). Stage I – Initial stage of incision. Channel characterized by U-shaped channel with no deposition; Stage II – Channel bed degradation, but bank heights have not exceeded the critical bank height required for bank failure by mass wasting processes; Stage III – Mass failures are initiated as the critical bank height is exceeded, causing channel widening. Slight aggradation may occur; Stage IV – Bank failures and channel widen continue, but at a slower rate. Depositional features begin to develop in over-widened channel; Stage V – a quasi equilibrium channel has developed. The depositional features that began to form in Stage IV grow and become vegetated, producing a floodplain within the original entrenchment. Sequence of events produces a terrace (i.e., an abandoned floodplain). Figure after Schumm (1984); modified from Watson et al. (2002). Tree art from a <https://www.vecteezy.com/free-vector/tree-clipart>>Tree Clipart Vectors by Vecteezy</a>.



**Figure S8.** Bank section located along upper Big Harris Creek near the confluence of Royster Creek (Figure 1). The more easily eroded legacy sediments overlie the more resistant dark colored precolonial deposits, which often form a ledge along the channel banks.