APPENDIX A

Goodell Creek Alluvial Fan Historical Timeline

Table A-1. Approximate Timeline of Historical Land Use Impacts to the Goodell Creek Alluvial Fan Project Area.[a]

Impact No.	Land Use Activity/ Impact	Description/ Effect	Reference	Approximate Dates	Geographic Location (see Figure A-1 and Report Figures)
1	Saw mill operation	Created mill pond; likely Channel diversion	Information received from Jesse Kennedy	1920	Black box on Figure A-1 – approximated location
2	Logging	Riparian habitat change, destabilization of soil in cleared areas, erosion and sediment transport to alluvial fan	Historical Aerials (1947-1976), NPS 2012	1920s-1968	Entire fan and riparian areas within upper watershed
3	Rail/ logging road and bridge [b]	Disrupted fan hydrogeomorphic processes and habitat connectivity; main stem backwater effects	Historical Aerials (1947-1976)	Associated with dam construction	Similar to SR 20 post-1947
4	Gravel bar mining [c]	Associated with dam and road construction	Historical photo of heavy equipment in main stem, date uncertain	1920s - ? (associated with dam construction)	Main channel Goodell Creek, between canyon and confluence with Skagit River
5	Skagit Hydroelectric Project Dam operations	Altered downstream boundary conditions and habitat connectivity, floodplain inundation extents; sediment dynamics [c]		Gorge 1921-1924, 1961 Diablo 1927-1930 Ross 1940-1953	Skagit main stem
6	Power line towers	Some towers are located within naturally low-lying areas of the floodplain near historic avulsion channels of the west alluvial fan	Aerial photographs	Since operation of Skagit Hydroelectric Project	Parallel to SR 20
7	Right Bank levee construction [b]	Constrains hydrogeomorphic processes and habitat connectivity; limits hydrologic connectivity to the floodplain and historic fan	1947 aerial photo	Pre-1947	Purple line on Figure A-1
8	Left Bank levee construction [b]	Constrains hydrogeomorphic processes and habitat connectivity; limits hydrologic connectivity to the floodplain and historic fan; garbage incorporated into upstream half of levee in the 1980s – soil and water contamination	1947 aerial photo; copy of email from J. Reidel to R. Zipp on 10/29/10	Pre-1947 to 1960s (original levee); garbage added in 1980s	Alignment matches current location

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9	SR 20 and bridge [d]	Disrupted fan hydrogeomorphic processes and habitat connectivity; main stem backwater effects		1972	Visible on lidar and aerial photographs
10	Gravel pit development and use	Mineral extraction: aesthetic quality, introduction of invasive species, slope instability	1947 aerial photo	Pre-1947	Visible on Lidar and aerial photographs
11	Campground construction/ repair	Disrupted fan hydrogeomorphic processes	1947 aerial photo; NPS 2012		Visible on aerial photographs
12	Access road to gravel pit	Disrupted fan hydrogeomorphic processes and distributary channel drainage	See 1947 and 1950 aerial photos	Pre-1947	Visible on aerial photographs
13	Access road to lower group campground	Disrupted fan hydrogeomorphic processes and distributary channel drainage	1947 aerial photo; NPS 2012	Pre-1947	Visible on aerial photographs
14	Access road to lower Goodell camp	Disrupted fan hydrogeomorphic processes and distributary channel drainage	1950 aerial	Visible in 1950 aerial	Visible on aerial photographs
15	Shooting range and access road	Disrupted fan hydrogeomorphic processes and distributary channel drainage; soil and water contamination	1947 aerial photo	Pre-1947	Visible on aerial photographs
16	SCL logging road	Disrupted fan hydrogeomorphic processes and distributary channel drainage	1953 aerial	Visible in 1953 aerial	Visible on aerial photographs
17	Logging or wildfire?	Slope destabilization	1953 aerial	Visible in 1953 aerial	Blue arrows on Figure A-1
18	Right Bank fill and revetment	Direct main channel flow under SR 20	This bank looks straighter in the earlier aerial photos compared to recent NAIP imagery	1972?	Yellow line on Figure A-1

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19	Colluvial process or landslide? Blasting and/ or filling of historic avulsion channel inlet?	Limited hydrologic connectivity to historic avulsion side channel	Relic channel visible in 1947 aerial photo, which was taken September 14	1953?	Red circle on Figure A-1

Supporting information:

[1] Timeline table originally compiled by Rick Hartson of USIT, provided to Herrera on 4-18-14, and herein includes some subsequent formatting by Herrera.

[2] Right Bank and Left Bank levees were built in 1920s and 1930s; Railroad/logging road bridge also constructed around this time; Terraces formed and trees grew riverward of levees.

[3] Some downcutting in main channel likely occurred as a result of a gravel bar mining and lowered downstream boundary elevation at the Skagit River confluence.

[4] 2003 landslide increased sediment delivery to the fan. Aggradation has occurred, particularly upstream of SR 20 bridge, hence flooding and avulsion in lower group campground and wooded terraces riverward of levees.

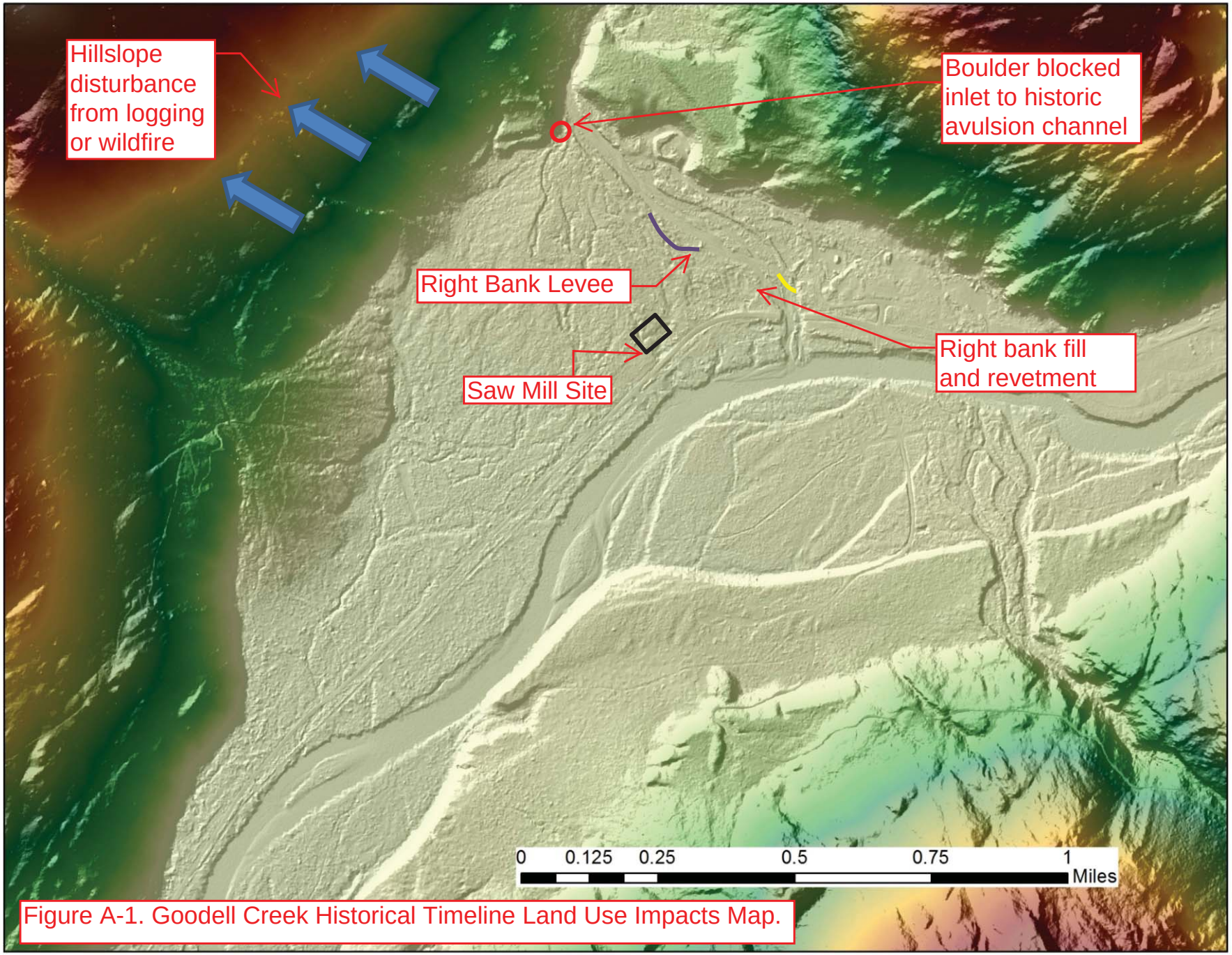

Figure A-1. Goodell Creek Historical Timeline Land Use Impacts Map.