WHITE PAPER

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Historical Fires in Headwaters Portion of Tucannon River Watershed[1]

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INTRODUCTION

Useful insights into past fire regimes have come from deciphering a history of climate, forest fire, and insect outbreaks as recorded in annual growth rings of living and dead trees – this is a science of dendrochronology (Banks 1991, Creber 1977, Douglass 1920, Fritts and Swetnam 1989).

By precisely dating fire scars in a tree-ring record and then mapping locations of trees with scars of the same age, it is possible to reconstruct a relatively accurate picture of fire frequency and size for a time period before Euro-American settlement (Arno and Sneck 1977). A fire-scar analysis technique is used to characterize presettlement fire regimes for dry-forest areas because fires tend to be primarily stand maintaining in this biophysical environment, so they leave a fire history record by scarring live trees (fig. 1).

[1] White papers are internal reports; they receive only limited review. Viewpoints expressed in this paper are those of the author – they may not represent positions of USDA Forest Service.

Figure 1. Many ponderosa pine trees have basal scars caused by frequent surface fire. Species like the ponderosa pine shown here achieve fire tolerance by developing thick bark to protect their cambium, and by self-pruning lower branches to raise their crown base height above average flame length. Both these resistance traits increase a tree's ability to survive surface fire. Trees with basal fire scars were analyzed and mapped to determine fire frequency and fire size (extent) for dry sites in Tucannon River watershed (Heyerdahl and Agee 1996, Heyerdahl 1997).

Analyzing age structure of forest stands for areas that burned with relatively high severity also reveals characteristics of presettlement fires, particularly if landscape fire patterns were not subsequently disrupted by timber harvest. Since crown fires generally result in nearly complete stand replacement (killing most or all existing trees), and because they initiate a new tree stand (or shrub fields in some instances), it is generally not possible to study tree scars for fire regimes dominated primarily by crown fires.

A stand-age analysis technique is used to characterize presettlement fire regimes for moist-forest sites because fires tend to be stand initiating in this biophysical environment, so they leave a fire history record by creating a mosaic of stand ages across a landscape (Agee and Maruoka 1994, Maruoka and Agee 1994).

FIRE HISTORY METHODOLOGY

Tucannon River watershed was one of four areas included in a study of historical fire regimes for Blue Mountains of northeastern Oregon and southeastern Washington (Heyerdahl and Agee 1996, Heyerdahl 1997). [Other three areas included Imnaha Creek and Baker City watershed on Wallowa-Whitman NF, and Dugout Creek on Malheur NF.] Forty individual fire years were interpreted for Tucannon River watershed, with first one occurring in 1583 and last one in 1898 (table 1).

Emily Heyerdahl provided us with shapefiles of her mapped fire extents for a Tucannon River study area. Individual fire extents were then overlaid with a base map consisting of four biophysical environments: cold upland forest, dry upland forest, moist upland forest, and nonforest (nonforest is comprised of all shrubland and herbland potential vegetation groups or PVGs).

To support a variety of strategic assessment and planning needs, fine-scale potential vegetation types (e.g., plant associations, plant communities, and plant community types) were recently aggregated into two mid-scale potential vegetation hierarchical units: plant association group (PAG) and potential vegetation group (PVG). PVGs provide an effective characterization of biophysical environment because they reflect inherent differences in ecological site potential and disturbance regimes. A protocol for assigning fine-scale potential vegetation types to mid-scale PVGs is described in Powell et al. (2007).

A base map also includes riparian habitat conservation areas (RHCAs) consisting of buffered areas along streams, and it also shows the streams. Note that the size (buffer width) of RHCAs varies by stream class; although stream class differences are not depicted on fire maps in appendix 1, acreage summaries in table 1 distinguish between stream classes 1, 2, 3, and 4.

Geographical extent of the base map is one large subwatershed (HUC 170601070601) within Tucannon River watershed. Base map themes (PVGs, RHCAs, streams) were derived from the same data sources used to prepare a Tucannon River watershed analysis released in August 2002 (USDA Forest Service 2002).

Note that fire-history studies generally result in reconstructed fire shapes that are undoubtedly simpler in outline than an actual fire extent. Mapped fires in appendix 1 with regular geometric shapes (1583 and 1618, for example) are probably depicted with a less complex boundary than what occurred. Even if the intricacies of fire shape cannot be depicted perfectly, spatial extent and location of a fire on the landscape should be relatively accurate with either the fire-scar or the stand-age fire-history reconstruction technique (Heyerdahl and Agee 1996, Heyerdahl 1997).

Robin L. Harris (R-6, DRM) completed GIS analyses to determine acreage of each fire, first stratifying by potential vegetation group and then calculating acreage amounts by stream class.

FIRE HISTORY STUDY RESULTS

By using a methodology described in a previous section, maps were prepared showing reconstructed locations for 40 historical fires occurring in the headwaters portion of Tucannon River watershed in southeastern Washington. These maps are provided in appendix 1. Acreage summaries were calculated for each fire, and acreage results are presented in table 1.

For the Tucannon River study area, 39 of 40 fire years affected a dry-forest biophysical environment (defined as the Dry Upland Forest PVG), with smallest fire extent on dry-forest sites being 29 acres and the largest affecting 1,935 acres. Mean fire extent on dry-forest portions of 39 fires in a headwaters subwatershed of Tucannon River watershed was 531.4 acres.

Of the mean fire extent for dry forests, about 34.9 acres (6.5%) occurred within RHCAs, with 93% of the RHCA acreage associated with stream classes 3 and 4 (table 1).

For the Tucannon River study area, 37 of 40 fire years affected a moist-forest biophysical environment (defined as the Moist Upland Forest PVG), with smallest fire extent on moist-forest sites being 29 acres and the largest affecting 3,129 acres. Mean fire extent on moist-forest portions of 37 fires in a headwaters subwatershed of Tucannon River watershed was 532.2 acres.

Of the mean fire extent for moist forests, about 125.3 acres (23.5%) occurred within RHCAs, but unlike the dry-forest situation, only 47% of the moist-forest RHCA acreage was associated with stream classes 3 and 4 (table 1).

For the Tucannon River study area, 18 of 40 fire years affected nonforest biophysical environments (defined as shrubland or herbland PVGs intermingled within forested study areas), with smallest fire extent on nonforest sites being 20 acres and the largest affecting 113 acres. Mean fire extent on nonforest portions of 18 fires in a headwaters subwatershed of Tucannon River watershed was 60.6 acres.

Of the mean fire extent for nonforest environments, about 3.2 acres (5.3%) occurred within RHCAs, and all RHCA acreage was associated with stream class 4 (table 1).

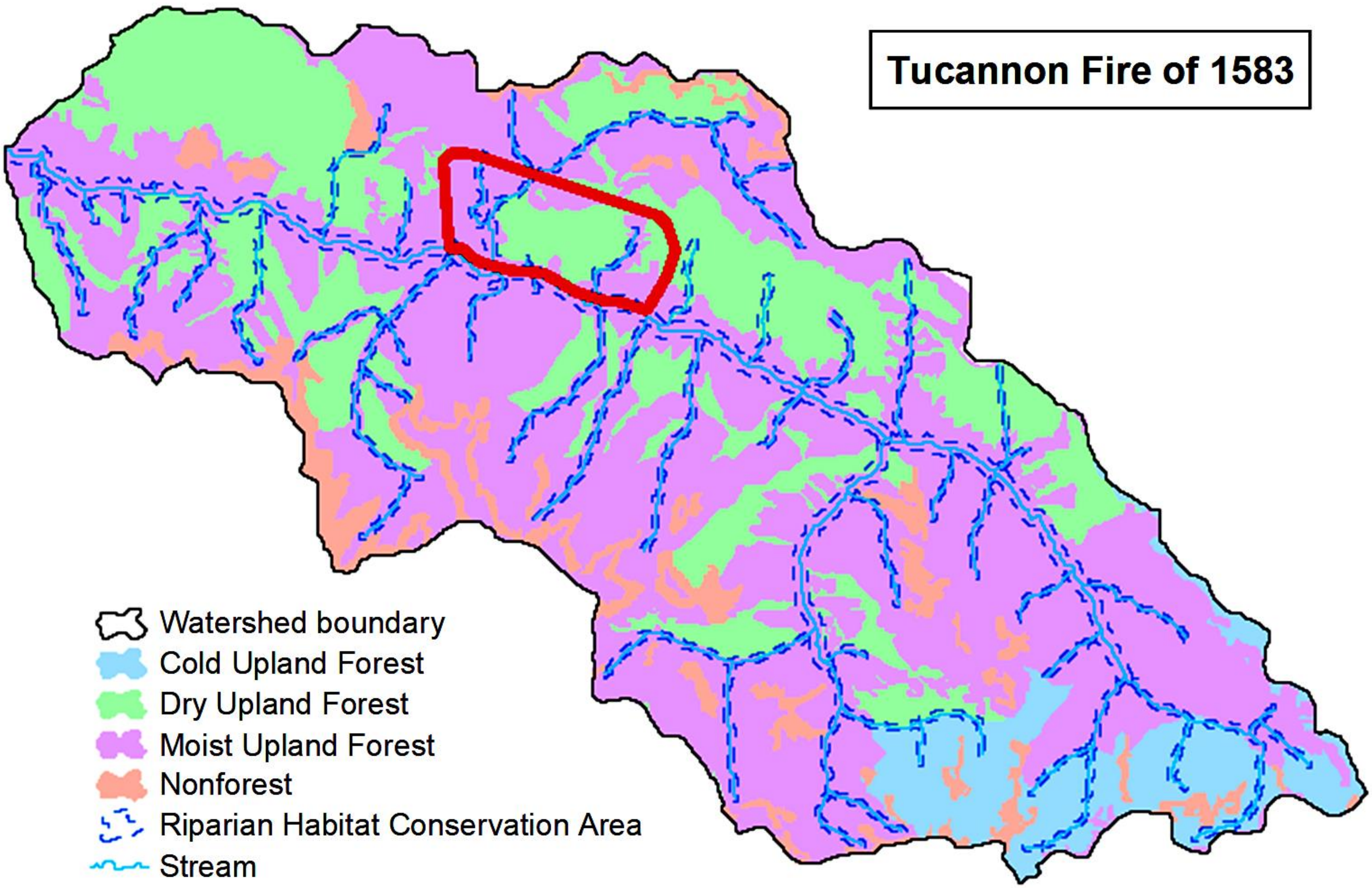
Table 1. Acreage summary by fire year, potential vegetation group (PVG), and RHCA (stream) class.

FIRE YEAR	TOTAL FIRE ACRES	DRY UPLAND FOREST PVG					MOIST UPLAND FOREST PVG					NONFOREST AREAS				
		Total	ACRES BY RHCA CLASS				Total	ACRES BY RHCA CLASS				Total	ACRES BY RHCA CLASS			
		Acres	1	2	3	4	Acres	1	2	3	4	Acres	1	2	3	4
1583	900.9	423.9	1.5		15.4		477.0	63.2		54.6	0.1	0.0				
1618	954.4	561.5			3.0	7.5	348.6			20.6	9.3	44.4				3.2
1630	973.4	663.9	0.1		34.7		309.5	51.2		29.2		0.0				
1635	354.4	41.4				2.4	313.0			20.7	0.9	0.0				
1652	1,939.6	1133.0	2.2		37.9	0.2	751.2	51.3		68.5	7.3	20.1				
1664	544.3	344.8	0.1		9.1		199.4	35.9		22.4		0.0				
1671	1,930.4	1157.5			13.5	5.4	727.5	31.8		53.9	16.2	45.5				3.2
1685	397.8	40.8					357.0			21.7		0.0				
1695	1,049.7	638.4	1.4		37.7		411.3	67.3		50.1		0.0				
1703	1,185.2	431.4	2.5		1.9	25.6	711.6	62.8		30.6	21.6	42.2				3.2
1705	317.6	231.8			0.7		85.9			6.6		0.0				
1706	1,205.7	792.0					339.1	24.6			0.9	44.2				
1712	707.5	119.0			3.9	4.0	588.5	52.1		35.8	17.6	0.0				
1734	375.8	165.1					210.7	18.8			0.9	0.0				
1743	1,056.2	352.9	0.0		7.6	25.6	670.0	63.1		39.5	22.7	33.4				3.2
1748	515.0	215.3	0.0		4.8		299.7	45.8		8.4	0.9	0.0				
1751	74.9	29.2	2.1				45.7	7.7		7.8		0.0				
1754	248.9	70.1					123.8			8.7		55.0				
1756	250.2	221.8					0.0					0.0				
1759	3,190.8	1523.7	7.8		53.5	25.6	1571.7	170.0		90.6	31.8	95.4				
1765	670.5	192.8	2.4				414.7	44.7			0.9	63.0				
1774	4,158.3	1393.3	3.4		58.9	4.0	2731.5	261.0		247.0	30.0	33.5				
1776	295.5	135.6					159.9	15.1				0.0				
1779	823.0	179.6			4.1	4.2	643.5	54.5		32.7	19.4	0.0				
1791	424.9	187.1			2.7		237.8			27.3	6.2	0.0				
1799	173.5	163.3					0.0					0.0				
1816	1,131.1	650.9	2.7				417.2	42.3			0.9	63.1				
1828	2,443.1	967.9	3.4		8.3	25.6	1349.7	105.4		50.1	40.0	112.6				3.2
1839	1,816.9	1258.9	4.0			18.2	459.9	52.6			0.9	80.6				3.0

FIRE YEAR	TOTAL FIRE ACRES	DRY UPLAND FOREST PVG					MOIST UPLAND FOREST PVG					NONFOREST AREAS				
		Total Acres	Acres By RHCA Class				Total Acres	Acres By RHCA Class				Total Acres	Acres By RHCA Class			
			1	2	3	4		1	2	3	4		1	2	3	4
1841	296.4	0.0					253.9			5.1		42.4				
1855	2,543.4	1107.8	3.6		6.4	25.6	1309.9	105.2		46.3	40.4	102.4				3.2
1863	268.6	239.3			25.2		29.3	3.0		6.8		0.0				
1865	857.0	573.0	1.5		35.3		284.0	41.8		22.7		0.0				
1869	1,088.3	643.2	0.1				382.2	38.4			0.9	62.9				
1873	507.0	320.7	2.6		3.5	0.3	186.2	9.6	1.7	46.6	8.8	0.0				
1883	74.9	29.2	2.1				45.7	7.7		7.8		0.0				
1886	1,867.9	1285.3	3.4			21.3	480.4	53.5			0.9	83.0				3.2
1888	5,137.6	1935.1	1.8	0.4	74.2	4.0	3129.0	269.1	3.2	236.8	50.1	67.1				
1893	47.1	46.4					0.8					0.0				
1898	489.7	257.3	1.6		12.7		232.3	69.1		15.8		0.0				
Mean	1082.2	531.4	2.2	0.4	19.8	12.5	532.2	63.9	2.4	45.3	13.7	60.6				3.2
Total	43,287.2	20724.0	50.5	0.4	454.8	199.5	21288.7	1918.3	4.8	1314.5	329.5	1090.7	0.0	0.0	0.0	25.5

Sources/Notes: This tabular summary and associated maps were prepared by David C. Powell and Robin L. Harris, Umatilla National Forest. Location, shape, and size of historical fires portrayed on accompanying maps are based on Heyerdahl and Agee (1996) and Heyerdahl (1997). A base map, showing four categories of potential vegetation group (cold upland forest, moist upland forest, dry upland forest, nonforest), was initially prepared for a Tucannon River ecosystem analysis released in August 2002. A base map pertains to one subwatershed: HUC 170601070601. Potential vegetation groups (PVG) are described in Powell et al. (2007). Riparian habitat conservation areas (RHCA) were calculated by using standard buffer widths, in feet (buffer widths vary by stream class), along with a Umatilla National Forest GIS theme providing stream location and stream classification, by class. Note that "Acres By RHCA Class" values are not mutually exclusive – acres shown by stream class are also included in a "Total Acres" column by PVG. Also note that for nine fire years (1652, 1706, 1756, 1799, 1828, 1839, 1855, 1886, and 1888), category acreages ("Total Acres" for dry PVG, moist PVG, and nonforest sections) will not add up to a total (TOTAL FIRE ACRES) because a small portion of those mapped fires extend beyond the subwatershed boundary.

APPENDIX 1: Historical Fires in the Headwaters Portion of the Tucannon River Watershed



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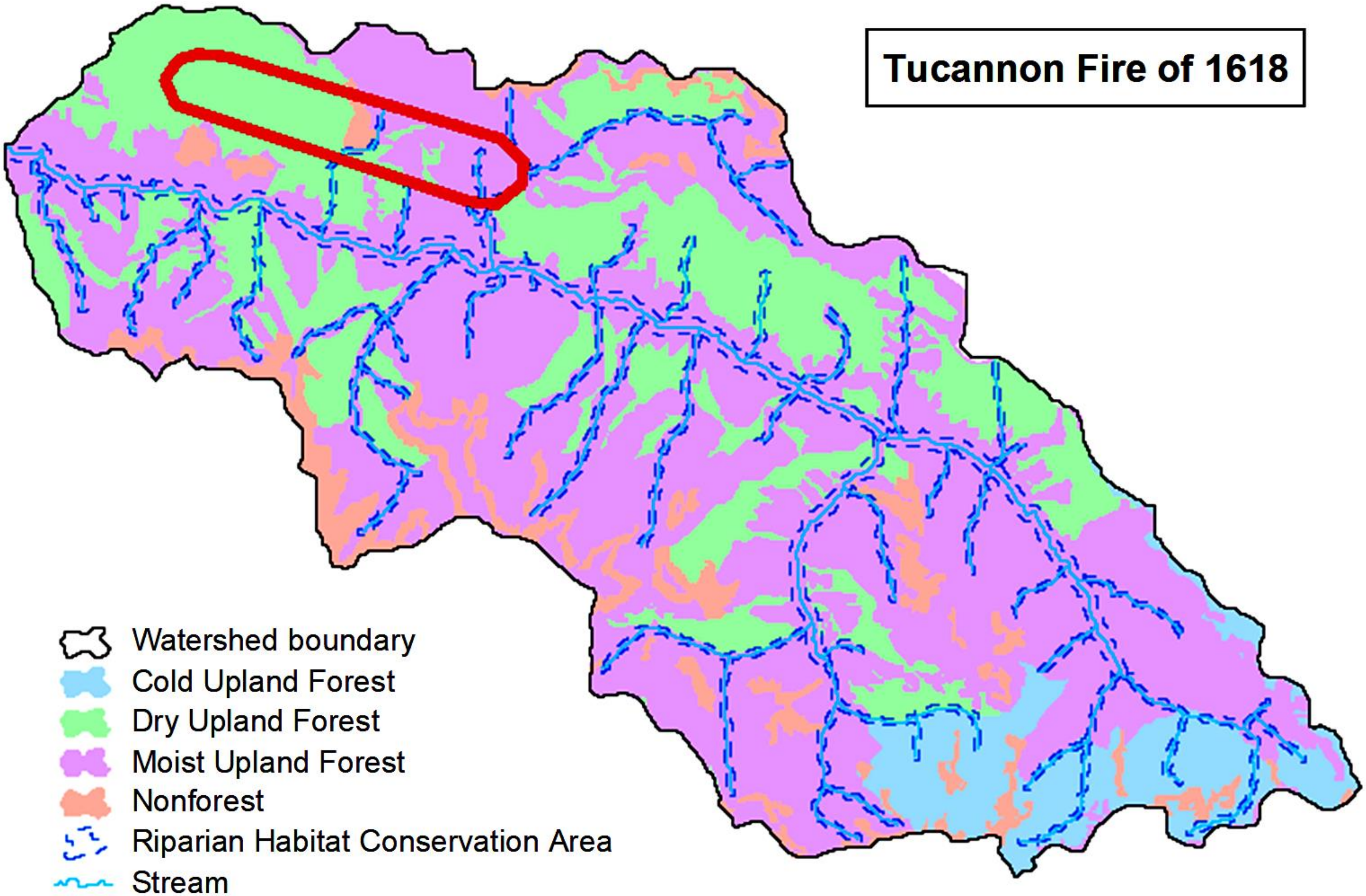

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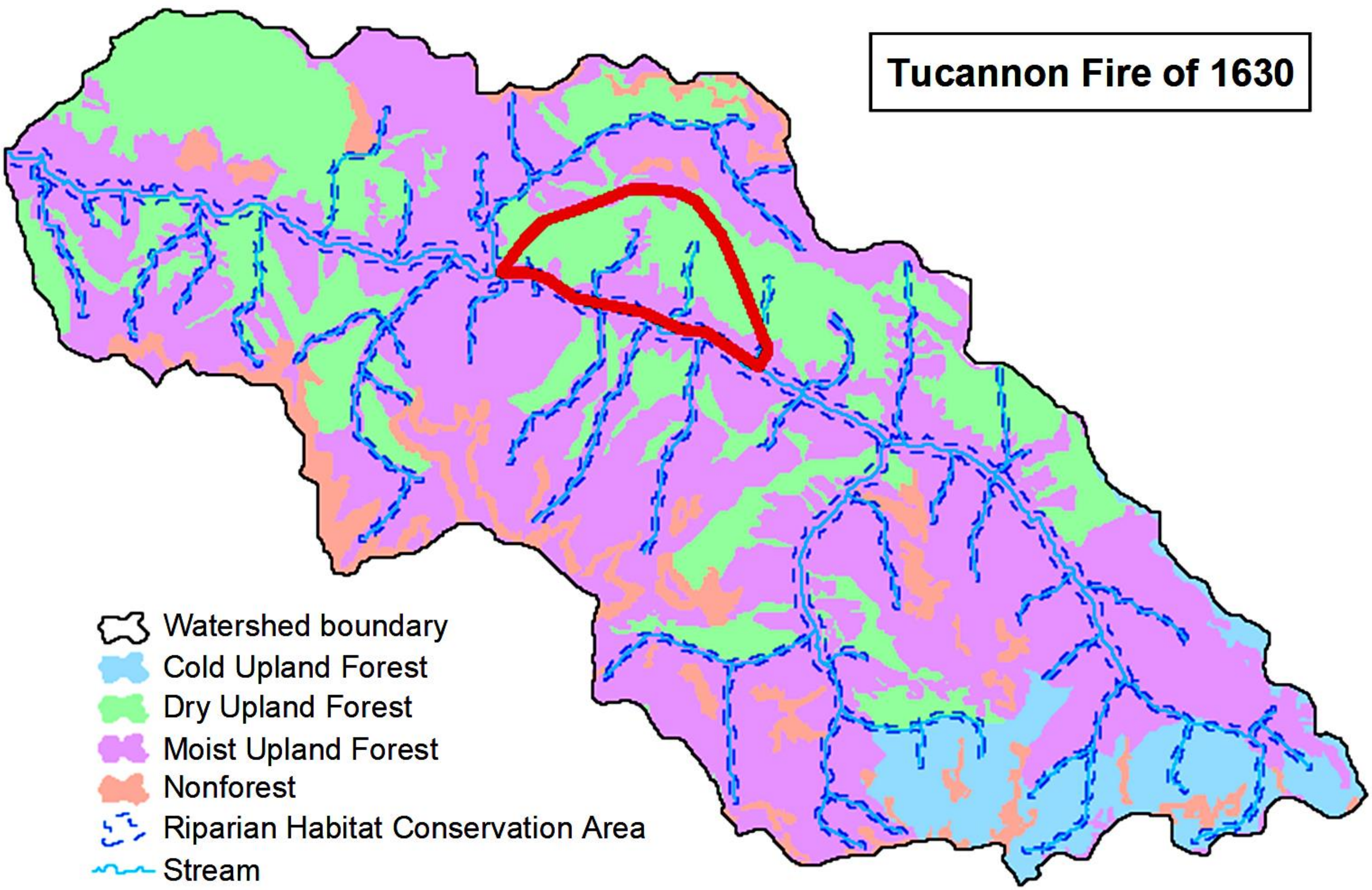

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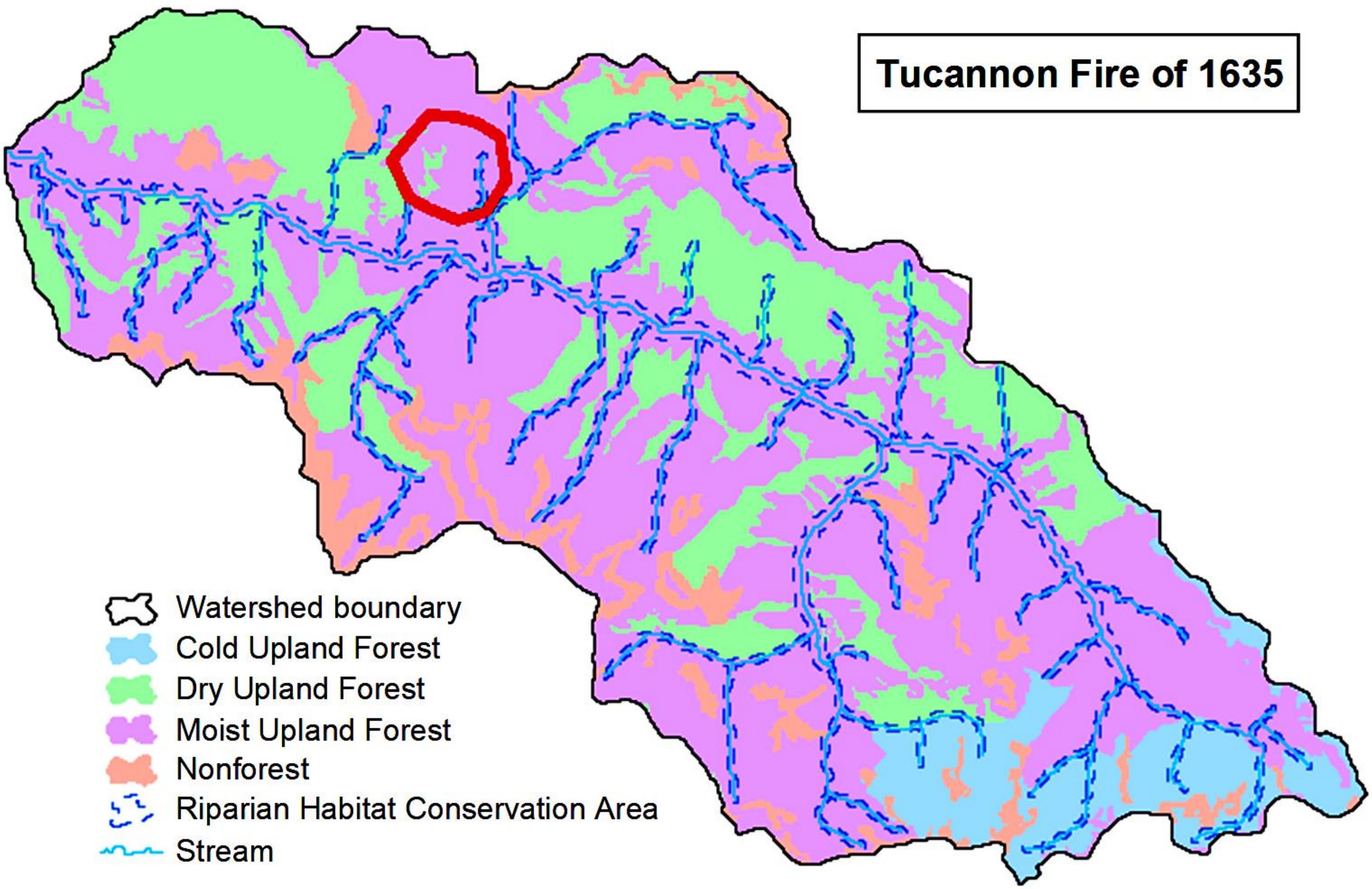

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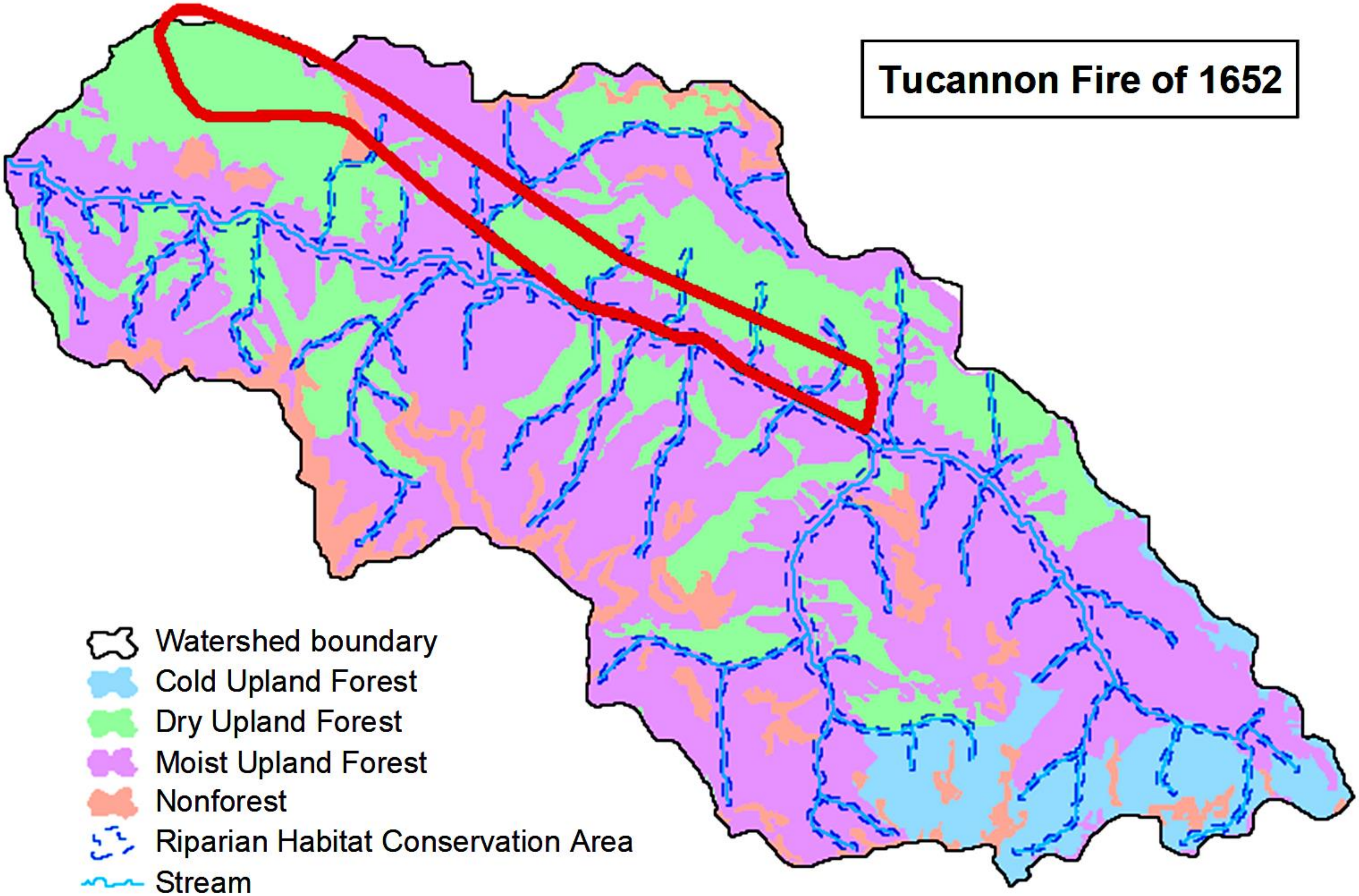

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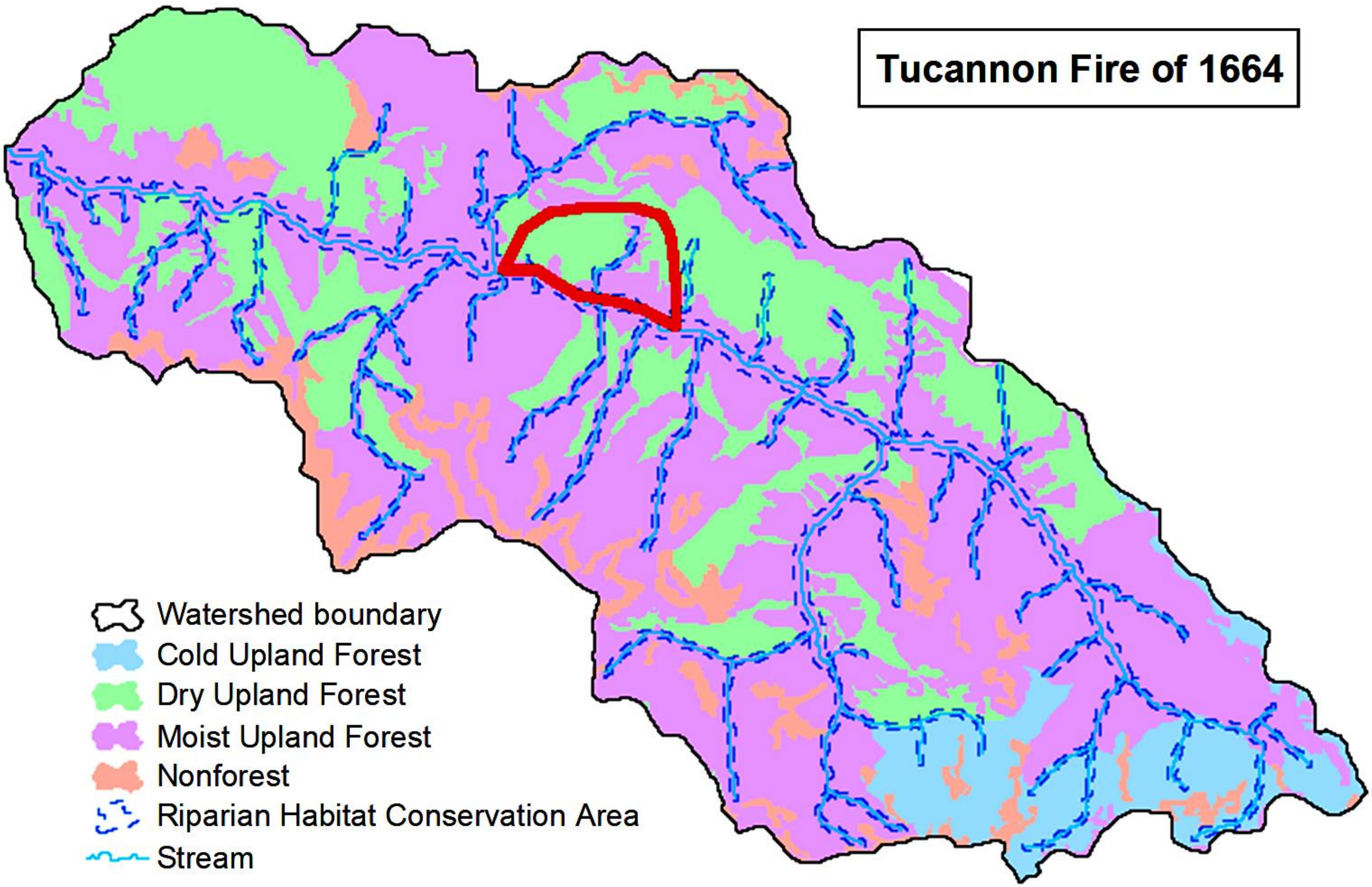

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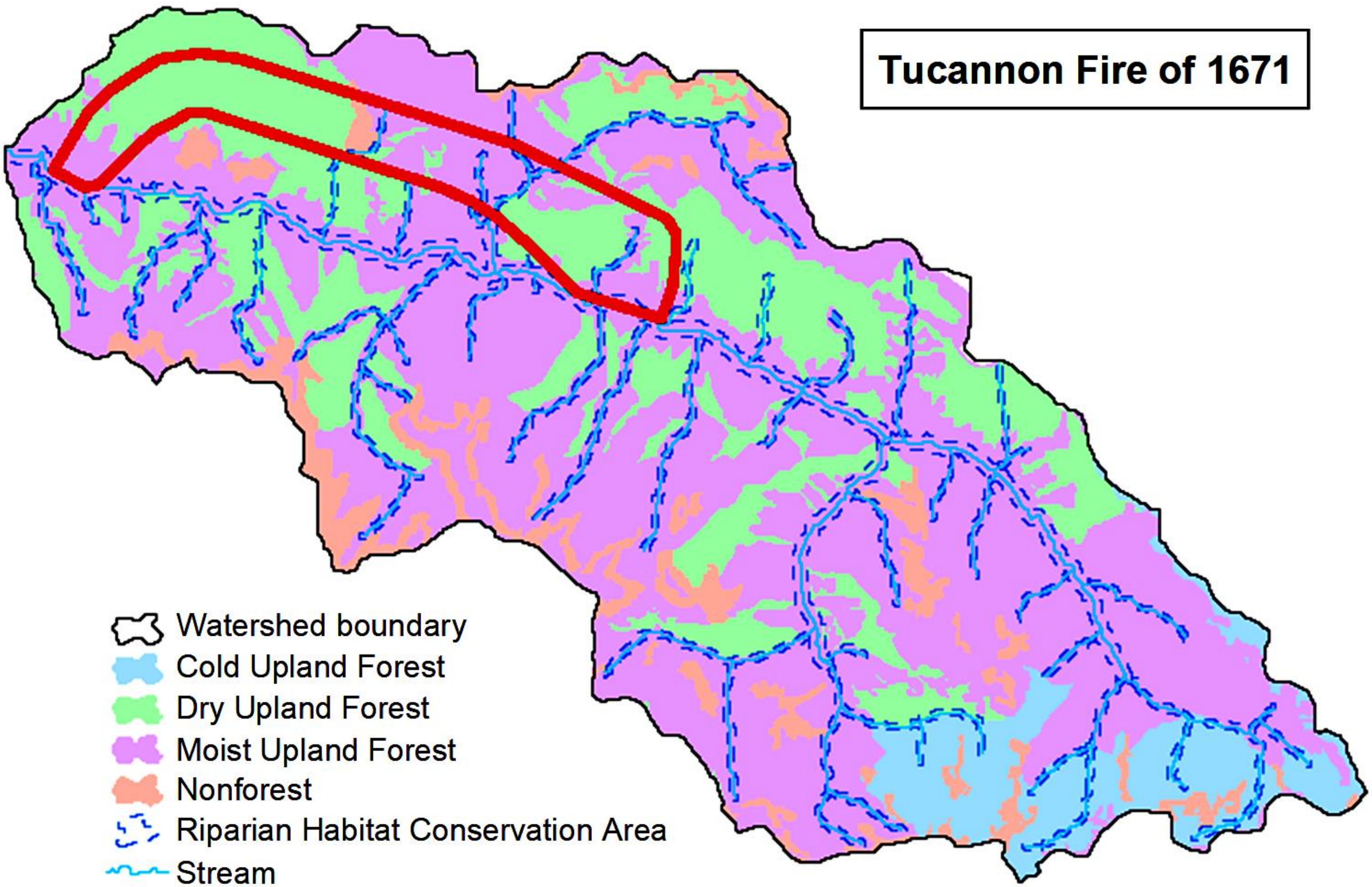

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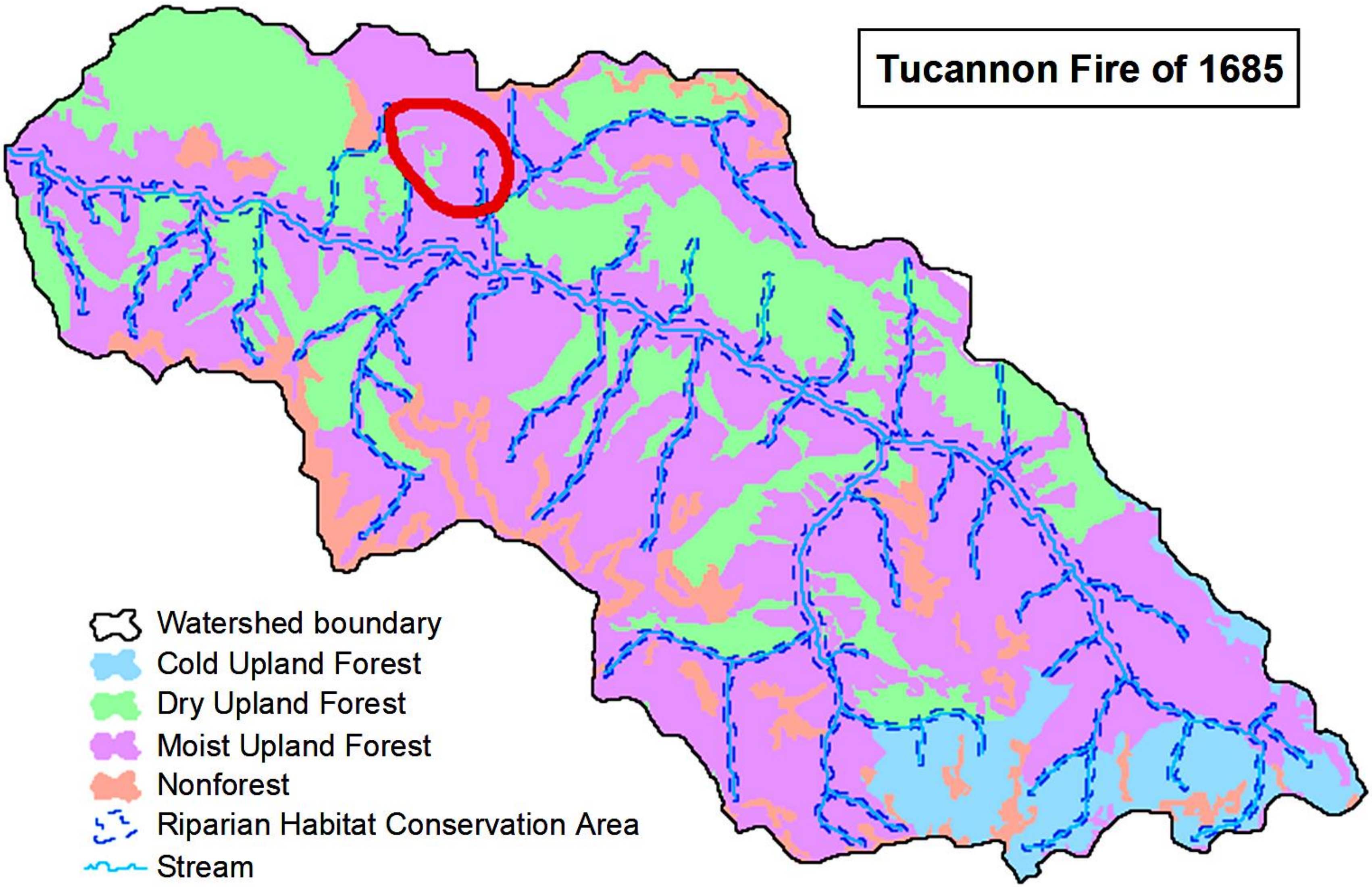

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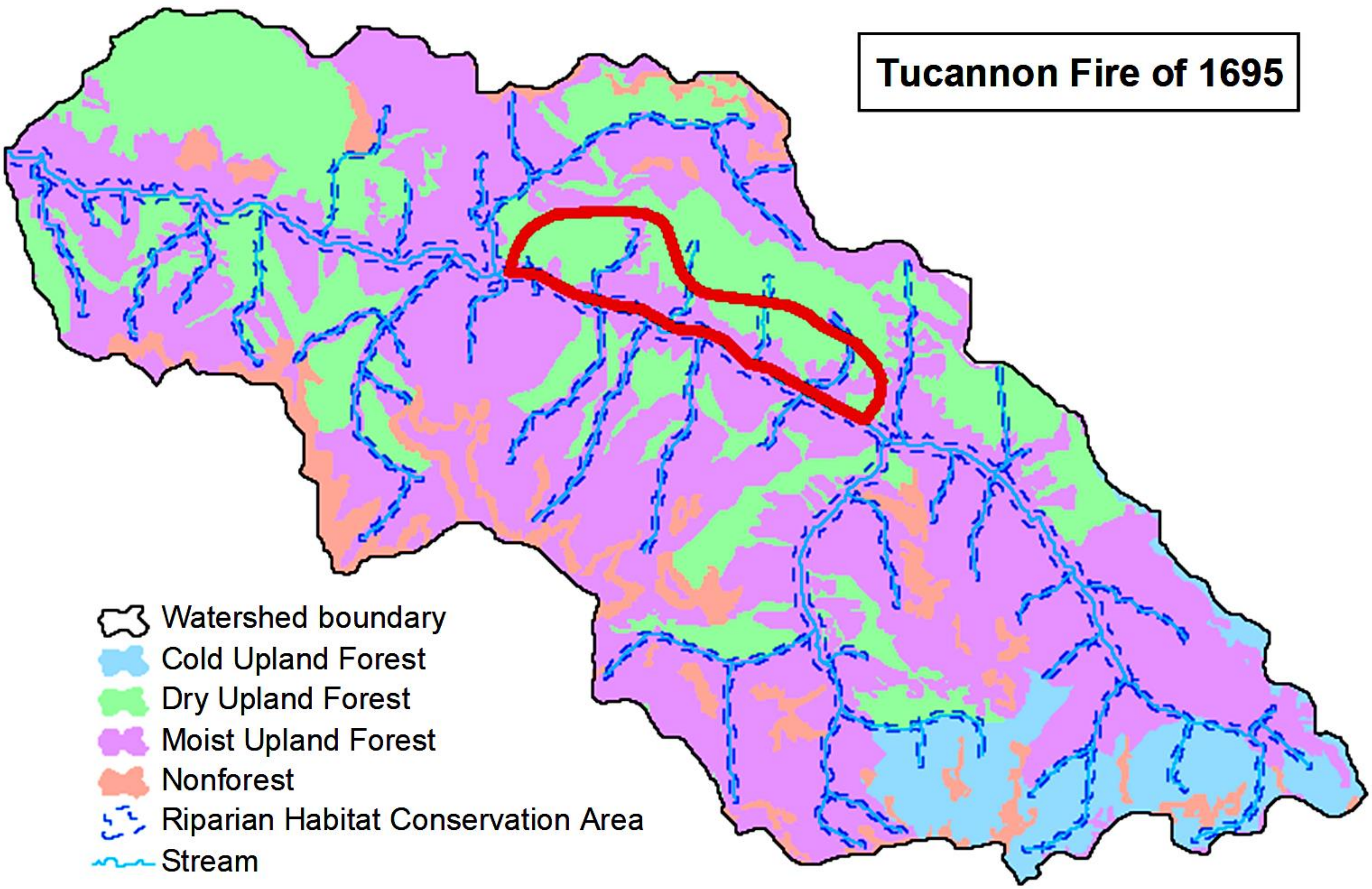

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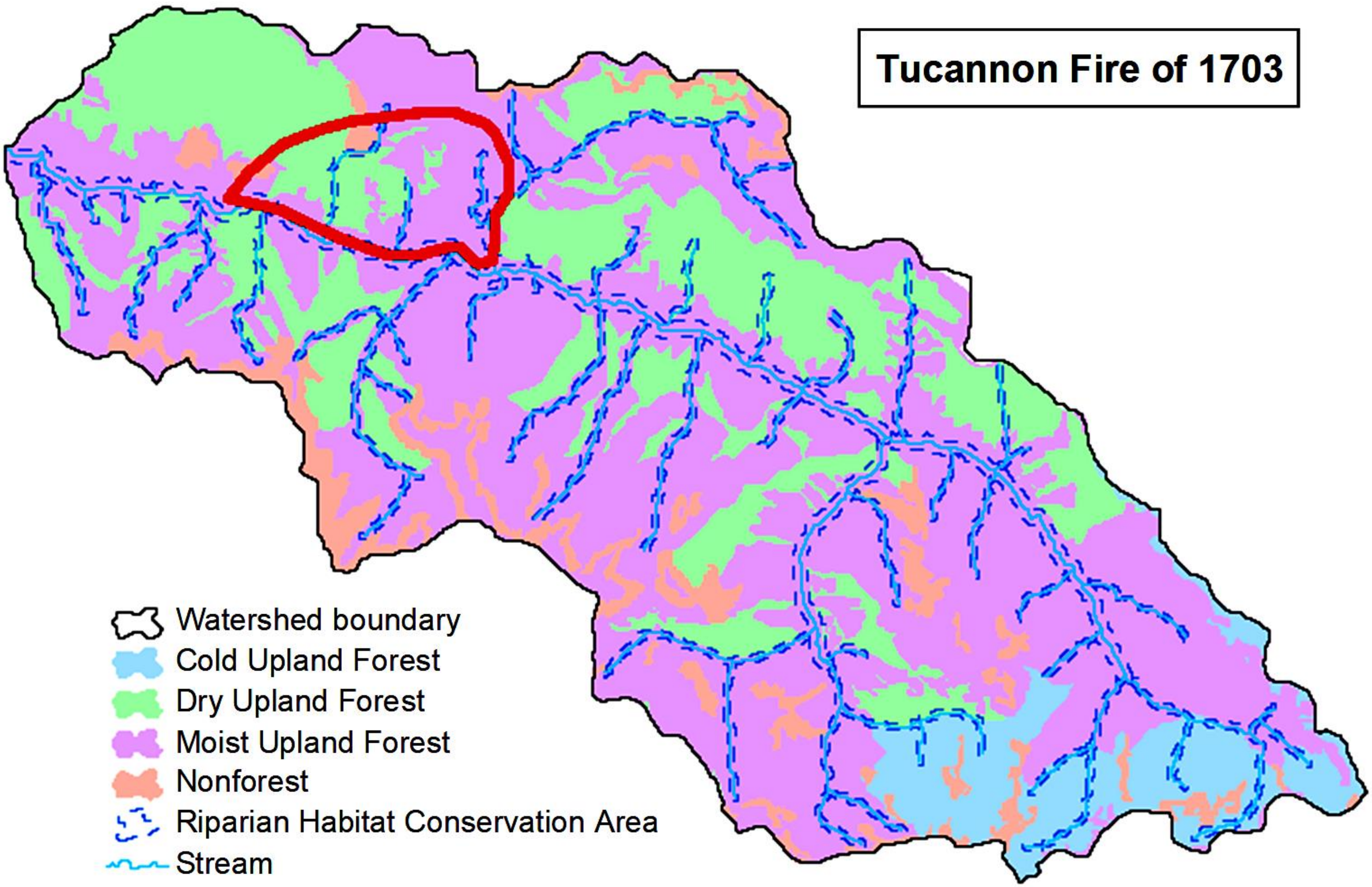

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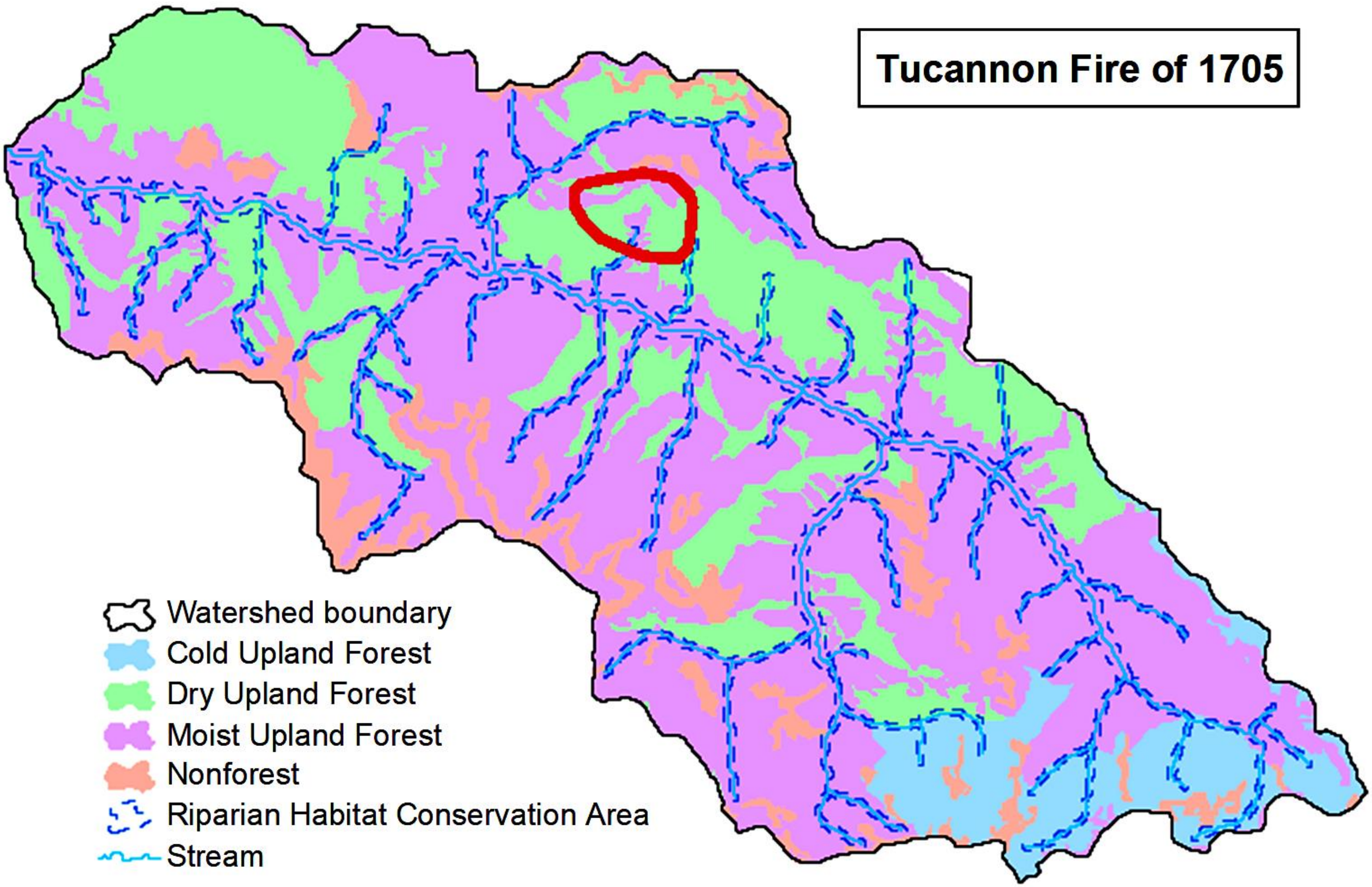

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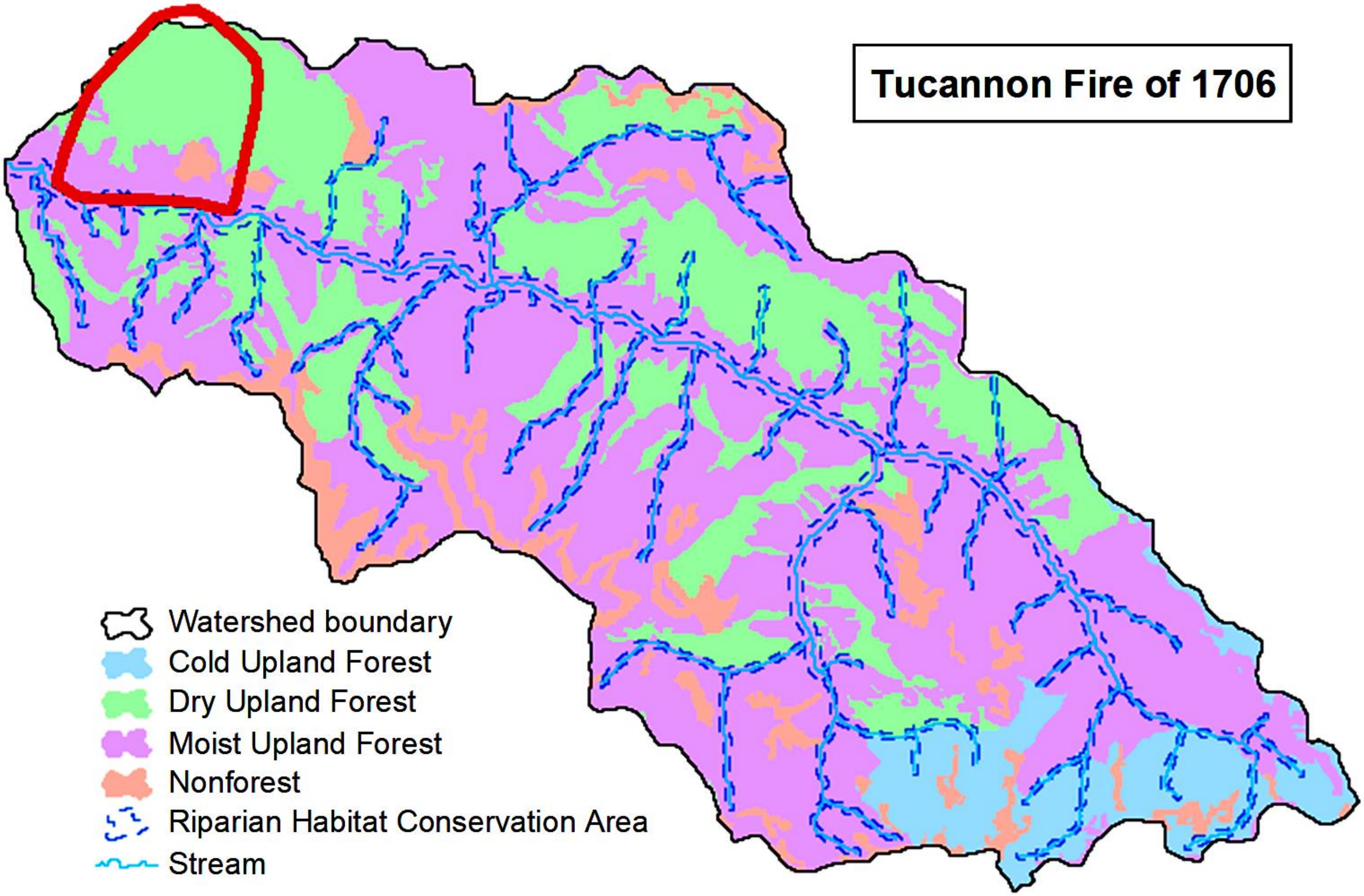

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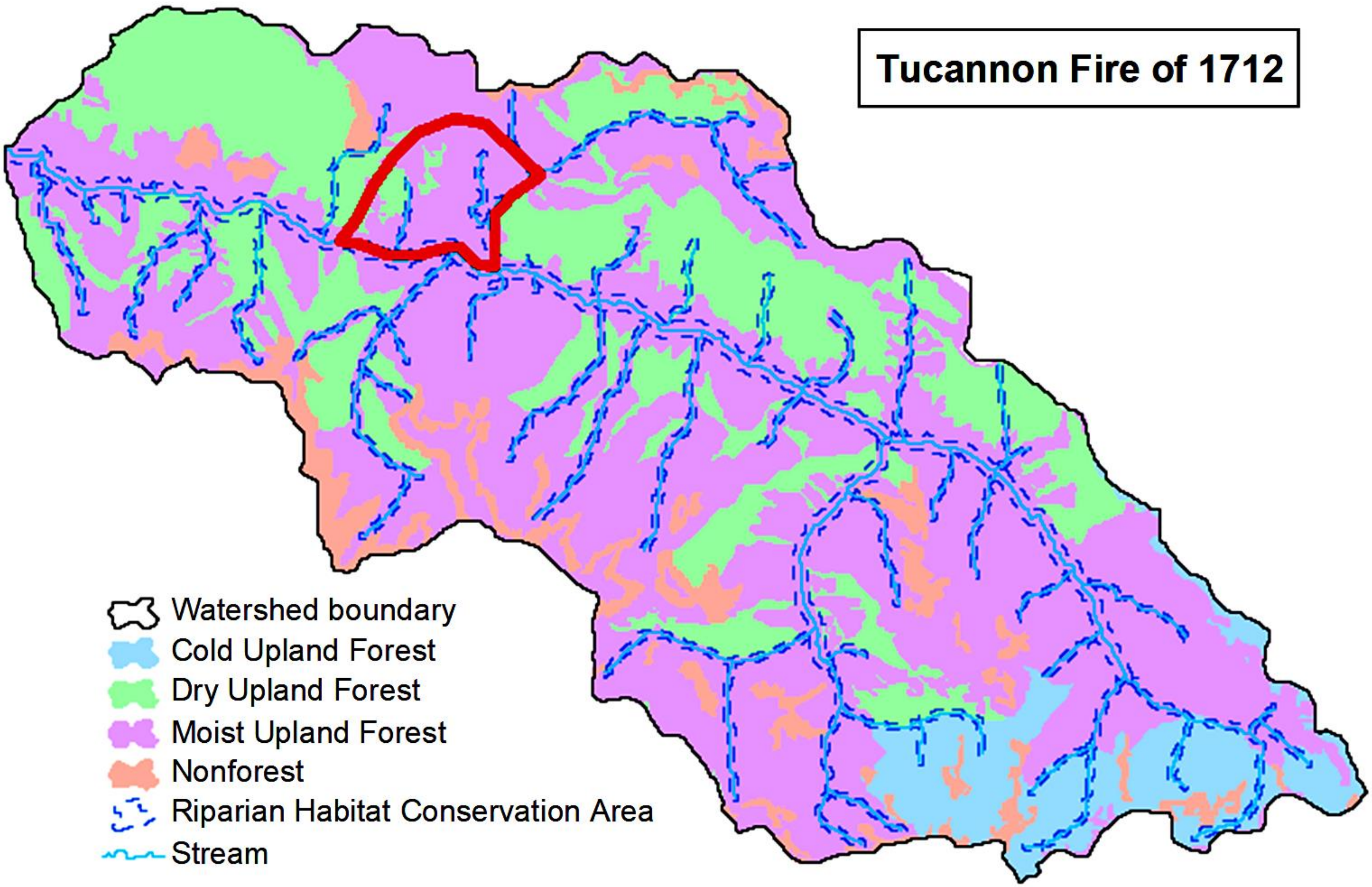

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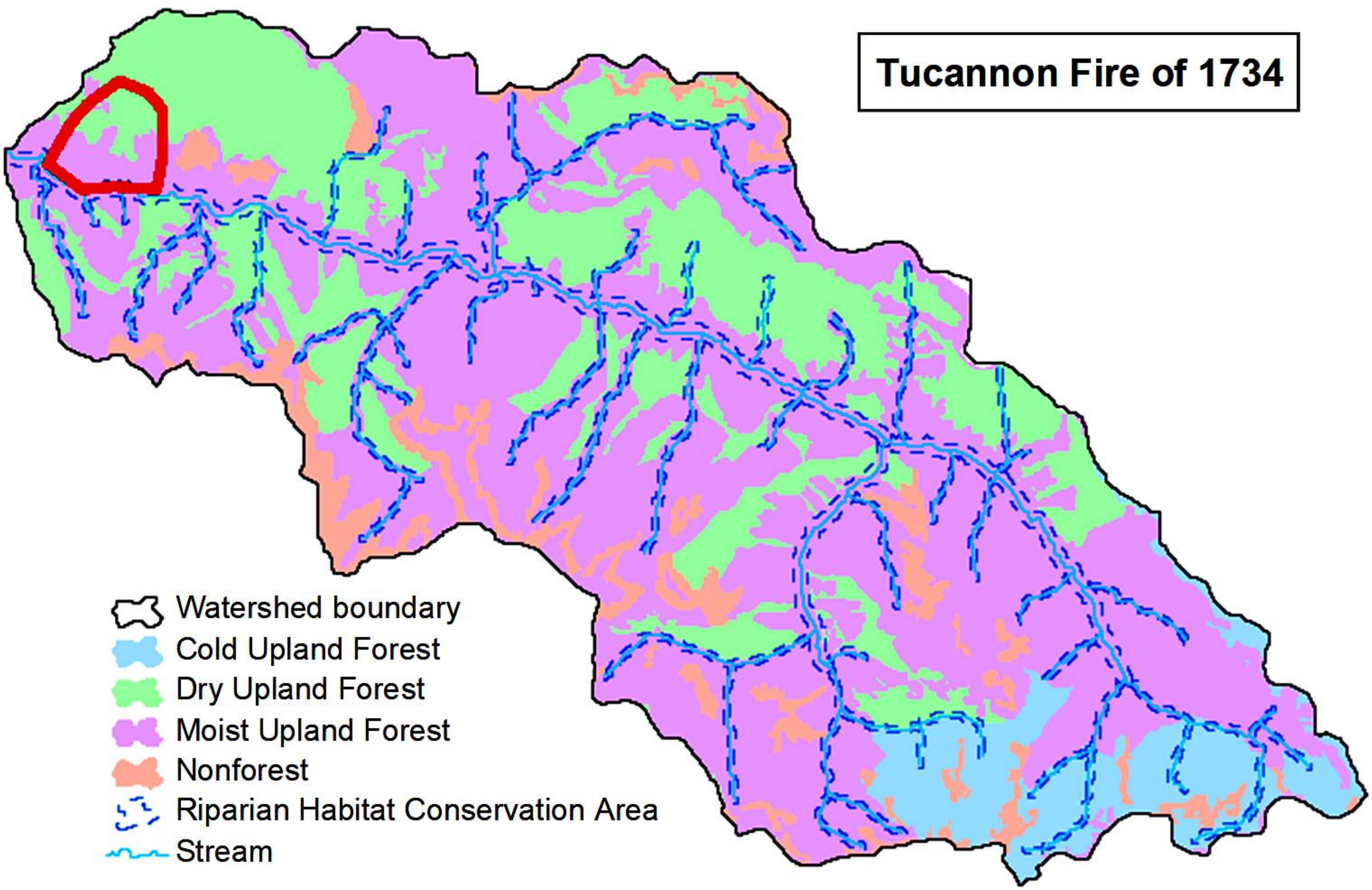

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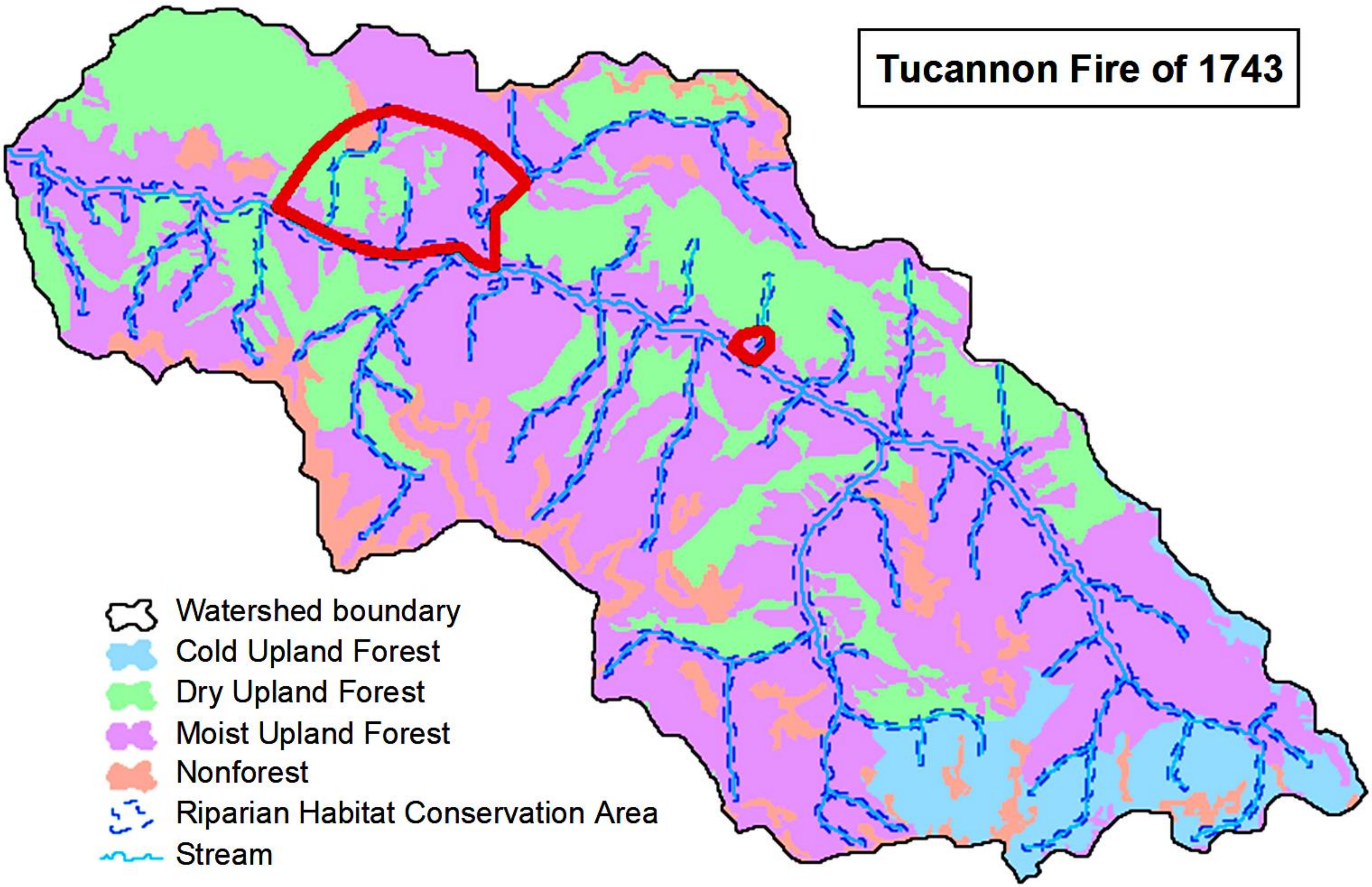

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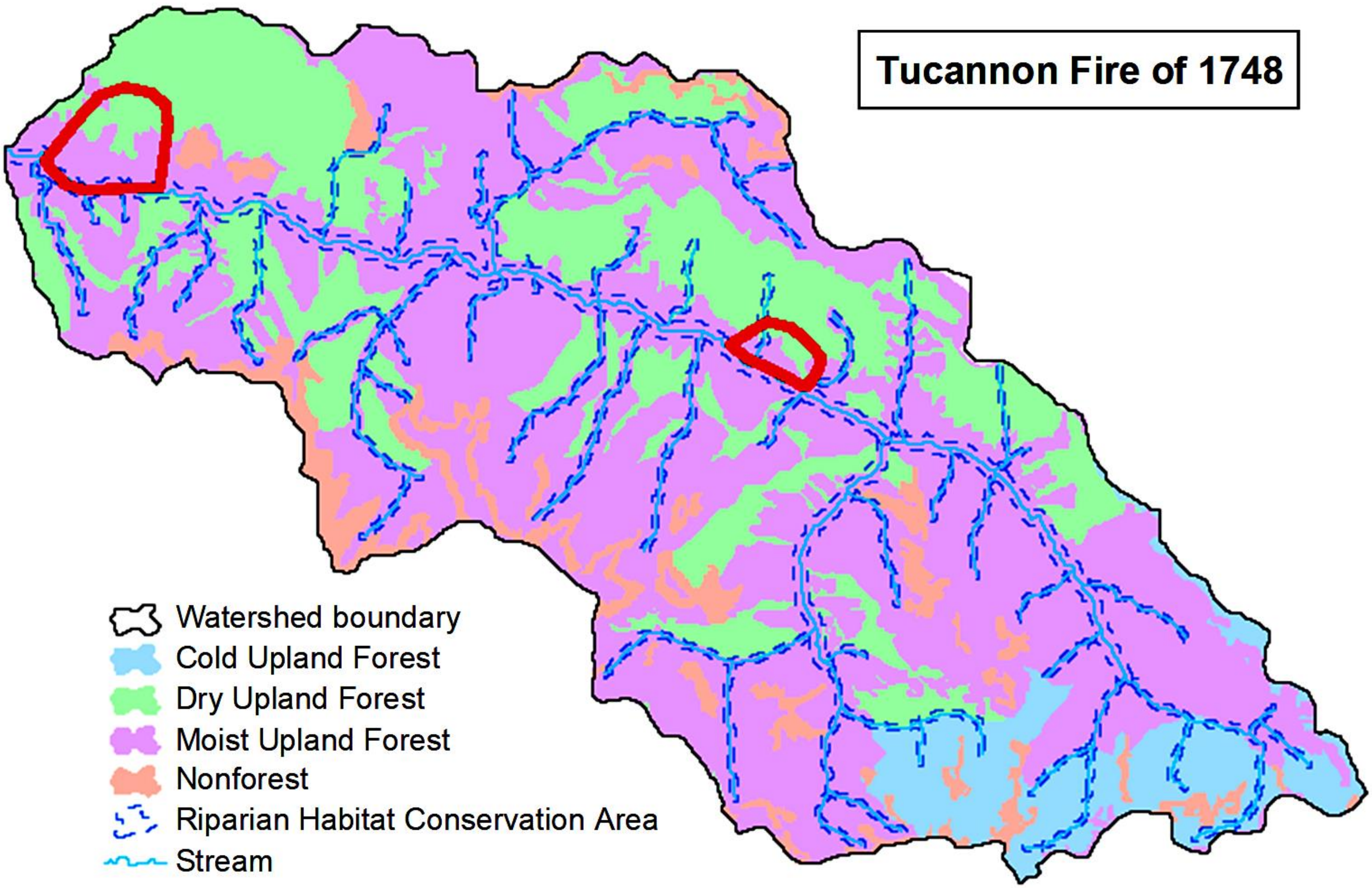

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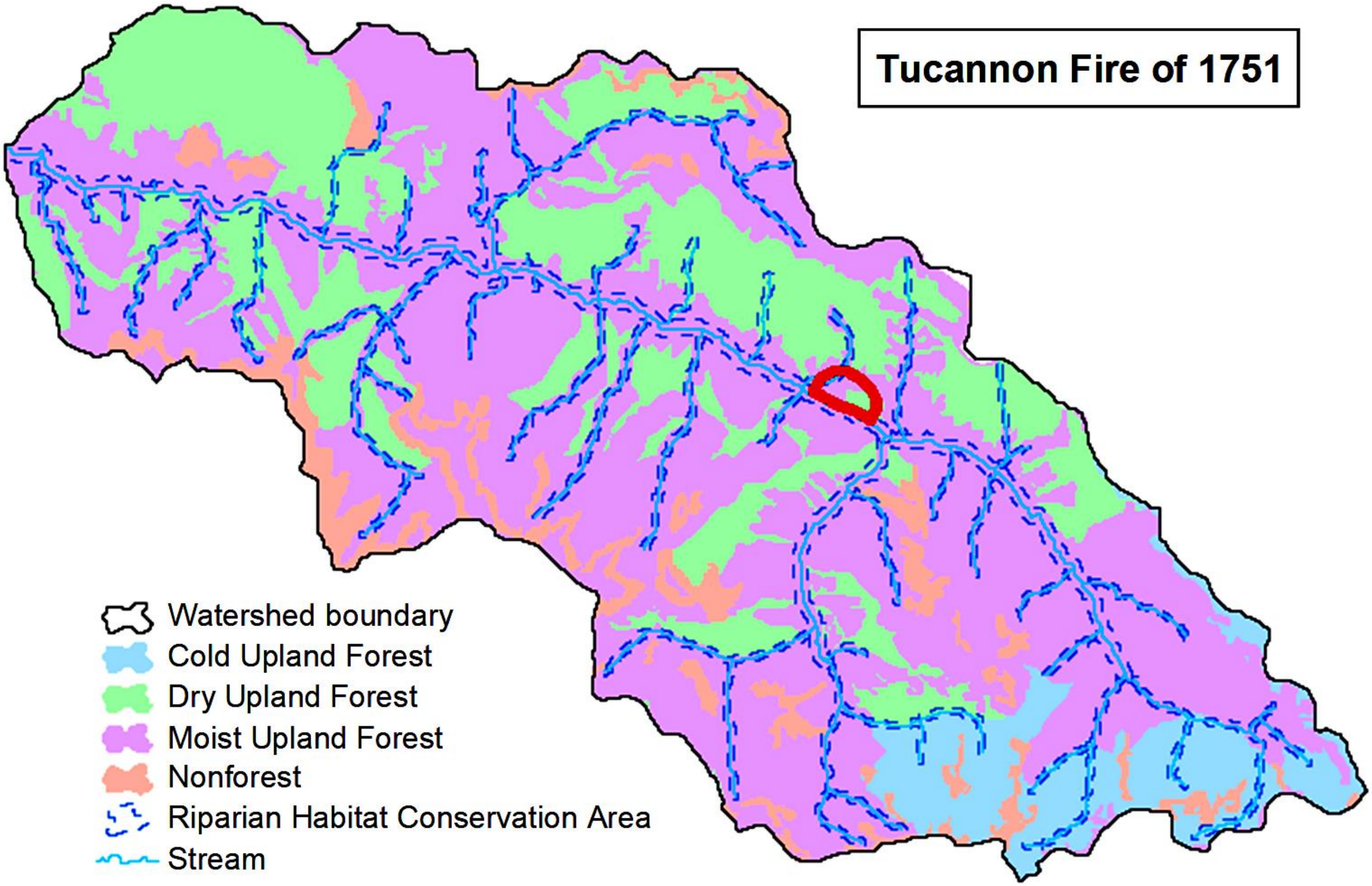

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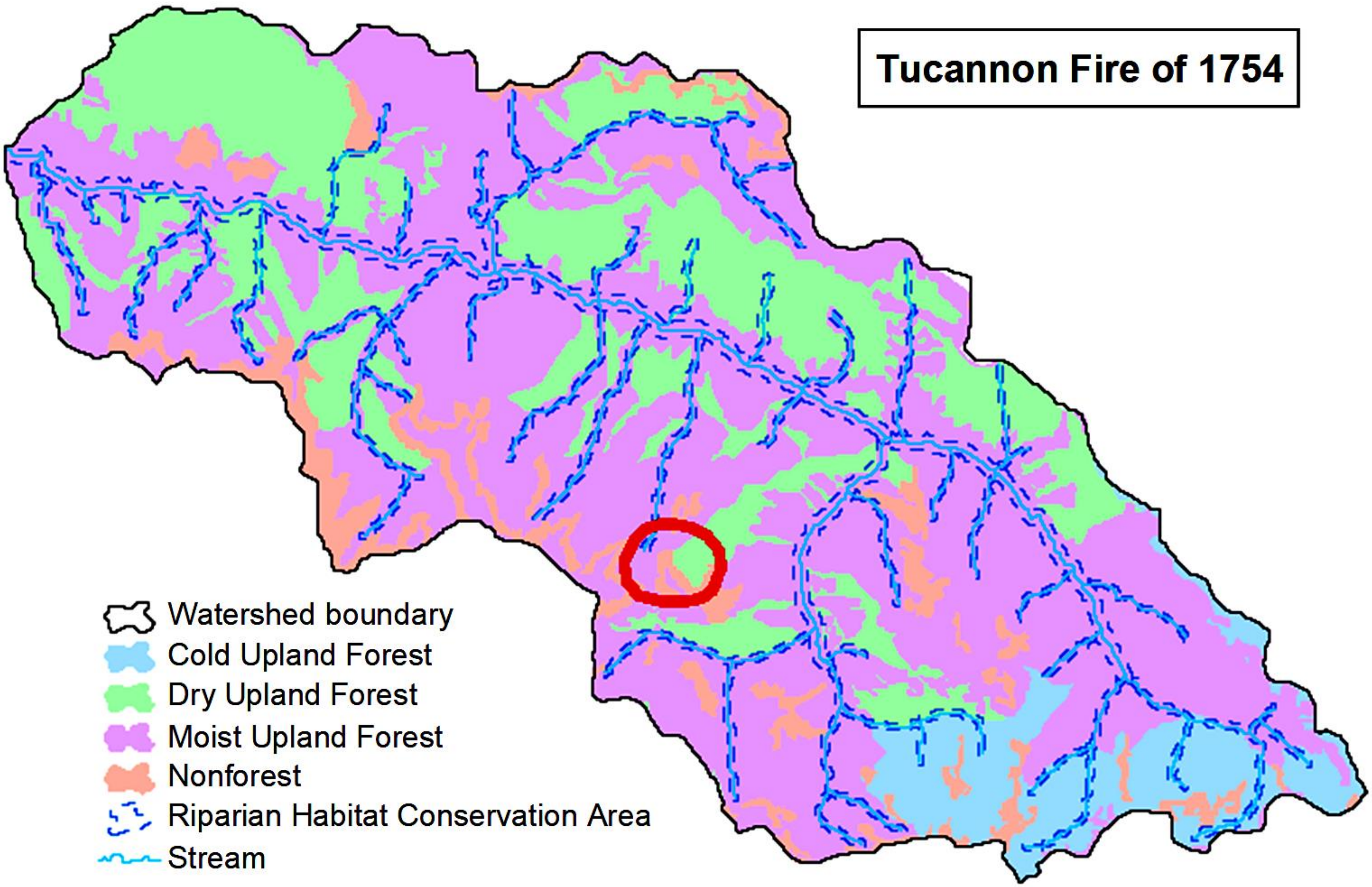

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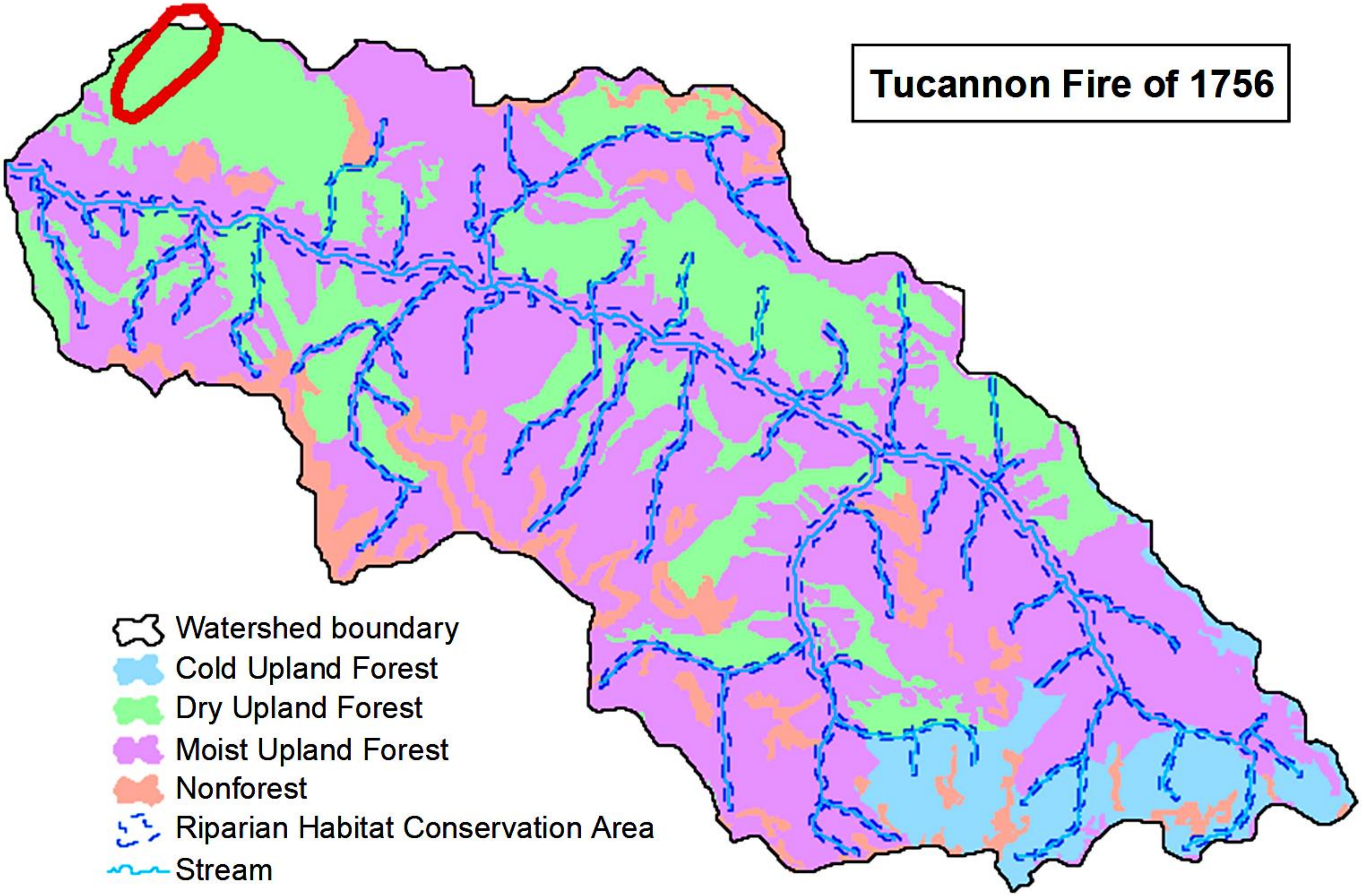

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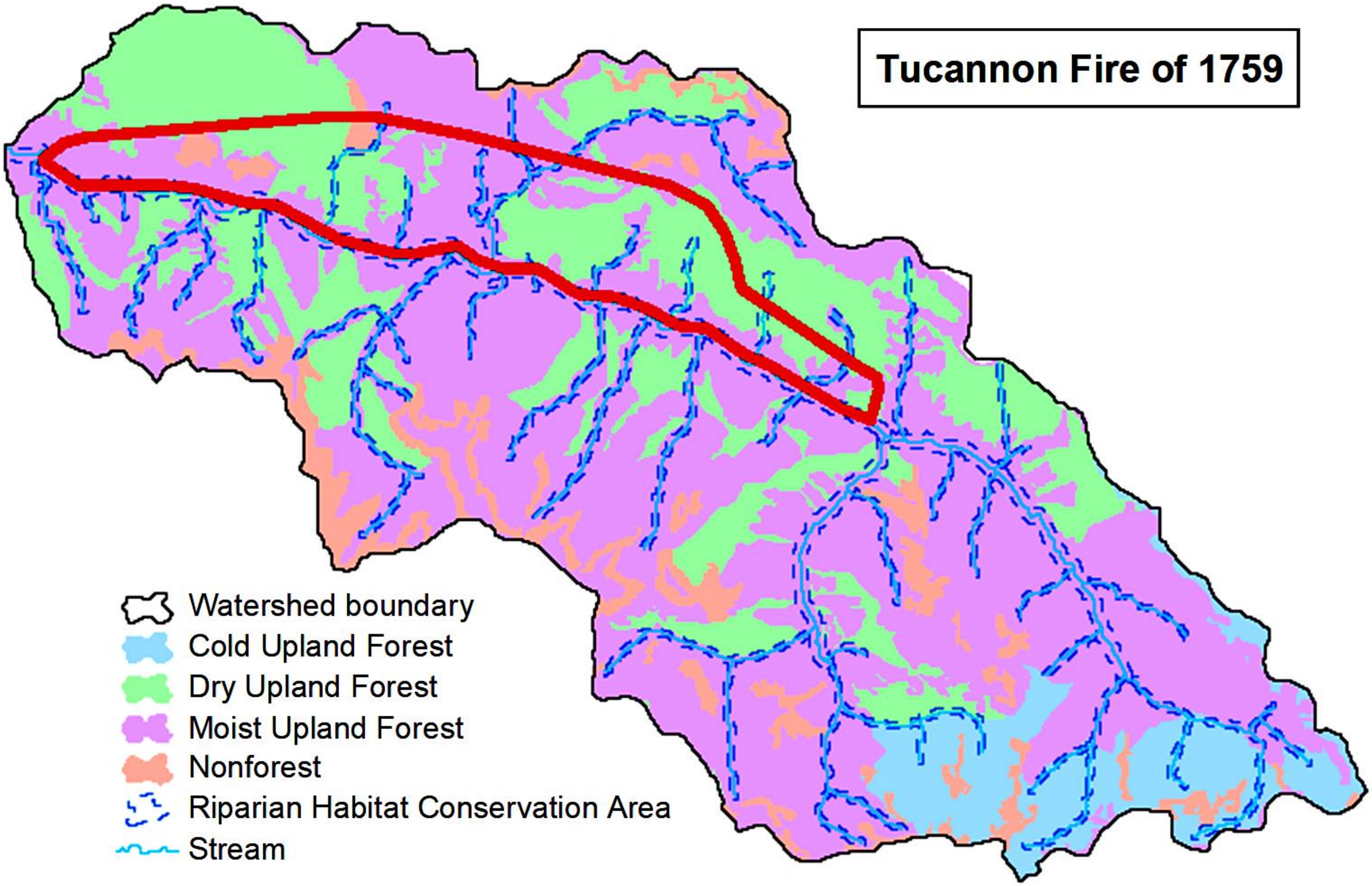

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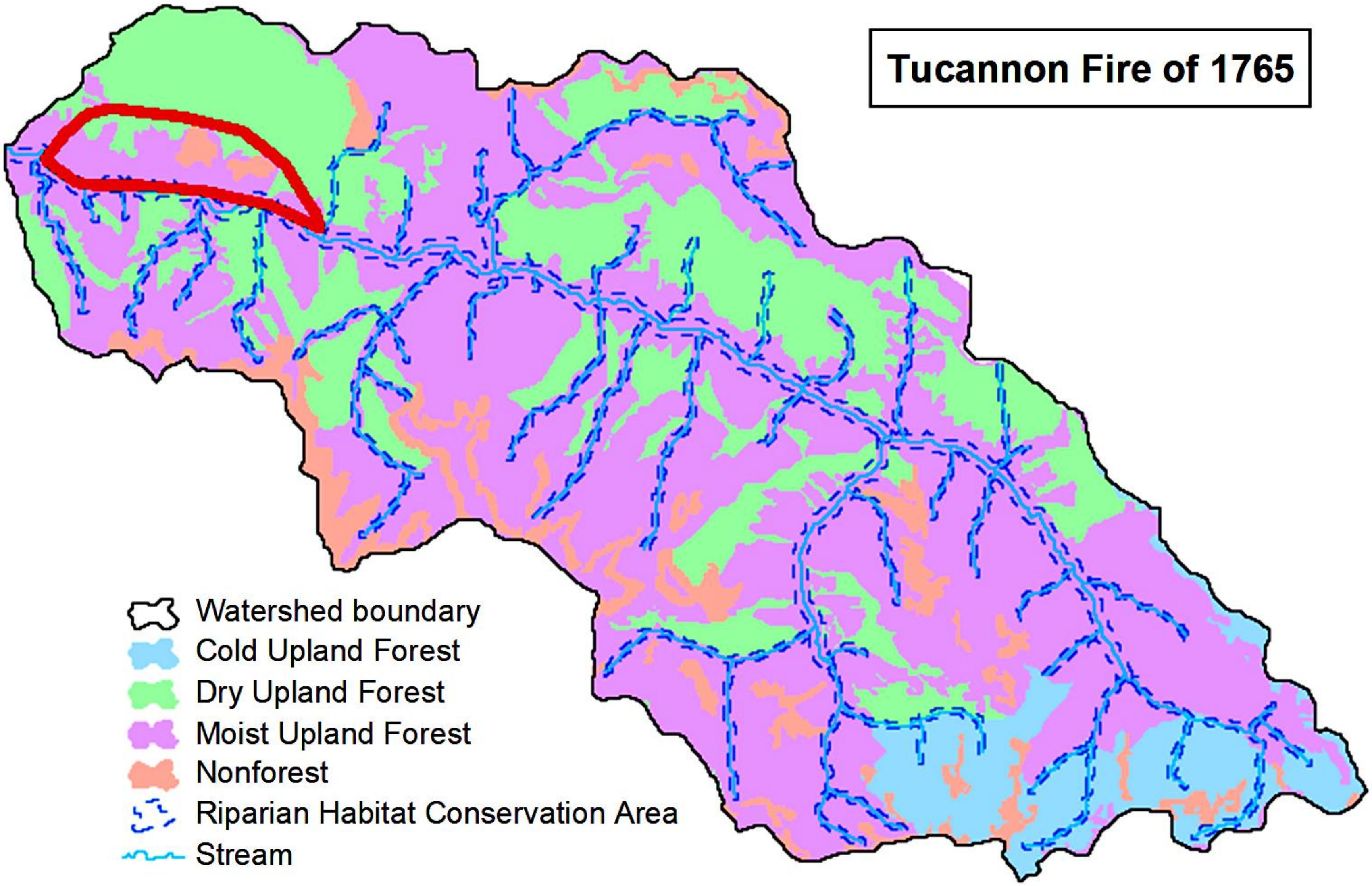

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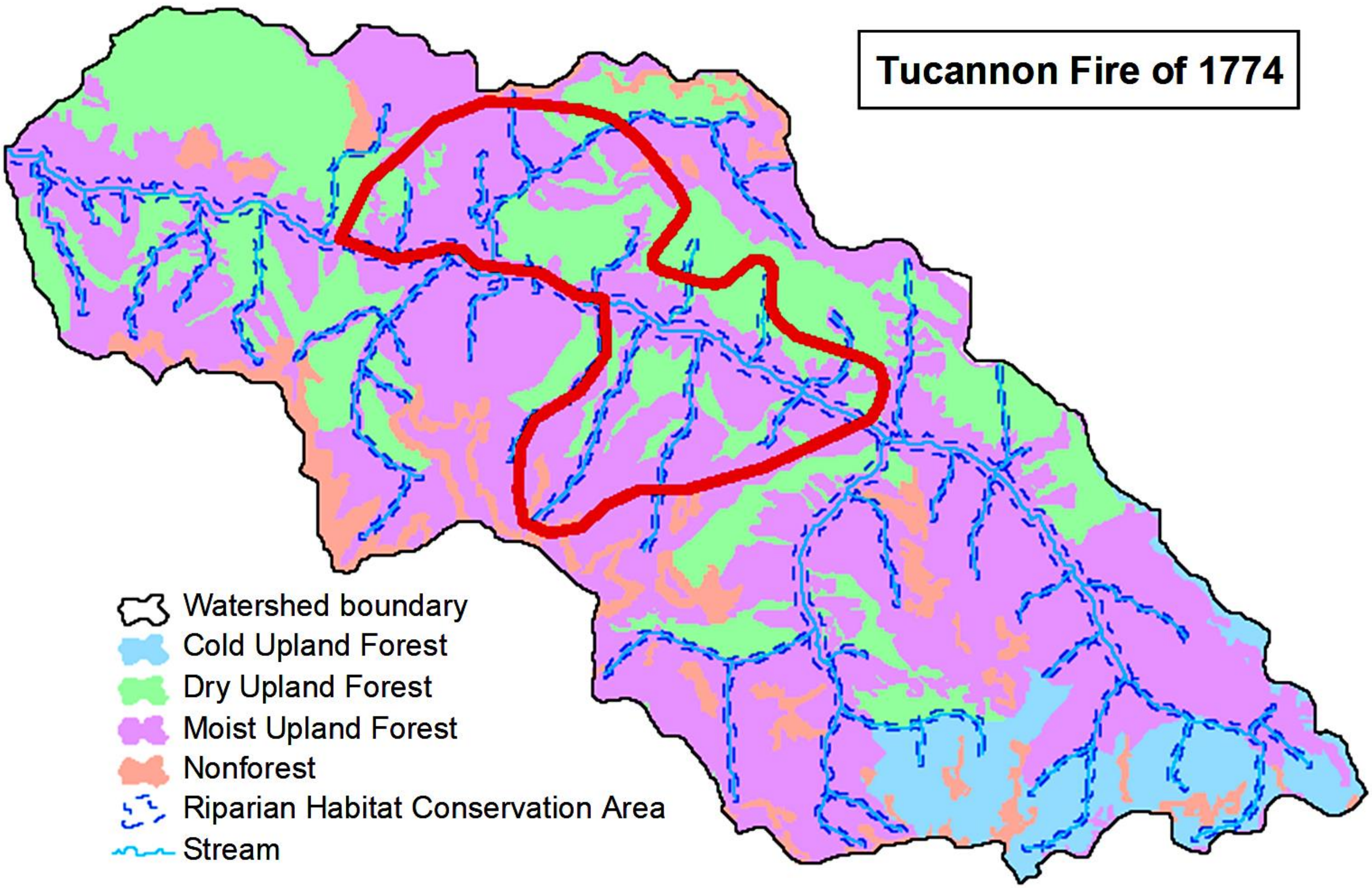

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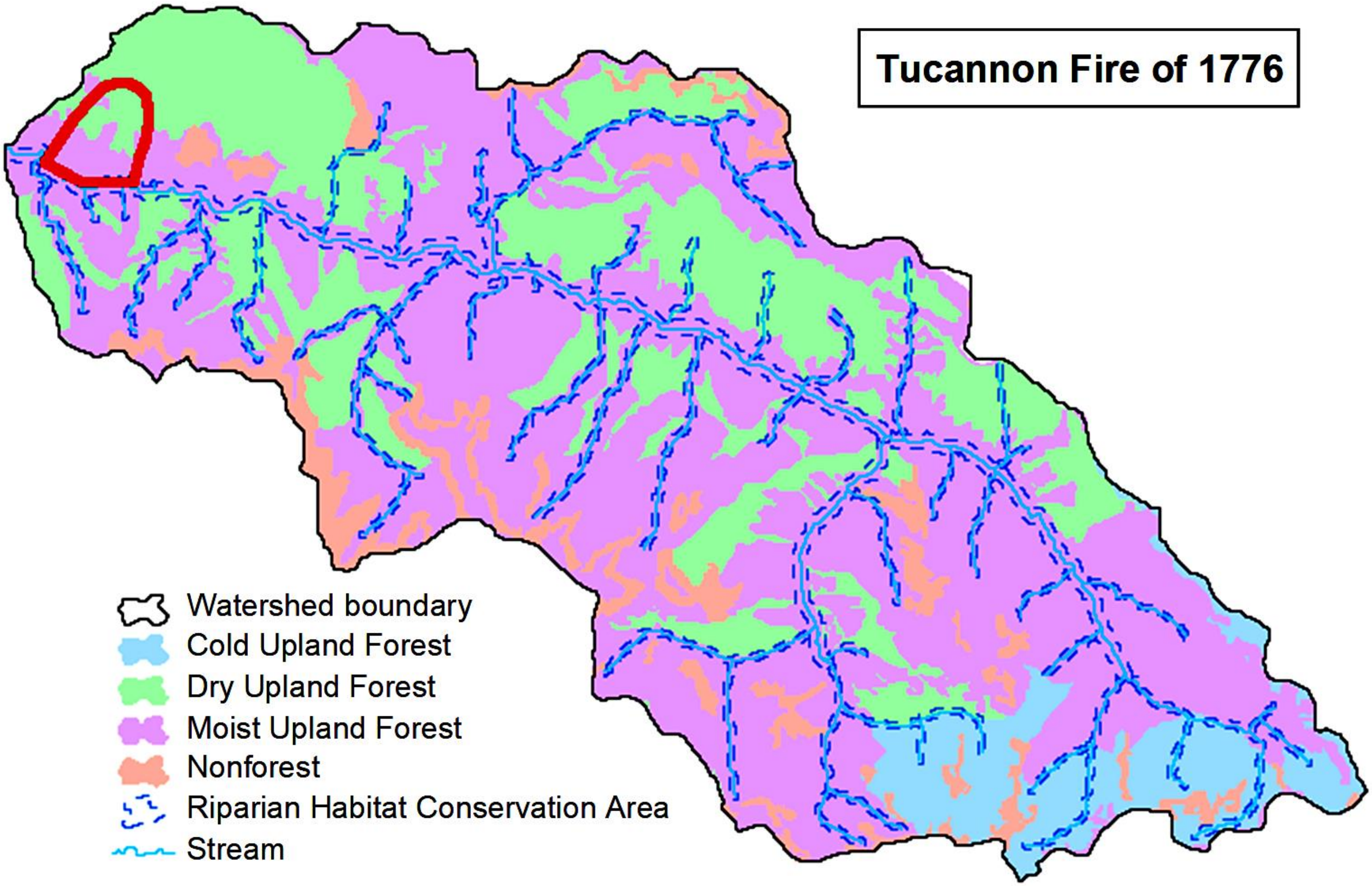

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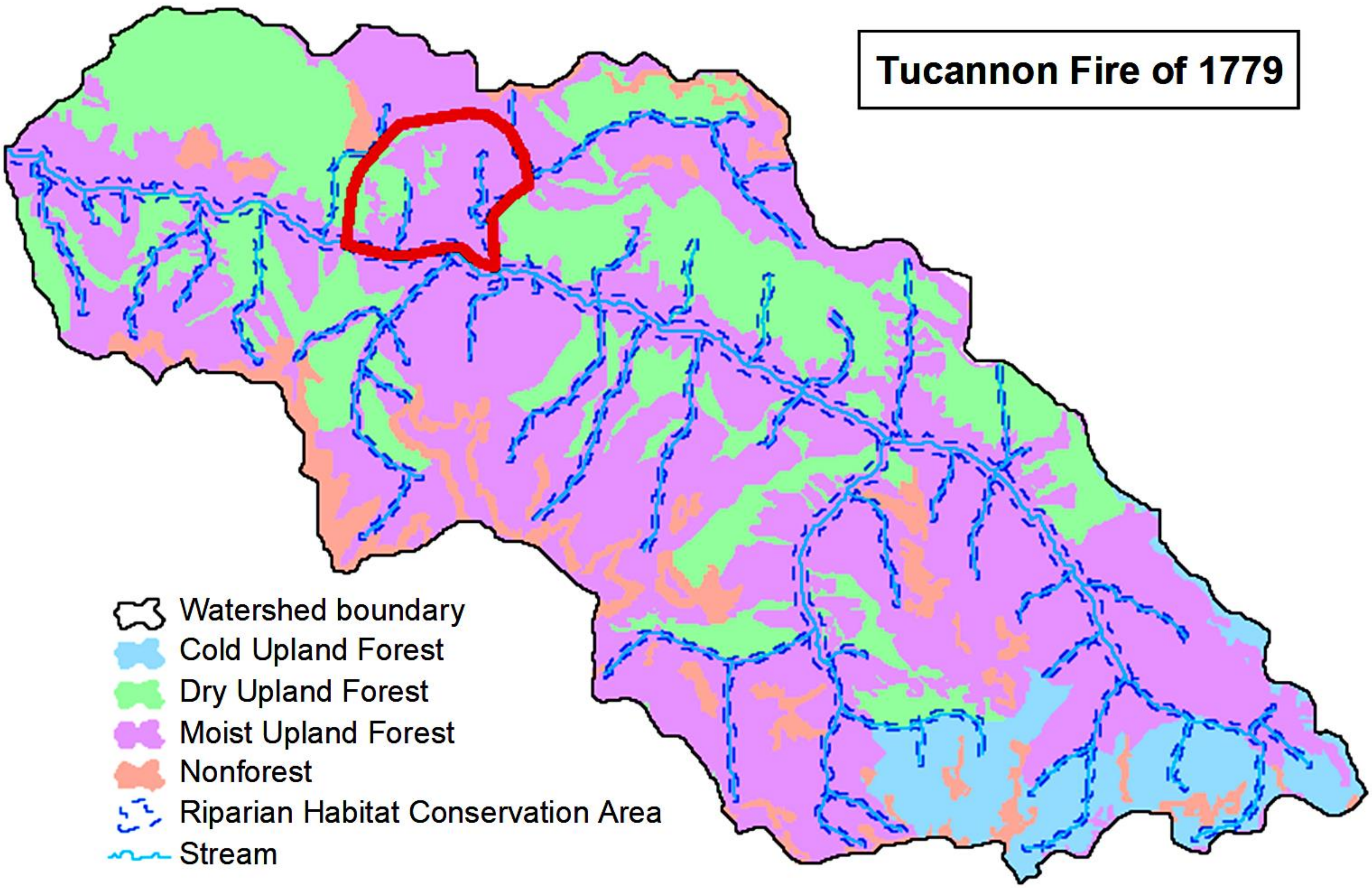

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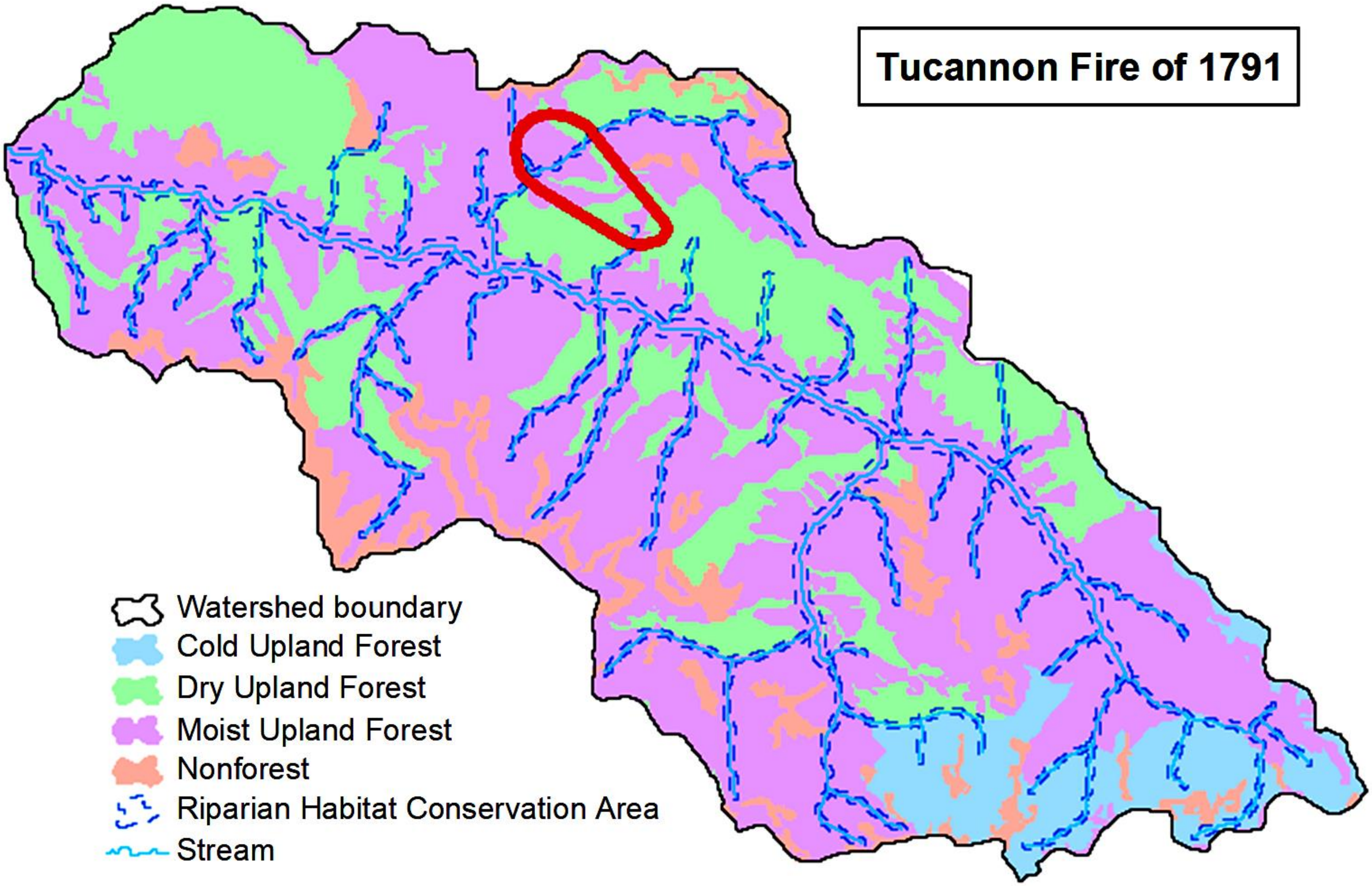

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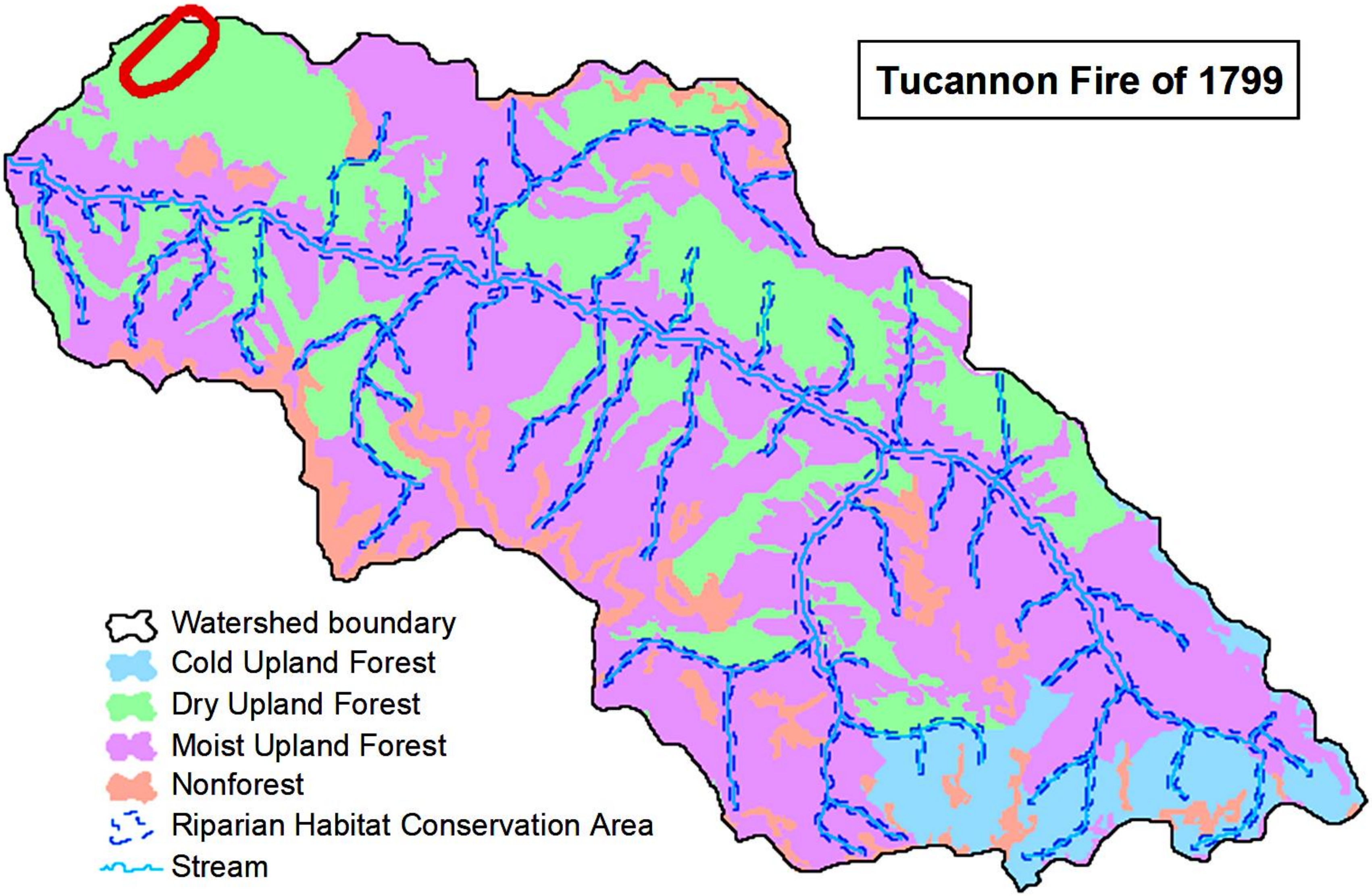

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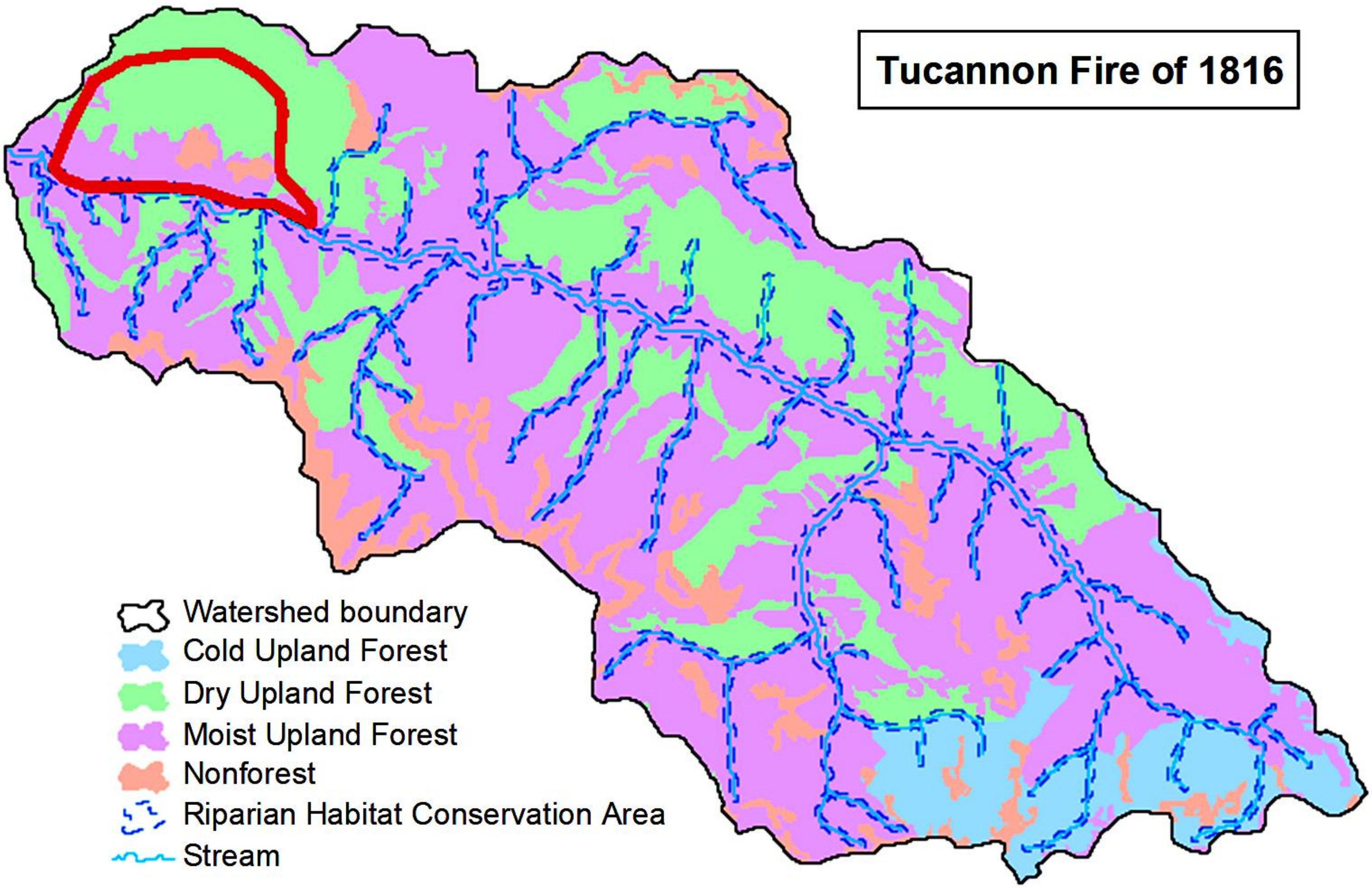

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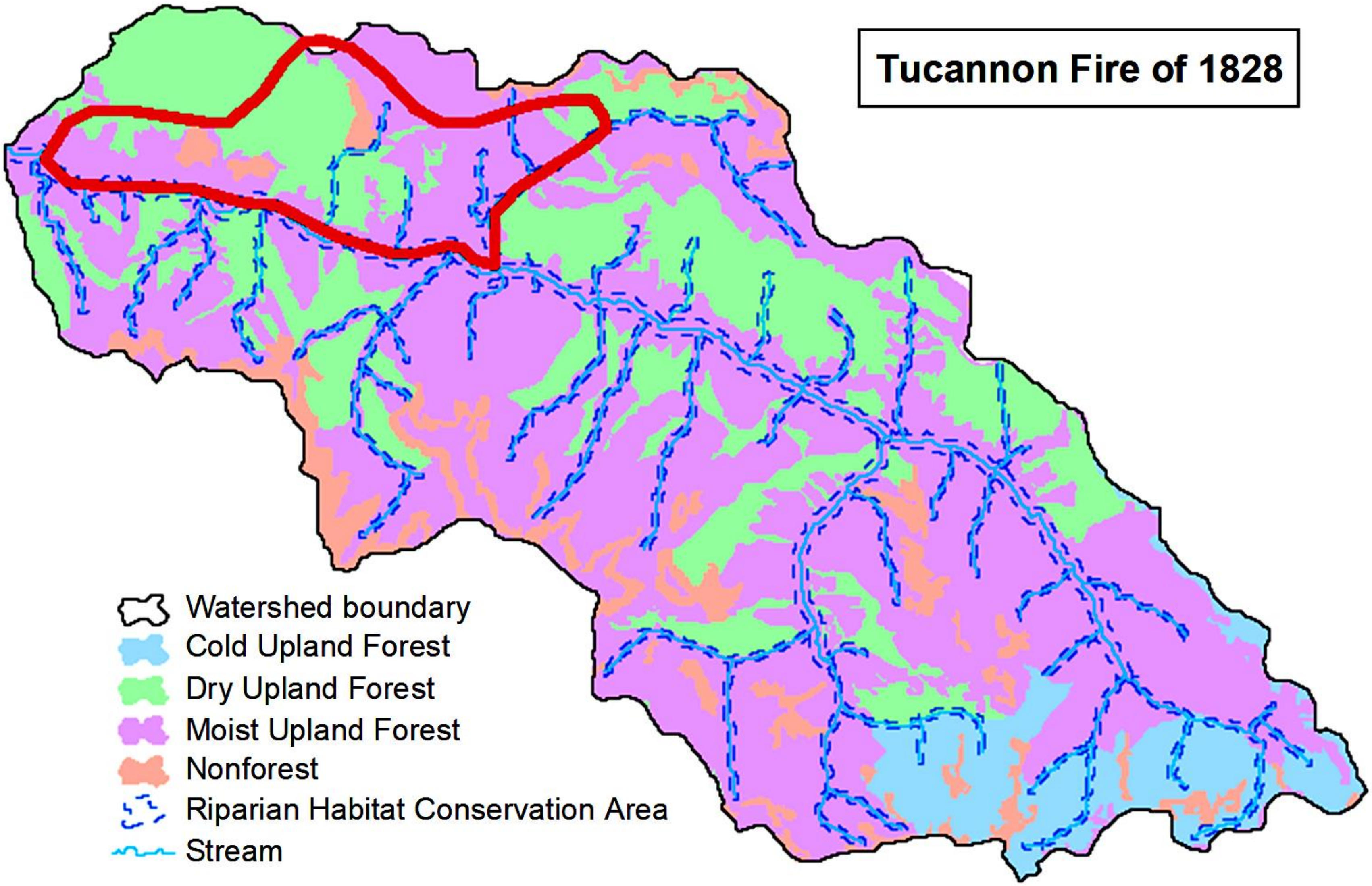

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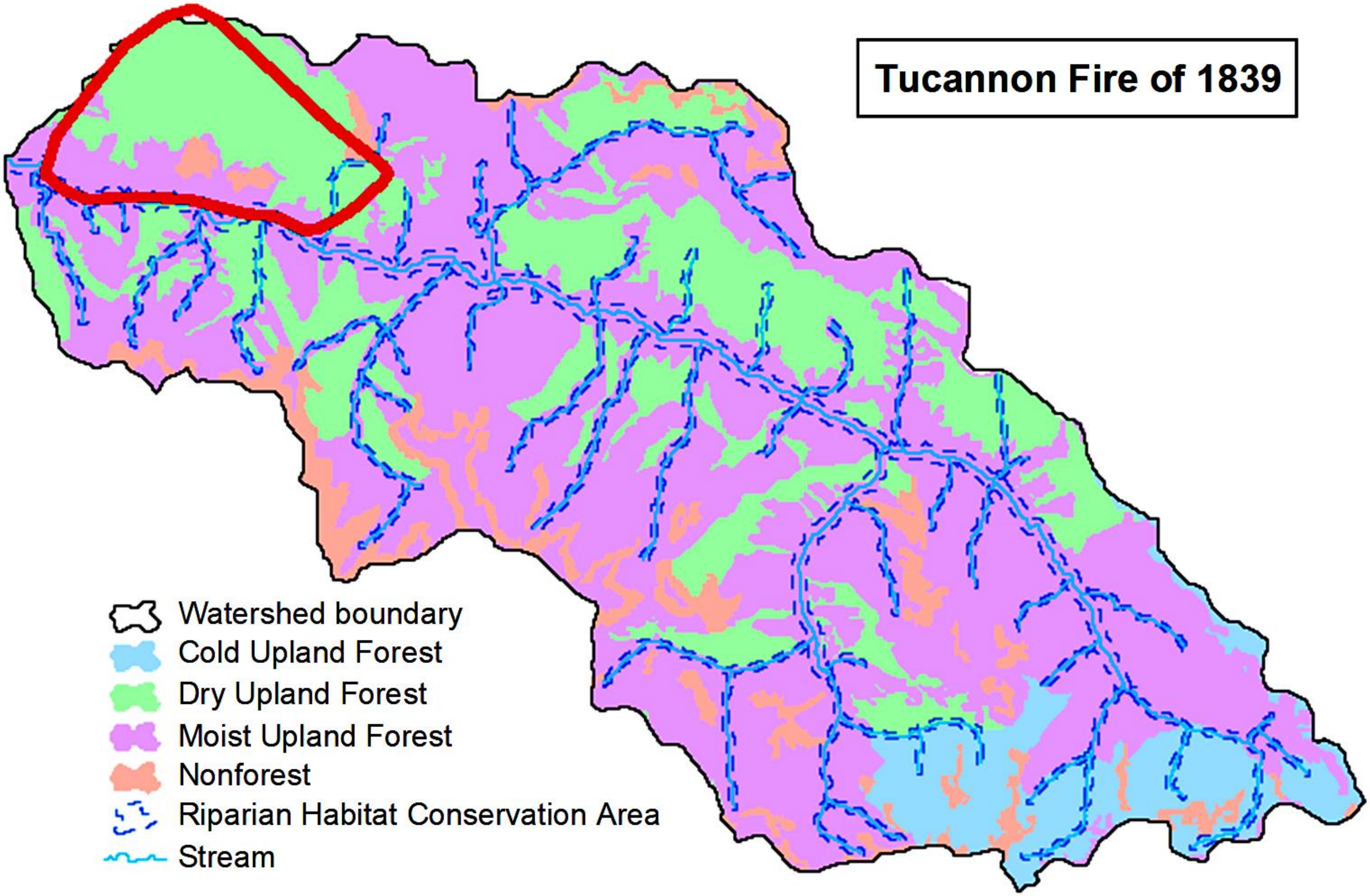

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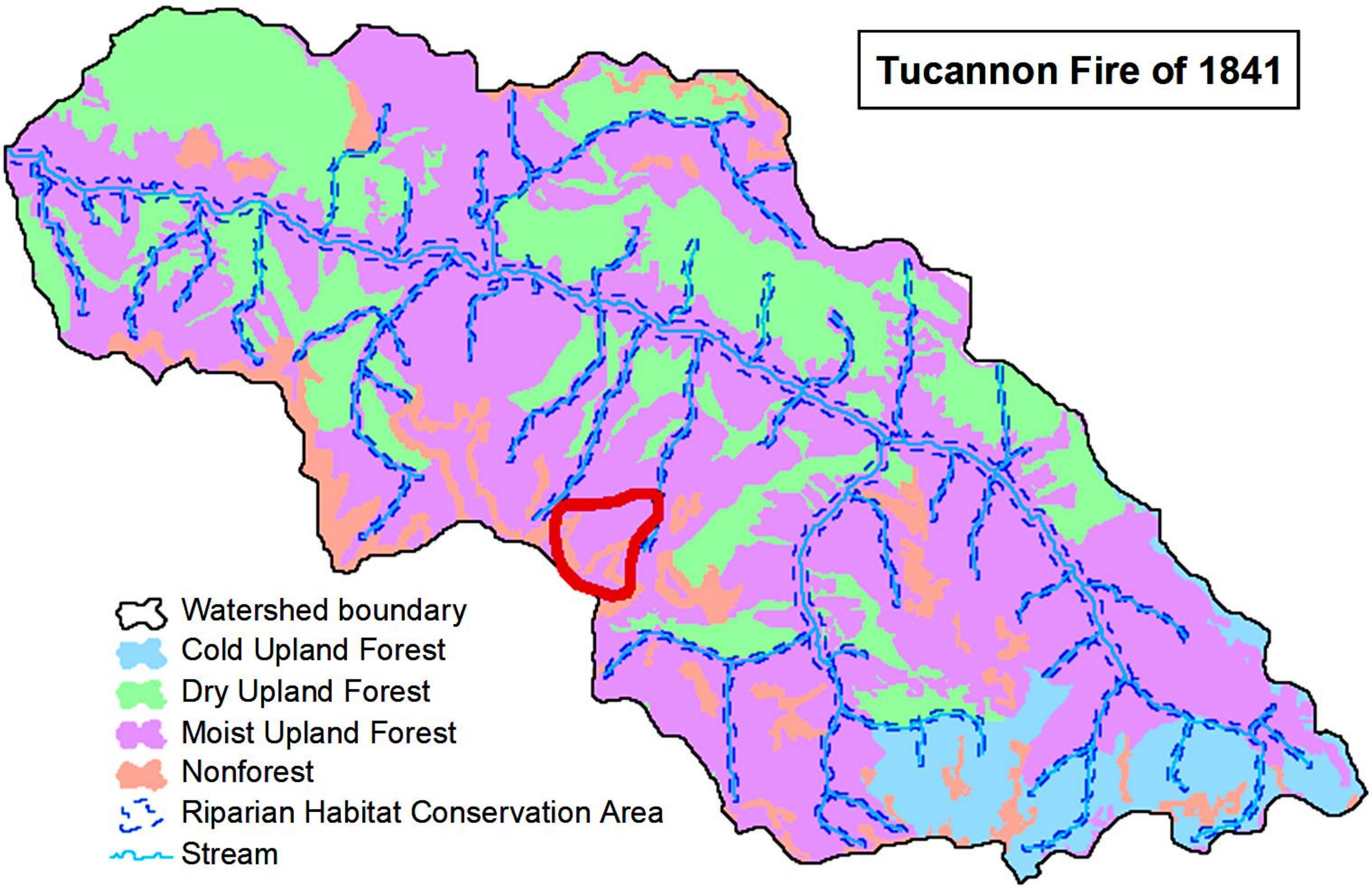

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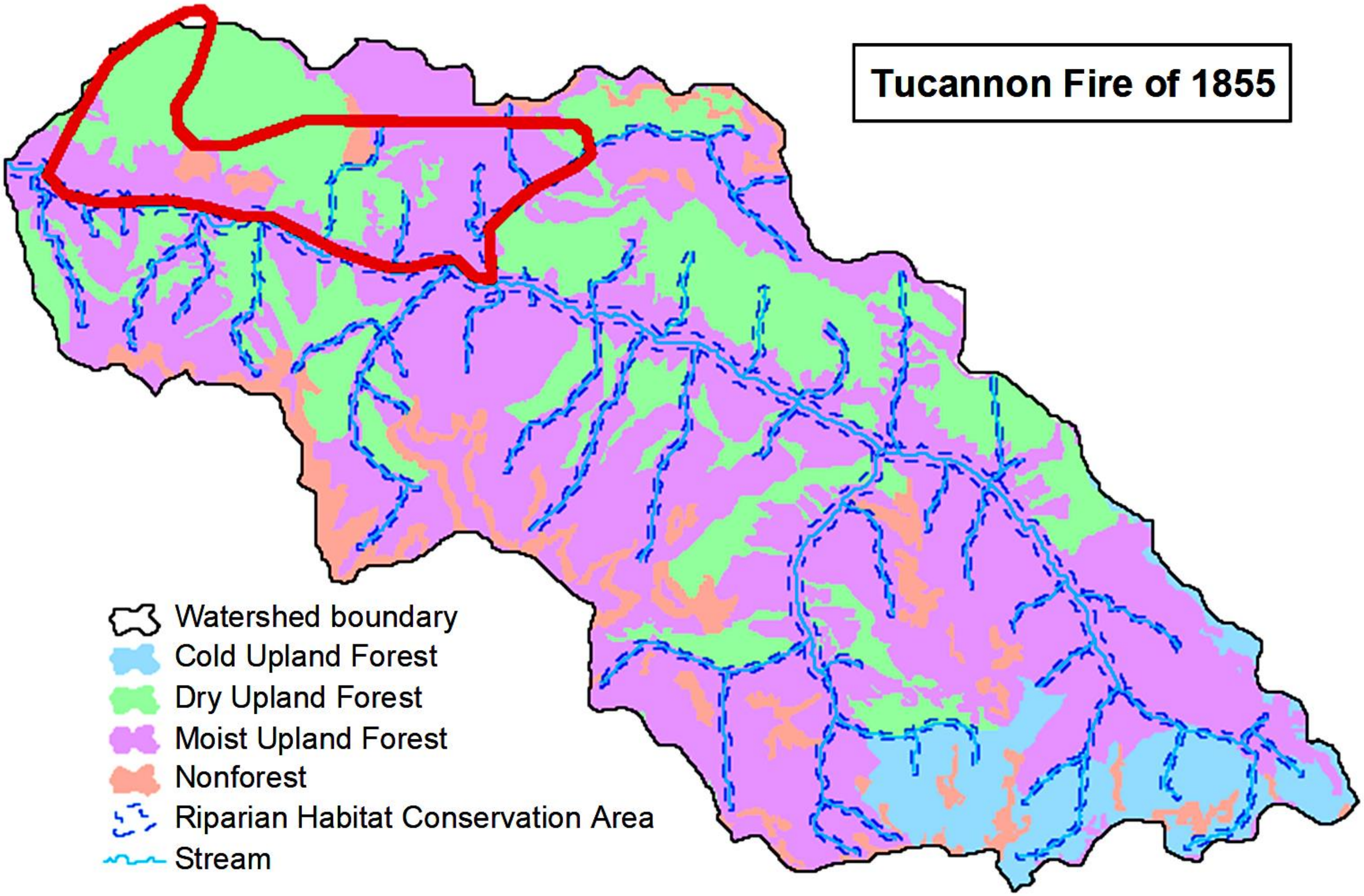

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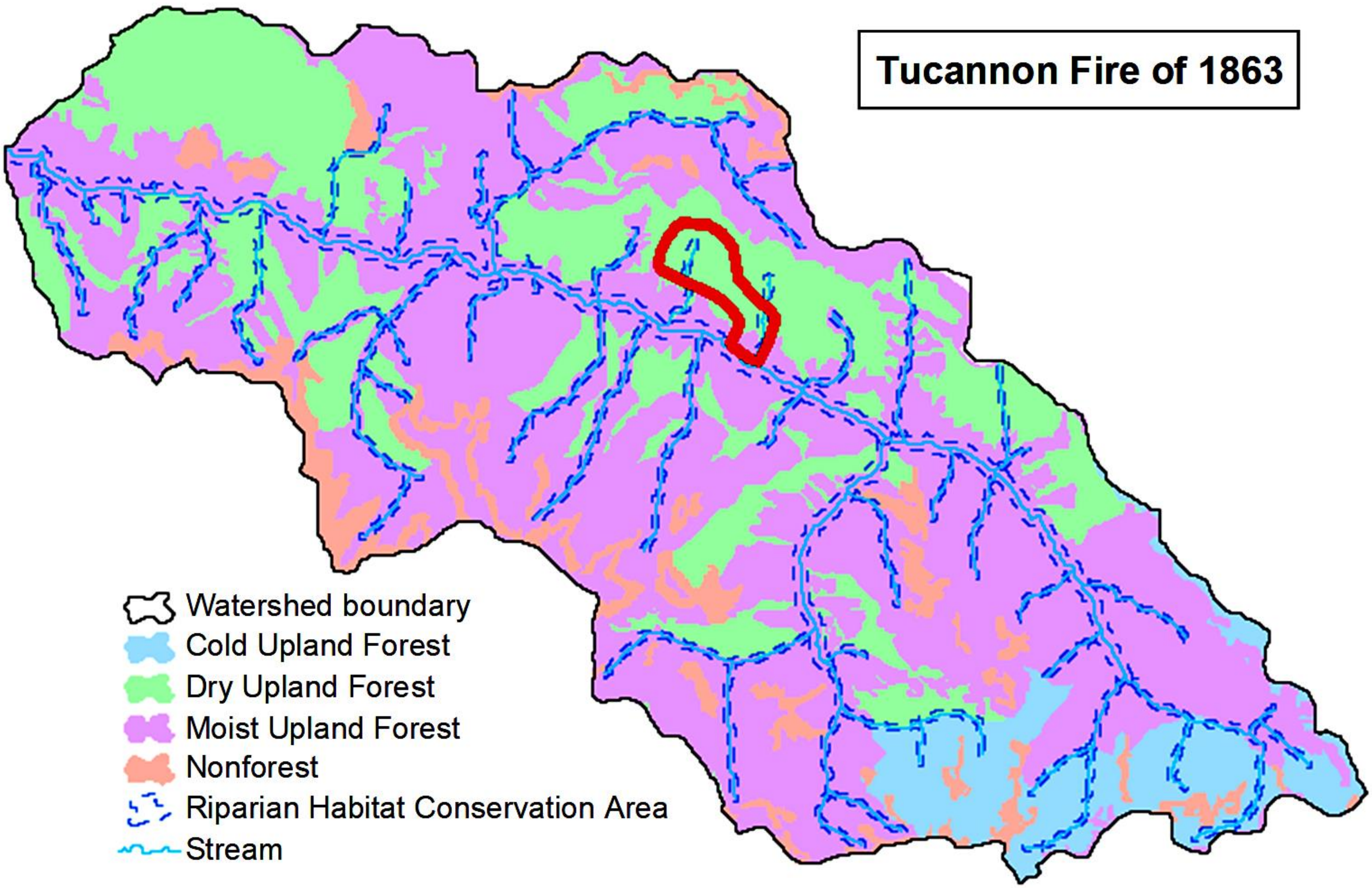

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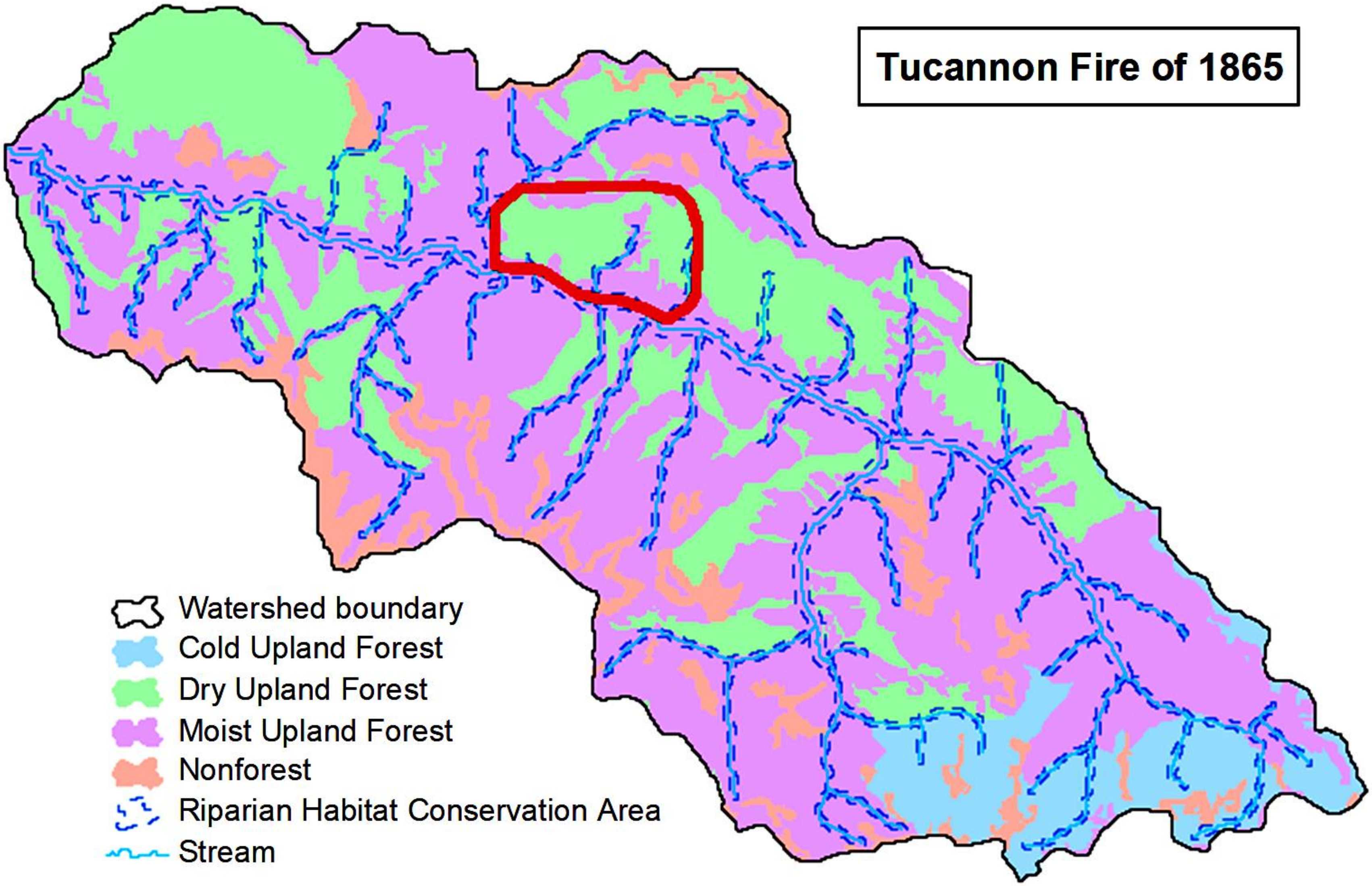
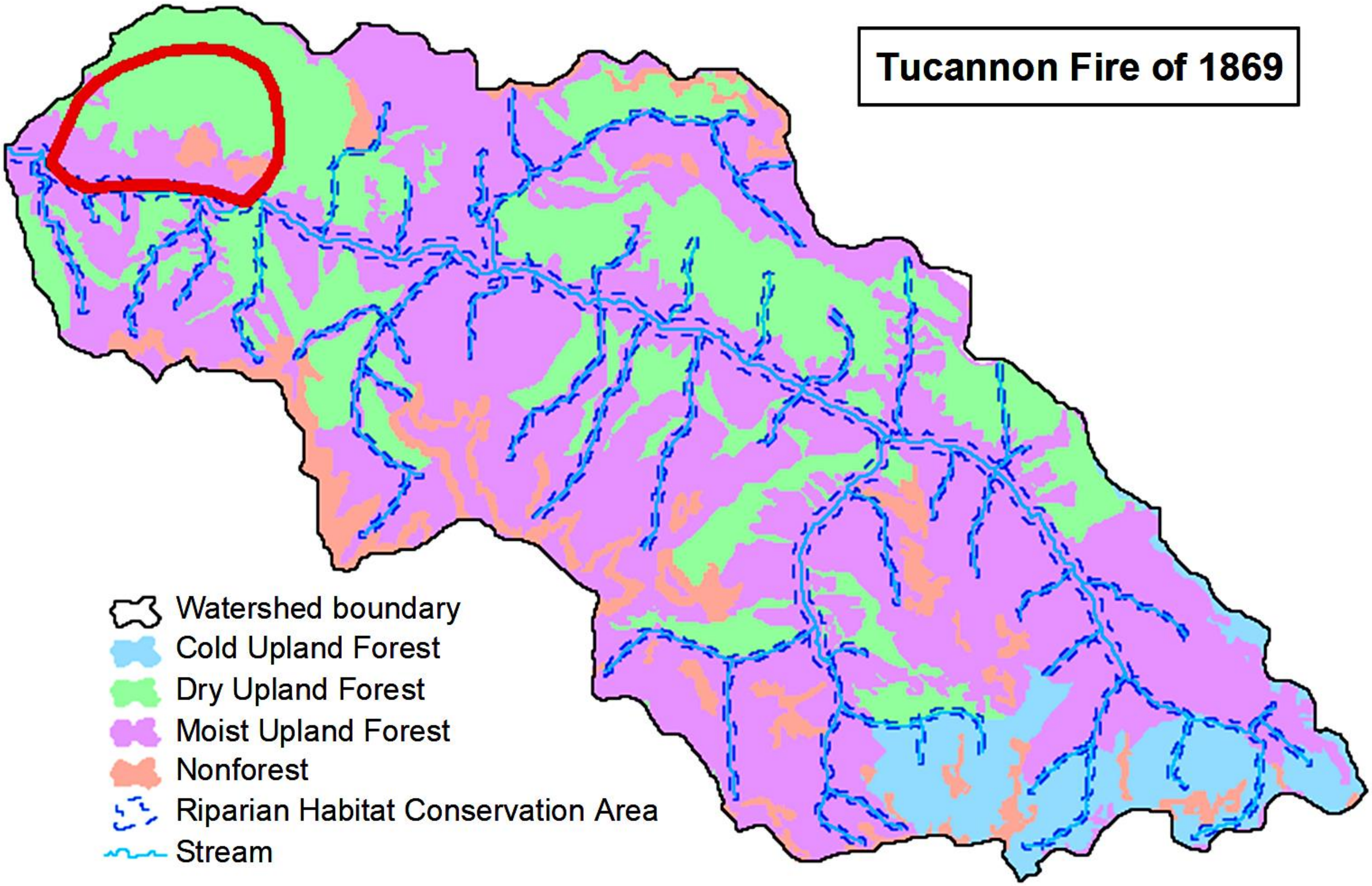
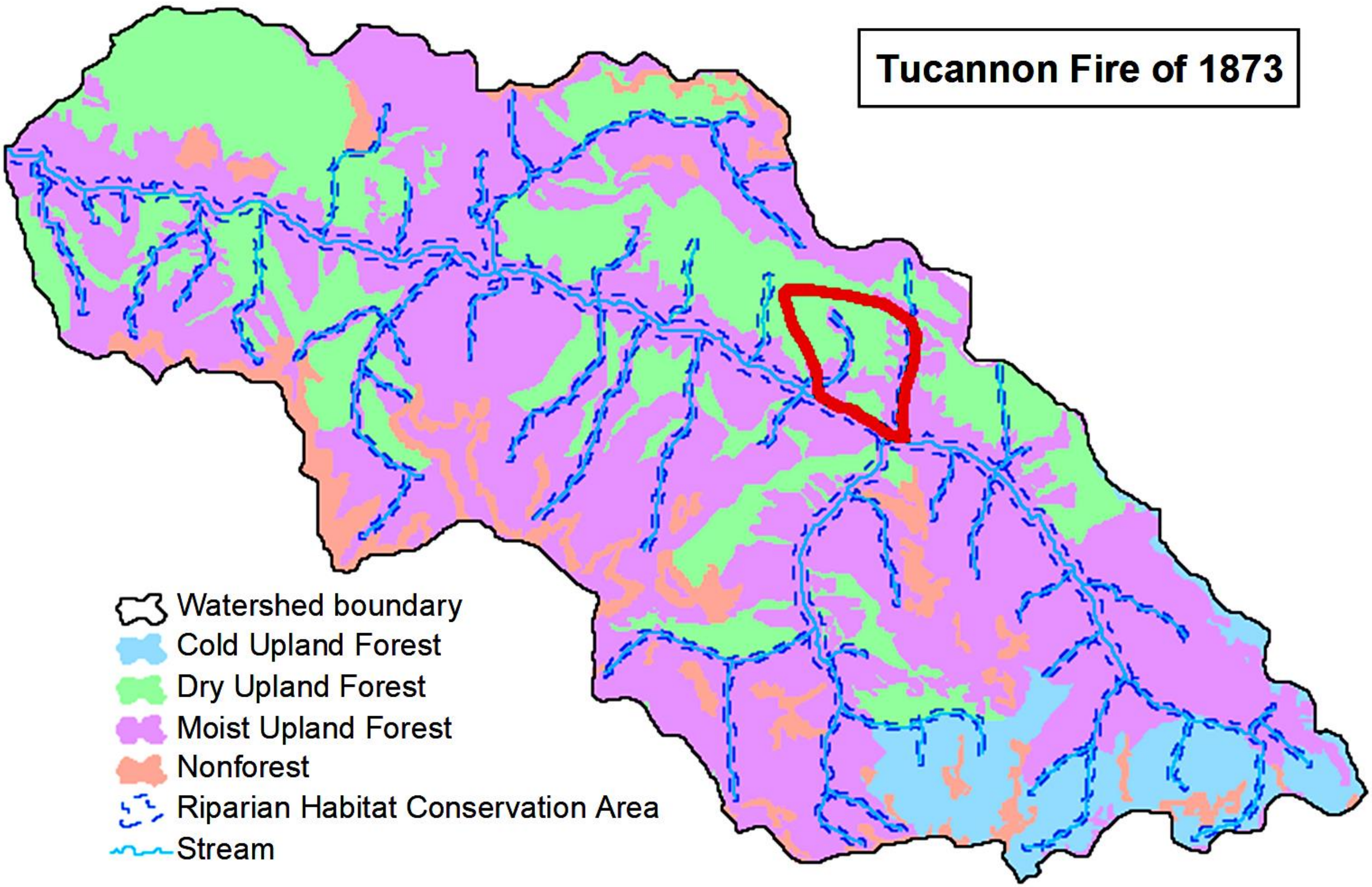


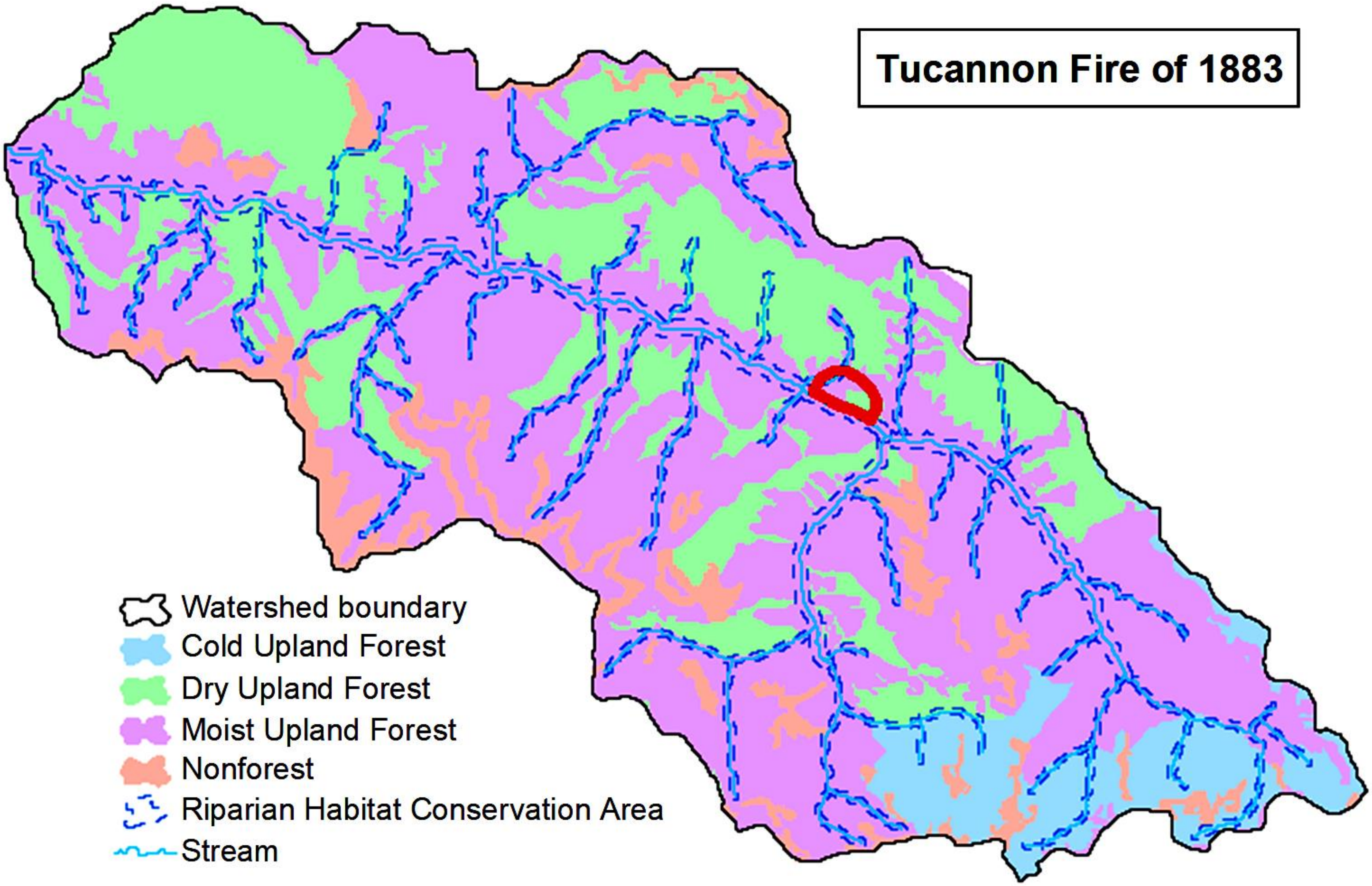
APPENDIX 1: Historical Fires in the Headwaters Portion of the Tucannon River Watershed



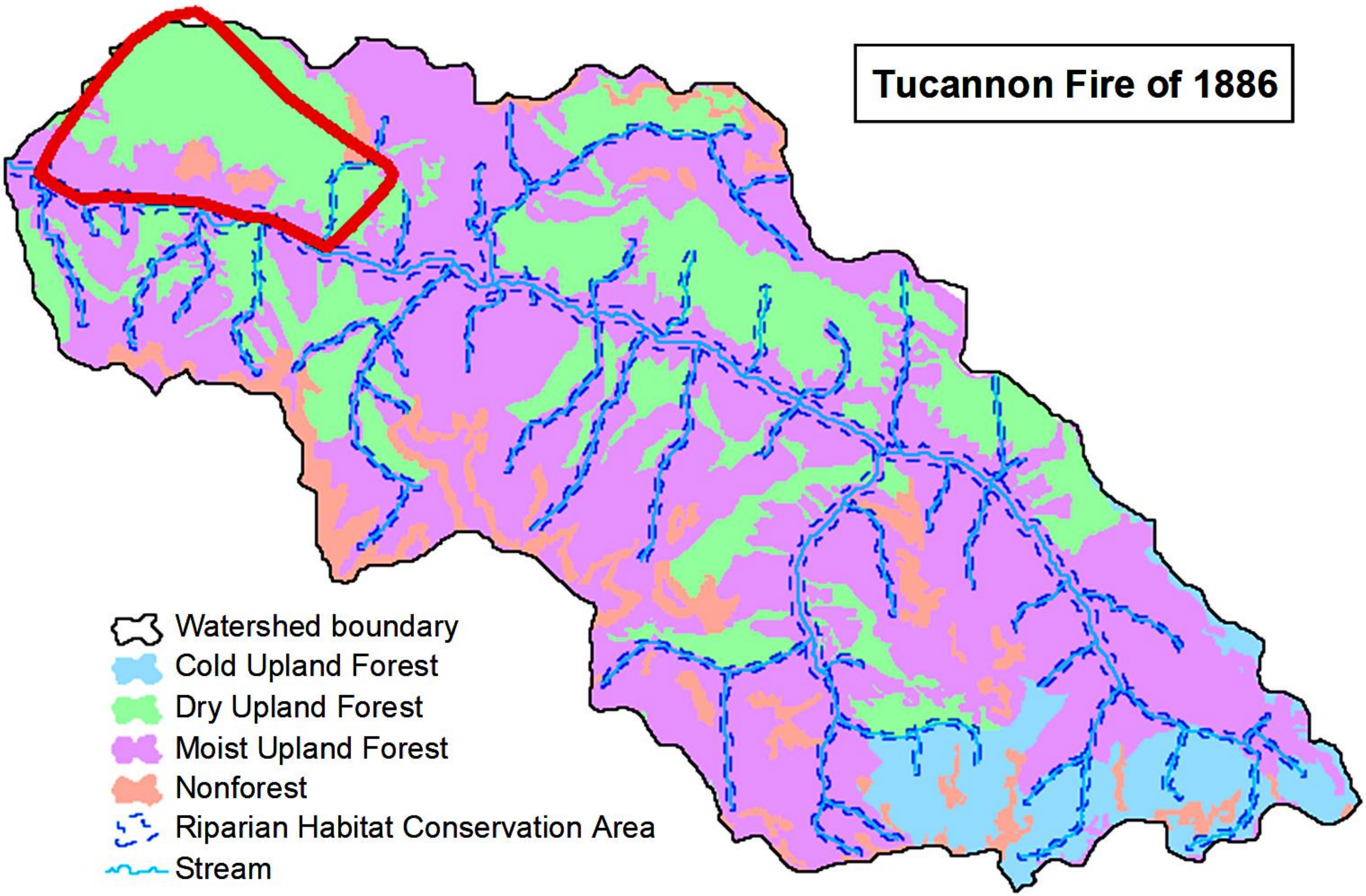
APPENDIX 1: Historical Fires in the Headwaters Portion of the Tucannon River Watershed



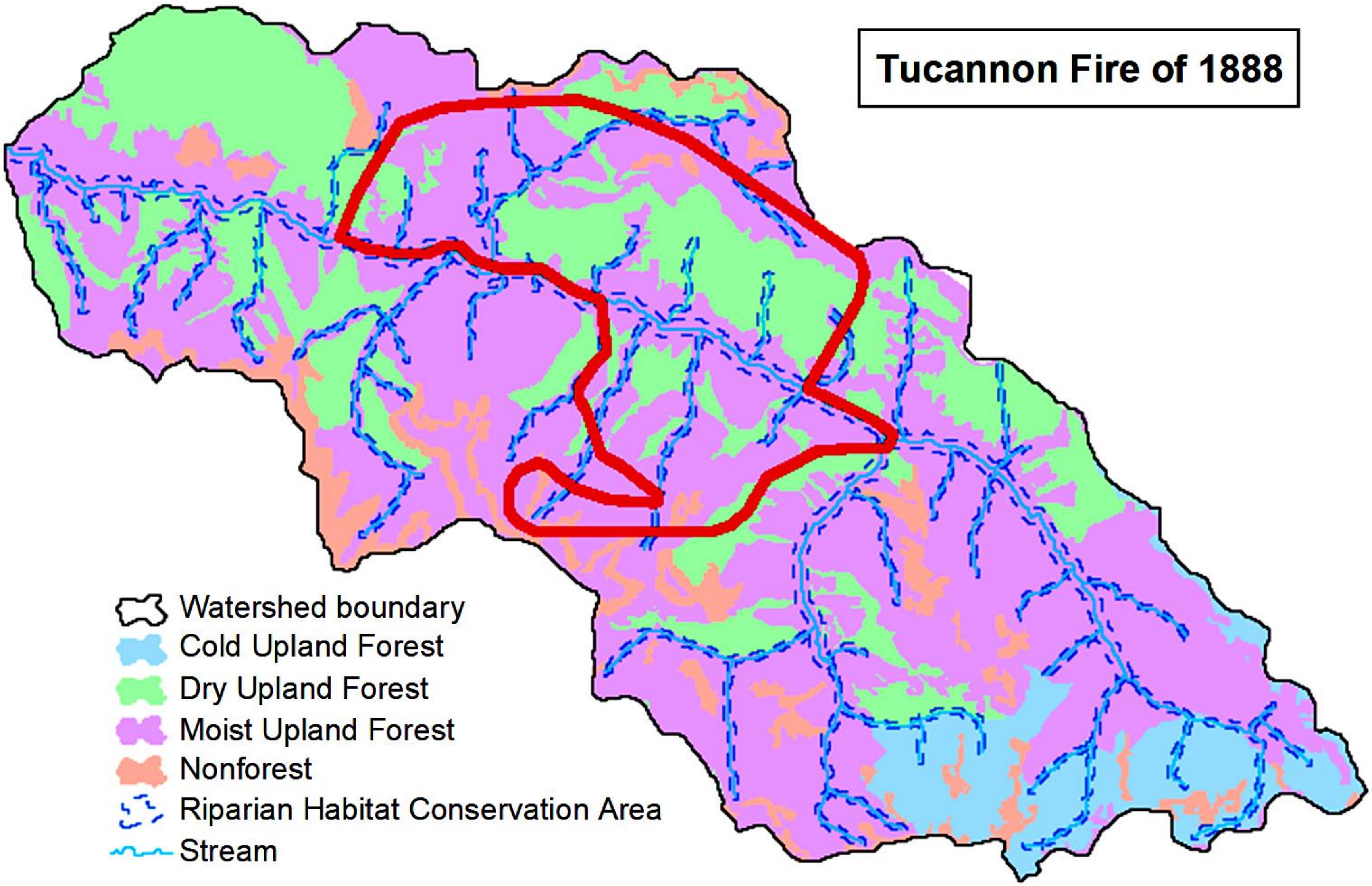
APPENDIX 1: Historical Fires in the Headwaters Portion of the Tucannon River Watershed



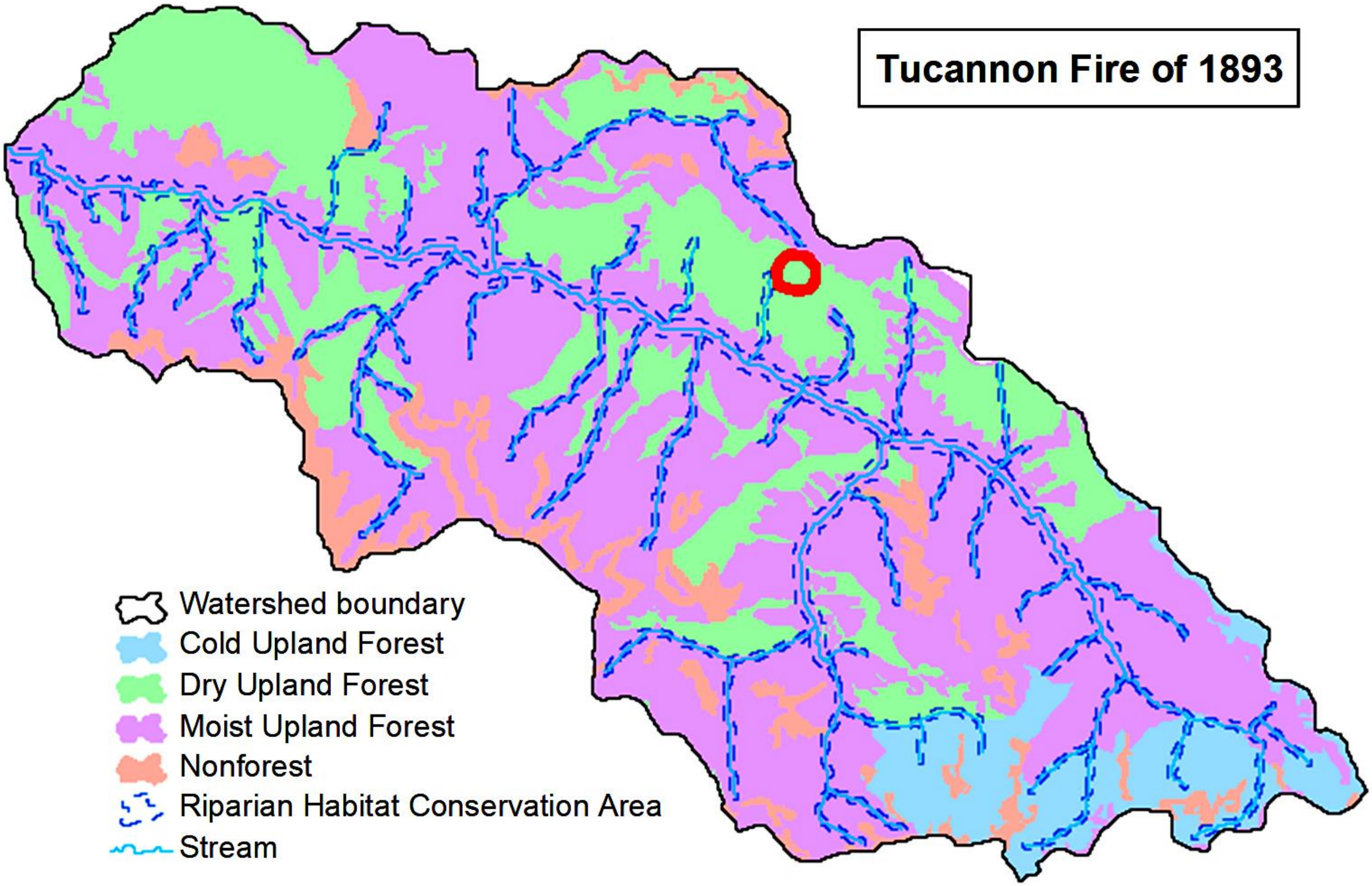
APPENDIX 1: Historical Fires in the Headwaters Portion of the Tucannon River Watershed



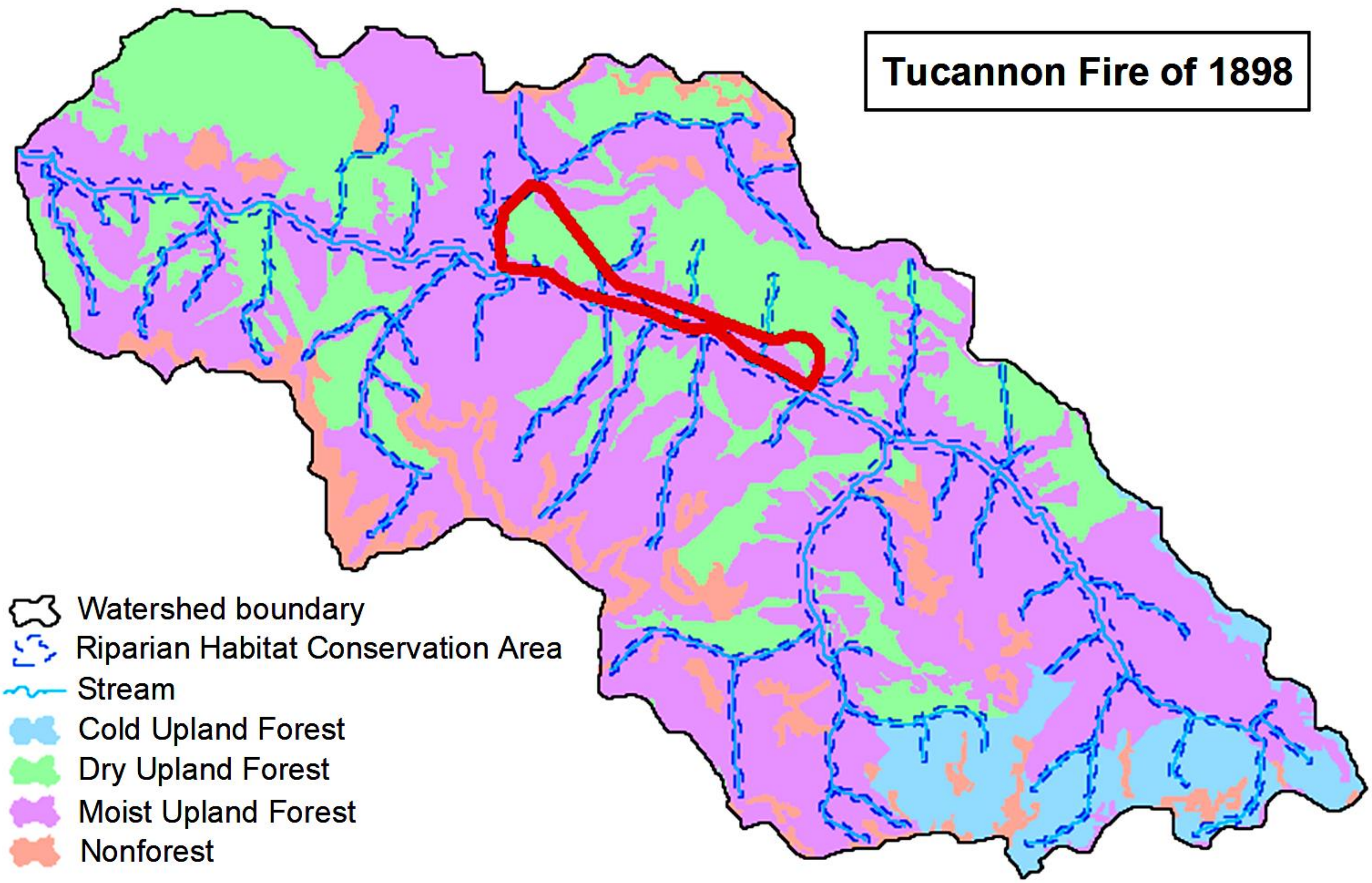
APPENDIX 1: Historical Fires in the Headwaters Portion of the Tucannon River Watershed



APPENDIX 1: Historical Fires in the Headwaters Portion of the Tucannon River Watershed



APPENDIX 1: Historical Fires in the Headwaters Portion of the Tucannon River Watershed



APPENDIX 2

Fire size and fire-free interval for four sampled areas in a Blue Mountains fire history study (from: Heyerdahl and Agee 1996)

		DRY-SITE FIRES		MESIC-SITE FIRES	
Study Area	Fire Year	Size (Acres)	Fire-Free Interval (Years)	Size (Acres)	Fire-Free Interval (Years)
Tucannon	1583	901			
Tucannon	1618	954	35		
Tucannon	1630	973	12		
Tucannon	1635	354	5		
Tucannon	1652	1,937	17		
Tucannon	1664	544	12		
Tucannon	1671	1,930	7		
Tucannon	1685	398	14		
Tucannon	1695	1,050	10		
Tucannon	1703	1,185	8		
Tucannon	1705	318	2		
Tucannon	1706	1,206	1		
Tucannon	1712	707	6		
Tucannon	1734	376	22		
Tucannon	1743	1,056	9		
Tucannon	1748	515	5		
Tucannon	1751	75	3		
Tucannon	1754			249	
Tucannon	1756	250	5		
Tucannon	1759	3,191	3		
Tucannon	1765	670	6		
Tucannon	1774	2,503	9	1,655	20
Tucannon	1776	295	2		
Tucannon	1779	823	3		
Tucannon	1791	425	12		
Tucannon	1799	173	8		
Tucannon	1816	1,131	17		
Tucannon	1828	2,443	12		
Tucannon	1839	1,817	11		
Tucannon	1841			296	67
Tucannon	1855	2,543	16		
Tucannon	1863	269	8		
Tucannon	1865	857	2		

		DRY-SITE FIRES		MESIC-SITE FIRES	
Study Area	Fire Year	Size (Acres)	Fire-Free Interval (Years)	Size (Acres)	Fire-Free Interval (Years)
Tucannon	1869	1,088	4		
Tucannon	1873	507	4		
Tucannon	1883	75	10		
Tucannon	1886	1,868	3		
Tucannon	1888	3,417	2	1,720	47
Tucannon	1893	47	5		
Tucannon	1898	490	5		
Tucannon	Mean	1,036	9	980	
	Min	47	1	249	
	Max	3,417	35	1,720	
	Count	(38)		(4)	
Imnaha	1632	96			
Imnaha	1652	96	20		
Imnaha	1661	294	9		
Imnaha	1671	678	10		
Imnaha	1681	96	10		
Imnaha	1687	1,434	6		
Imnaha	1705	1,768	18		
Imnaha	1712	644	7		
Imnaha	1722	607	10		
Imnaha	1724	301	2		
Imnaha	1747	200	23		
Imnaha	1751	1,251	4		
Imnaha	1752	606	1		
Imnaha	1754	390	2		
Imnaha	1763	1,347	9		
Imnaha	1778	1,731	15		
Imnaha	1783	4,289	5		
Imnaha	1795	1,583	12		
Imnaha	1798	1,847	3	1,936	
Imnaha	1831	316	33		
Imnaha	1834	4,824	3	625	36
Imnaha	1844	2,671	10		
Imnaha	1846	63	2		
Imnaha	1852	697	6		
Imnaha	1863	329	11		
Imnaha	1864			346	30

Study Area	Fire Year	DRY-SITE FIRES Size (Acres)	DRY-SITE FIRES Fire-Free Interval (Years)	MESIC-SITE FIRES Size (Acres)	MESIC-SITE FIRES Fire-Free Interval (Years)
Imnaha	1869	1,764	6		
Imnaha	1871	1,682	2		
Imnaha	1885	971	14		
Imnaha	1886	1,329	1	403	22
Imnaha	1889	98	3		
Imnaha	1890	544	1		
Imnaha	1896	365	6		
Imnaha	1897	757	1		
Imnaha	1898	695	1		
Imnaha	1902	600	4		
Imnaha	1905	437	3		
Imnaha	1917	99	12		
Imnaha	1919	193	2		
Imnaha	Mean	992	8	828	29
	Min	63	1	346	22
	Max	4,824	33	1,936	36
	Count	(38)		(4)	
Baker	1634	3,726			
Baker	1646	3,458	12		
Baker	1652	2,933	6		
Baker	1656	3,478	4		
Baker	1668	988	12		
Baker	1671	3,443	3		
Baker	1679	3,419	8		
Baker	1695	8,184	16		
Baker	1706	1,121	11		
Baker	1708	6,046	2		
Baker	1712	1,048	4		
Baker	1717	2,276	5		
Baker	1721	1,154	4		
Baker	1722	4,559	1		
Baker	1729	7,485	7		
Baker	1739	6,499	10		
Baker	1751	6,923	12		
Baker	1756	122	5		
Baker	1762	6,375	6		
Baker	1767	1,901	5		

Study Area	Fire Year	DRY-SITE FIRES Size (Acres)	DRY-SITE FIRES Fire-Free Interval (Years)	MESIC-SITE FIRES Size (Acres)	MESIC-SITE FIRES Fire-Free Interval (Years)
Baker	1770	550	3		
Baker	1776	2,479	6		
Baker	1777	1,154	1		
Baker	1778	4,660	1		
Baker	1781	909	3		
Baker	1783	6,155	2		
Baker	1788	842	5		
Baker	1791	7,319	3		
Baker	1794	877	3		
Baker	1797	1,321	3		
Baker	1798	2,585	1		
Baker	1800	5,925	2		
Baker	1807	283	7		
Baker	1812	3,532	5		
Baker	1816	2,626	4		
Baker	1822	6,736	6		
Baker	1826	1,738	4		
Baker	1828	1,579	2		
Baker	1833	1,411	5		
Baker	1834	5,592	1		
Baker	1839	2,711	5		
Baker	1846	9,140	7		
Baker	1854	487	8		
Baker	1855	2,266	1		
Baker	1857	2,272	2		
Baker	1865	723	8		
Baker	1869	3,026	4		
Baker	1871	647	2		
Baker	1872	93	1		
Baker	1879	190	7		
Baker	1880	121	1		
Baker	1883	82	3		
Baker	1892	233	9		
Baker	1962	93	70		
Baker	Mean	2,880	6		
	Min	82	1		
	Max	9,140	70		

		DRY-SITE FIRES		MESIC-SITE FIRES	
Study Area	Fire Year	Size (Acres)	Fire-Free Interval (Years)	Size (Acres)	Fire-Free Interval (Years)
	Count	(54)			
Dugout	1529	784			
Dugout	1540	1,072	11		
Dugout	1547	121	7		
Dugout	1565	2,939	18		
Dugout	1570	1,735	5		
Dugout	1593	537	23		
Dugout	1598	3,108	5		
Dugout	1629	13,668	31		
Dugout	1645	6,627	16		
Dugout	1652	1,472	7		
Dugout	1656	12,319	4		
Dugout	1664	801	8		
Dugout	1667	2,935	3		
Dugout	1676	9,499	9		
Dugout	1685	93	9		
Dugout	1687	16,611	2		
Dugout	1688	848	1		
Dugout	1690	1,193	2		
Dugout	1694	1,613	4		
Dugout	1697	3,523	3		
Dugout	1700	7,909	3		
Dugout	1707	2,655	7		
Dugout	1710	18,318	3		
Dugout	1721	19,959	11		
Dugout	1729	3,102	8		
Dugout	1732	2,753	3		
Dugout	1733	323	1		
Dugout	1734	5,981	1		
Dugout	1737	914	3		
Dugout	1739	4,734	2		
Dugout	1740	1,345	1		
Dugout	1741	10,588	1		
Dugout	1743	250	2		
Dugout	1745	1,937	2		
Dugout	1751	13,149	6		
Dugout	1753	932	2		

		DRY-SITE FIRES		MESIC-SITE FIRES	
Study Area	Fire Year	Size (Acres)	Fire-Free Interval (Years)	Size (Acres)	Fire-Free Interval (Years)
Dugout	1755	1,677	2		
Dugout	1756	9,975	1		
Dugout	1759	9,548	3		
Dugout	1765	2,147	6		
Dugout	1771	15,426	6		
Dugout	1774	1,919	3		
Dugout	1775	390	1		
Dugout	1776	3,540	1		
Dugout	1780	9,509	4		
Dugout	1783	8,797	3		
Dugout	1788	1,881	5		
Dugout	1789	733	1		
Dugout	1792	1,427	3		
Dugout	1794	18,283	2		
Dugout	1799	8,251	5		
Dugout	1800	7,339	1		
Dugout	1802	3,633	2		
Dugout	1804	3,526	2		
Dugout	1806	259	2		
Dugout	1807	796	1		
Dugout	1812	3,876	5		
Dugout	1814	556	2		
Dugout	1822	3,886	8		
Dugout	1823	2,408	1		
Dugout	1829	19,292	6		
Dugout	1830	1,137	1		
Dugout	1835	6,856	5		
Dugout	1840	1,523	5		
Dugout	1844	18,437	4		
Dugout	1849	914	5		
Dugout	1856	7,964	7		
Dugout	1868	496	12		
Dugout	1869	18,910	1		
Dugout	1873	1,058	4		
Dugout	1877	590	4		
Dugout	1878	732	1		
Dugout	1883	1,539	5		

Study Area	Fire Year	DRY-SITE FIRES Size (Acres)	Fire-Free Interval (Years)	MESIC-SITE FIRES Size (Acres)	Fire-Free Interval (Years)
Dugout	1887	846	4		
Dugout	1888	2,570	1		
Dugout	1889	5,055	1		
Dugout	1898	2,003	9		
Dugout	1899	919	1		
Dugout	1914	635	15		
Dugout	1926	57	12		
Dugout	Mean	4,846	5		
	Min	57	1		
	Max	19,959	31		
	Count	(80)			
All Areas	Mean	2,953	6	904	37
	Min	47	1	249	20
	Max	19,959	70	1,936	67
	Count	(210)		(8)	

Sources/Notes: Base information for this table was taken from Heyerdahl and Agee (1996). Statistics (means, minimum and maximum values, counts) were derived by using a spreadsheet program.

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APPENDIX 3: SILVICULTURE WHITE PAPERS

White papers are internal reports, and they are produced with a consistent formatting and numbering scheme – all papers dealing with Silviculture, for example, are placed in a silviculture series (Silv) and numbered sequentially. Generally, white papers receive only limited review and, in some instances pertaining to highly technical or narrowly focused topics, the papers may receive no technical peer review at all. For papers that receive no review, the viewpoints and perspectives expressed in the paper are those of the author only, and do not necessarily represent agency positions of the Umatilla National Forest or the USDA Forest Service.

Large or important papers, such as two papers discussing active management considerations for dry and moist forests (white papers Silv-4 and Silv-7, respectively), receive extensive review comparable to what would occur for a research station general technical report (but they don't receive blind peer review, a process often used for journal articles).

White papers are designed to address a variety of objectives:

(1) They guide how a methodology, model, or procedure is used by practitioners on the Umatilla National Forest (to ensure consistency from one unit, or project, to another).

(2) Papers are often prepared to address ongoing and recurring needs; some papers have existed for more than 20 years and still receive high use, indicating that the need (or issue) has long standing – an example is white paper #1 describing the Forest's big-tree program, which has operated continuously for 25 years.

(3) Papers are sometimes prepared to address emerging or controversial issues, such as management of moist forests, elk thermal cover, or aspen forest in the Blue Mountains. These papers help establish a foundation of relevant literature, concepts, and principles that continuously evolve as an issue matures, and hence they may experience many iterations through time. [But also note that some papers have not changed since their initial development, in which case they reflect historical concepts or procedures.]

(4) Papers synthesize science viewed as particularly relevant to geographical and management contexts for the Umatilla National Forest. This is considered to be the Forest's self-selected 'best available science' (BAS), realizing that non-agency commenters would generally have a different conception of what constitutes BAS – like beauty, BAS is in the eye of the beholder.

(5) The objective of some papers is to locate and summarize the science germane to a particular topic or issue, including obscure sources such as master's theses or Ph.D. dissertations. In other instances, a paper may be designed to wade through an overwhelming amount of published science (dry-forest management), and then synthesize sources viewed as being most relevant to a local context.

(6) White papers function as a citable literature source for methodologies, models, and procedures used during environmental analysis – by citing a white paper, specialist reports can include less verbiage describing analytical databases, techniques, and so forth, some of which change little (if at all) from one planning effort to another.

(7) White papers are often used to describe how a map, database, or other product was developed. In this situation, the white paper functions as a 'user's guide' for the new product. Ex-

amples include papers dealing with historical products: (a) historical fire extents for the Tucannon watershed (WP Silv-21); (b) an 1880s map developed from General Land Office survey notes (WP Silv-41); and (c) a description of historical mapping sources (24 separate items) available from the Forest's history website (WP Silv-23).

The following papers are available from the Forest's website: Silviculture White Papers

Paper #	Title
1	Big tree program
2	Description of composite vegetation database
3	Range of variation recommendations for dry, moist, and cold forests
4	Active management of Blue Mountains dry forests: Silvicultural considerations
5	Site productivity estimates for upland forest plant associations of Blue and Ochoco Mountains
6	Blue Mountains fire regimes
7	Active management of Blue Mountains moist forests: Silvicultural considerations
8	Keys for identifying forest series and plant associations of Blue and Ochoco Mountains
9	Is elk thermal cover ecologically sustainable?
10	A stage is a stage is a stage…or is it? Successional stages, structural stages, seral stages
11	Blue Mountains vegetation chronology
12	Calculated values of basal area and board-foot timber volume for existing (known) values of canopy cover
13	Created opening, minimum stocking, and reforestation standards from Umatilla National Forest Land and Resource Management Plan
14	Description of EVG-PI database
15	Determining green-tree replacements for snags: A process paper
16	Douglas-fir tussock moth: A briefing paper
17	Fact sheet: Forest Service trust funds
18	Fire regime condition class queries
19	Forest health notes for an Interior Columbia Basin Ecosystem Management Project field trip on July 30, 1998 (handout)
20	Height-diameter equations for tree species of Blue and Wallowa Mountains
21	Historical fires in headwaters portion of Tucannon River watershed
22	Range of variation recommendations for insect and disease susceptibility
23	Historical vegetation mapping
24	How to measure a big tree
25	Important Blue Mountains insects and diseases
26	Is this stand overstocked? An environmental education activity
27	Mechanized timber harvest: Some ecosystem management considerations
28	Common plants of south-central Blue Mountains (Malheur National Forest)
29	Potential natural vegetation of Umatilla National Forest

Paper #	Title
30	Potential vegetation mapping chronology
31	Probability of tree mortality as related to fire-caused crown scorch
32	Review of “Integrated scientific assessment for ecosystem management in the interior Columbia basin, and portions of the Klamath and Great basins” – Forest vegetation
33	Silviculture facts
34	Silvicultural activities: Description and terminology
35	Site potential tree height estimates for Pomeroy and Walla Walla Ranger Districts
36	Stand density protocol for mid-scale assessments
37	Stand density thresholds as related to crown-fire susceptibility
38	Umatilla National Forest Land and Resource Management Plan: Forestry direction
39	Updates of maximum stand density index and site index for Blue Mountains variant of Forest Vegetation Simulator
40	Competing vegetation analysis for southern portion of Tower Fire area
41	Using General Land Office survey notes to characterize historical vegetation conditions for Umatilla National Forest
42	Life history traits for common Blue Mountains conifer trees
43	Timber volume reductions associated with green-tree snag replacements
44	Density management field exercise
45	Climate change and carbon sequestration: Vegetation management considerations
46	Knutson-Vandenberg (K-V) program
47	Active management of quaking aspen plant communities in northern Blue Mountains: Regeneration ecology and silvicultural considerations
48	Tower Fire…then and now. Using camera points to monitor postfire recovery
49	How to prepare a silvicultural prescription for uneven-aged management
50	Stand density conditions for Umatilla National Forest: A range of variation analysis
51	Restoration opportunities for upland forest environments of Umatilla National Forest
52	New perspectives in riparian management: Why might we want to consider active management for certain portions of riparian habitat conservation areas?
53	Eastside Screens chronology
54	Using mathematics in forestry: An environmental education activity
55	Silviculture certification: Tips, tools, and trip-ups
56	Vegetation polygon mapping and classification standards: Malheur, Umatilla, and Wallowa-Whitman National Forests
57	State of vegetation databases for Malheur, Umatilla, and Wallowa-Whitman National Forests
58	Seral status for tree species of Blue and Ochoco Mountains

REVISION HISTORY

December 2012: minor formatting and editing changes were made; appendix 3 was added describing a white paper system, including a list of available white papers.