National Park Service
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Natural Resource Program Center

Lower Stehekin River cutthroat and rainbow trout spawning surveys, 2009

Natural Resource Data Series NPS/NOCA/NRDS—2010/111

ON THE COVER
Surveyor stands by a Rainbow Trout Redd.
Photograph by: North Cascades National Park

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Introduction

On November 6, 2007, Public Utility District No. 1 of Chelan County (Chelan PUD) filed the Lake Chelan Fishery Plan (LCFP) pursuant to Article 404 of the Federal Energy Regulatory Commission Order on Offer of Settlement and Issuing New License dated November 6, 2006 for the Lake Chelan Hydroelectric Project. The fish management goal under the Lake Chelan Fisheries Plan, and adopted by the National Park Service (NPS), United States Forest Service (USFS) and Washington Department of Fish and Wildlife (WDFW), is to beneficially alter the abundance and composition of fish species in Lake Chelan through continuing efforts to restore and enhance native fisheries. Multiple methods are in progress or will be used in the future to accomplish this goal, such as altered fishing regulations, a change in stocking practices, and removal of lake tributary alluvial barriers to spring spawning fish.

Native westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) were historically one of the dominant fish species in Lake Chelan and the Stehekin River. A combination of many factors has led to the near disappearance of the cutthroat trout within these systems. Historic hatchery egg taking programs, repeated stocking of competing fish species and cutthroat trout hybridization with rainbow trout (*O. mykiss)* are important factors leading to the decline of native cutthroat trout stocks (Ostberg and Rodriguez 2006.)

Native westslope cutthroat trout (WCT) are currently found throughout the Lake Chelan and Stehekin River systems, though their population status is uncertain. Robust populations of WCT exist in the upper reaches of the Stehekin River above migration barriers (physical and temperature), but below these barriers and throughout the lower Stehekin River introduced rainbow trout have largely displaced the native cutthroat. In 2003 the Washington Department of Fish and Wildlife ceased stocking viable rainbow trout (RBT) into Lake Chelan in favor of sterile rainbow trout triploids and Twin Lakes strain WCT (*Lake Chelan Fishery Forum 2009 Annual Work Plan*, p. 14).

The LCFP goal for westslope cutthroat trout is to increase significantly the abundance of WCT in the lake tributaries and the lake itself, for these fish to eventually replace themselves naturally, and for fish to contribute to the sport fishery (*Lake Chelan Fishery Forum 2009 Annual Work Plan*, p.2). To reach this goal the following conditions must be met:

1. WCT hatched from eyed egg or fry stocking in lake tributaries must survive to maturity, spawn and contribute to increased natural production.
2. A sufficient number of the catchable size WCT must escape harvest and recruit to the spawning run in order to substantially increase natural production.
3. The catchable size WCT must eventually replace the catchable size rainbow trout in the sport fishery.
4. A majority of anglers fishing Lake Chelan must accept the change in species.

The objectives relating to WCT survival and spawning activities will be monitored through surveys performed by the cooperating agencies. The National Park Service, as represented by North Cascades National Park Aquatic Resources staff, has been directed under the Lake Chelan Fishery Plan to develop a monitoring and evaluation program for the lower Stehekin River to

assess the efficacy of cutthroat trout management actions. This monitoring plan was implemented in 2009 and is outlined below.

Objectives

The objectives of the 2009 Stehekin River spawning surveys are to:

- Select 10-12 index sites for long-term monitoring of cutthroat and rainbow trout spawning activities within the lower 10 miles of the Stehekin River.

- Begin monitoring trends in abundance of spawning cutthroat and rainbow trout at index sites.

Methods

An initial rapid assessment of side channels habitat was completed on April 13th and 14th 2009. Index sites were selected based on presence of suitable spawning gravels and flows. Suitable substrates varied from 2 - 50 mm in diameter (Shepard 1984). Suitable sites also had a depth of water over the spawning gravel of 30 - 60 cm and a water velocity of 30 - 100 cm/sec during moderate flow conditions (Quinn 2005). Pool tailouts with these conditions were deemed particularly good spawning habitat. Other considerations included the feasibility of conducting snorkel surveys during the May-June period of high flows and potential stability of candidate index sites for long-term monitoring.

The goal in selecting index sites was to provide a representative sample of approximately 10 to 12 sites with survey lengths of 10 to 20 channel widths. A total of 47.10 km of channels were evaluated (Figure 1) and 19 index sites were initially selected. These sites were pared down

following visits under different flow and visibility conditions. Ultimately 12 stream segments totaling 1781 meters were selected as long term index sites (Table 1 and Appendix A.1-5). Three spawning surveys were conducted at each of the index sites with the first survey on May 5th and the last survey on June 24th.

Spawning surveys were conducted by teams of two; one acting as the observer counting and identifying fish and the other recording data. Water temperature, precipitation, viewing condition, cloud cover, underwater visibility and discharge data were taken at the beginning of each day. Discharge data was taken from the USGS website for the mainstem of the Stehekin River: http://waterdata.usgs.gov/wa/nwis/uv?station=12451000. Fish observation and redd data was recorded on separate datasheets (Appendix B). Surveys were conducted from both the stream bank and by snorkeling, depending on water depth and underwater visibility. Care was taken not to step in existing fish redds. Surveyors began at the downstream end of each index reach and proceeded upstream searching for fish and new redds. New redds were flagged when first observed so as not to recount them on subsequent visits. Redds were identified as belonging to either rainbow trout or cutthroat trout depending on the proximity of the redd to spawning fish. If no fish were present on or near the redd it was determined to be of unknown origin.

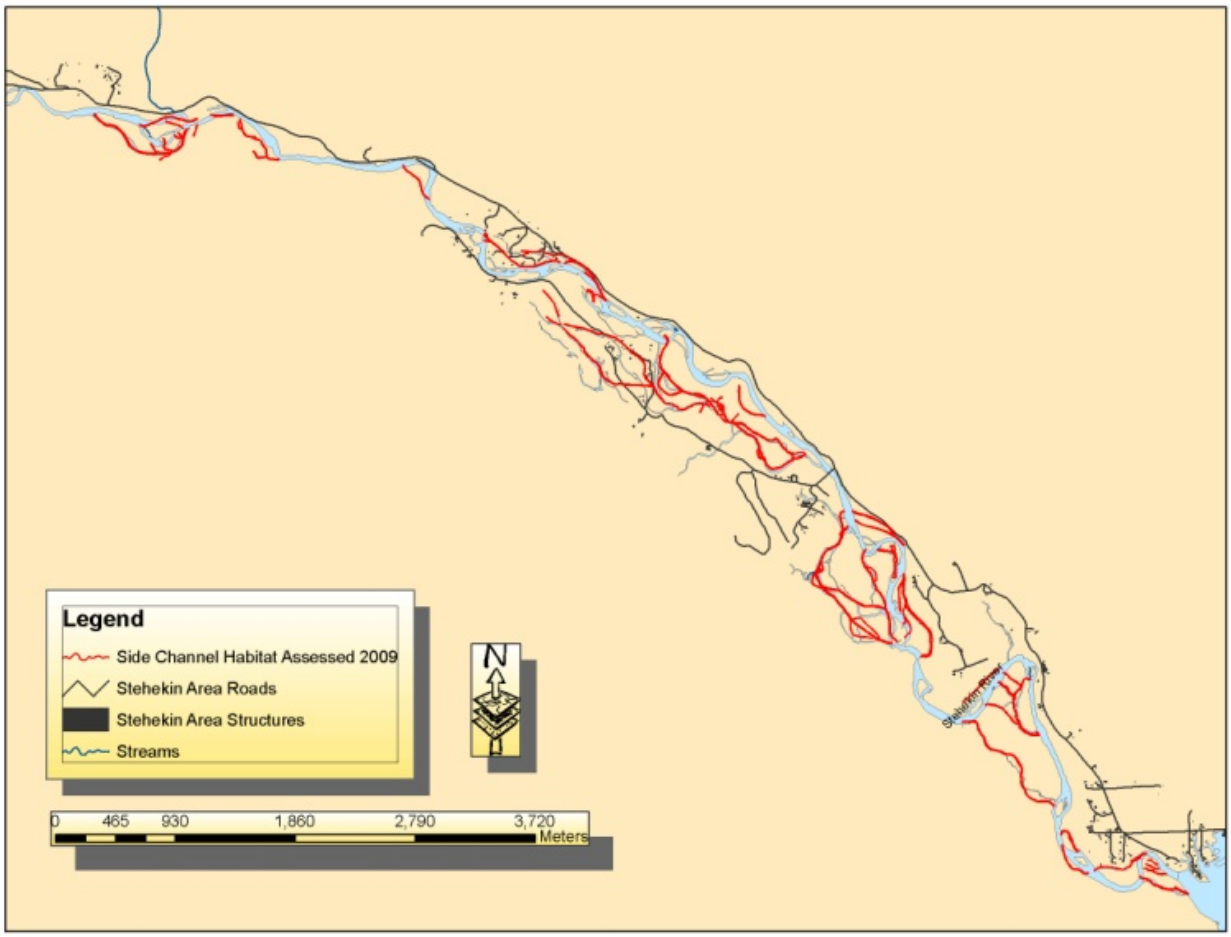

Figure 1. Stehekin River side channels assessed for suitability as index sites for cutthroat trout spawning surveys.

Table 1. Index reach dimensions.

Index Reach ID	Reach Length (m)	Reach Width (m)
i1	115	11
i2	44	3
i3	43	2
i4	217	12
i5	245	15
i6	292	15
i7	189	9
i8	134	6
i9	176	9
i10	125	8
i11	116	4
i12	85	5

Due to the presence of rainbow/ cutthroat trout hybrids in this system, it is necessary to closely examine fish to determine species. While rainbow/ cutthroat hybrids may exhibit the characteristic “cut mark” of westslope cutthroat trout, these hybrids do not tend to possess basibranchial teeth which true cutthroats do possess (Trotter, 2008). The maxillary of cutthroat trout extends beyond the orbit of the eye giving it a long - jawed appearance. Rainbow trout maxillary do not extend to this extent. If field observations prove to be insufficient in distinguishing cutthroat trout from hybrids, it may be necessary to capture individuals to determine presence of basibranchial teeth or to obtain a tissue sample for DNA analysis.

Results

No cutthroat trout or their redds were seen in the 2009 surveys. In total nine rainbow trout redds and four unknown redds were seen within the index reaches (Table 2). Eleven rainbow trout greater than 6 in. and four rainbow trout less than 6 in. were observed. One unidentified fish greater than 6 in. and four unidentified fish less than 6 in. were observed within the index reaches. Two sculpins less than 6 in. in length were also observed (Table 3). The spawning rainbow trout were generally from 12 to 18 inches in length. The substrate size within redds ranged from 5,- 70 mm in diameter, though generally substrate was from 10 - 40 mm in size.

Table 2. Stehekin River cutthroat trout spawning survey redd observations, May 5- June 23, 2009.

Redd Event #	Index Reach ID	Date	Species Creating Redd	# Fish on Redd	Redd Diameter (cm)	Gravel Size (mm)	Water Depth at Redd (m)
1	i5	5/5/2009	RBT	0	60	5- 20	0.2
2	i10	5/5/2009	RBT	0	60	15-40	0.2
3	i10	5/5/2009	RBT	0	60	15-40	0.2
4	i10	5/5/2009	RBT	2	120	5-40	0.2
5	i10	5/5/2009	RBT	0	45	5-40	0.2
6	i8	5/26/2009	RBT	2	40	5-20	0.45
7	i8	5/26/2009	RBT	0	40	5-20	0.45
8	i8	5/26/2009	RBT	0	40	5-20	0.45
9	i8	5/26/2009	RBT	0	40	5-20	0.45
10	i8	6/23/2009	unknown	0	60	10-60	1.3
11	i8	6/23/2009	unknown	0	50	10-40	1.1
12	i8	6/23/2009	unknown	0	70	10-60	1.4
13	i2	6/23/2009	unknown	0	70	20-70	1.2

Discussion

The index reaches selected for monitoring within the lower Stehekin River appear to have ample suitable spawning habitat as evidenced by the spawning rainbow trout observed. The body length of adfluvial WCT returning to the Stehekin River would be comparable to the body size of the spawning rainbows and thus their spawning substrate preferences would be similar.

Table 3. Stehekin River cutthroat trout spawning survey fish observations, May 5 - June 23, 2009.

Index Reach ID	Survey Date	# Fish Observed_WCT		# Fish Observed_RBT		# Fish Observed_UNKWN		# Fish Observed_OTHER	
		<6"	>6"	<6"	>6"	<6"	>6"	<6"	>6"
i8	5/5/2009	0	0	0	0	1	0	1	0
i11	5/5/2009	0	0	0	2	0	0	0	0
i5	5/27/2009	0	0	0	0	0	1	0	0
i9	5/26/2009	0	0	0	5	1	0	0	0
i5	6/23/2009	0	0	0	0	0	0	1	0
i9	6/23/2009	0	0	3	2	2	0	0	0
i10	6/23/2009	0	0	1	2	0	0	0	0
Totals		**0**	**0**	**4**	**11**	**4**	**1**	**2**	**0**

It is likely that the absence of spawning cutthroat in our index reaches during 2009 could simply be due to the low number of WCT residing in the Lake Chelan system; however it could be attributed to the possibility that survey timing did not overlap well with cutthroat spawning in the lower Stehekin. It may be valuable to continue surveys through the first week of July; however it is unlikely that any significant spawning would be occurring much later than the first week of July. Spawning dates were estimated from observations of emergent fry for Company Creek and Blackberry Creek, tributaries to the Stehekin River, by Duke Engineering and Services Inc.

(2001, pg. 12). Based on the emergence timing they concluded that cutthroat trout spawned between May 22 and August 1. However, the August 1st estimated spawning timing may not be reliable because it was based on unverified species information from observations of fry in the water. Excluding these observations, the latest back calculated spawning timing for WCT in Blackberry and Company Creeks would have occurred around June 24th (Duke Engineering and Services, Inc. 2001; Table 3-7, pg 11).

Other WCT spawning and emergence information in the Lake Chelan basin coincide with historic spawning timing. Johnson and Archibald (2009) estimated spawning timing on two Lake Chelan tributaries (Grade and Safety Harbor Creeks) as occurring between mid-May and late June based on observations of emergent fry on July 30, 2009. NPS staff found that WCT spawning in Triplet Lakes (Fourmile Creek drainage of Lake Chelan, at 6500 ft elevation) had almost completed spawning by July 1, 2009. Water temperature at the time of this survey was 13.5^{o}C. In addition, during 2008 WCT emergent fry were observed in the outlet area of Upper Triplet Lake between August 11th and 16th. Additional information on WCT spawning timing could be obtained by surveying upstream locations in the Stehekin River where WCT are abundant and rainbow trout are rare (i.e., in tributaries and the mainstem of the Stehekin River upstream of the Bridge Creek confluence). In future water temperature data should be recorded along with any observations of spawning or fry emergence.

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Appendix A. Locations of Lower Stehekin River cutthroat trout spawning survey index reaches.

Exhibit 1. Location of index reaches 1-12 overview.

Appendix A. Lower Stehekin River cutthroat trout spawning survey index reaches (continued).

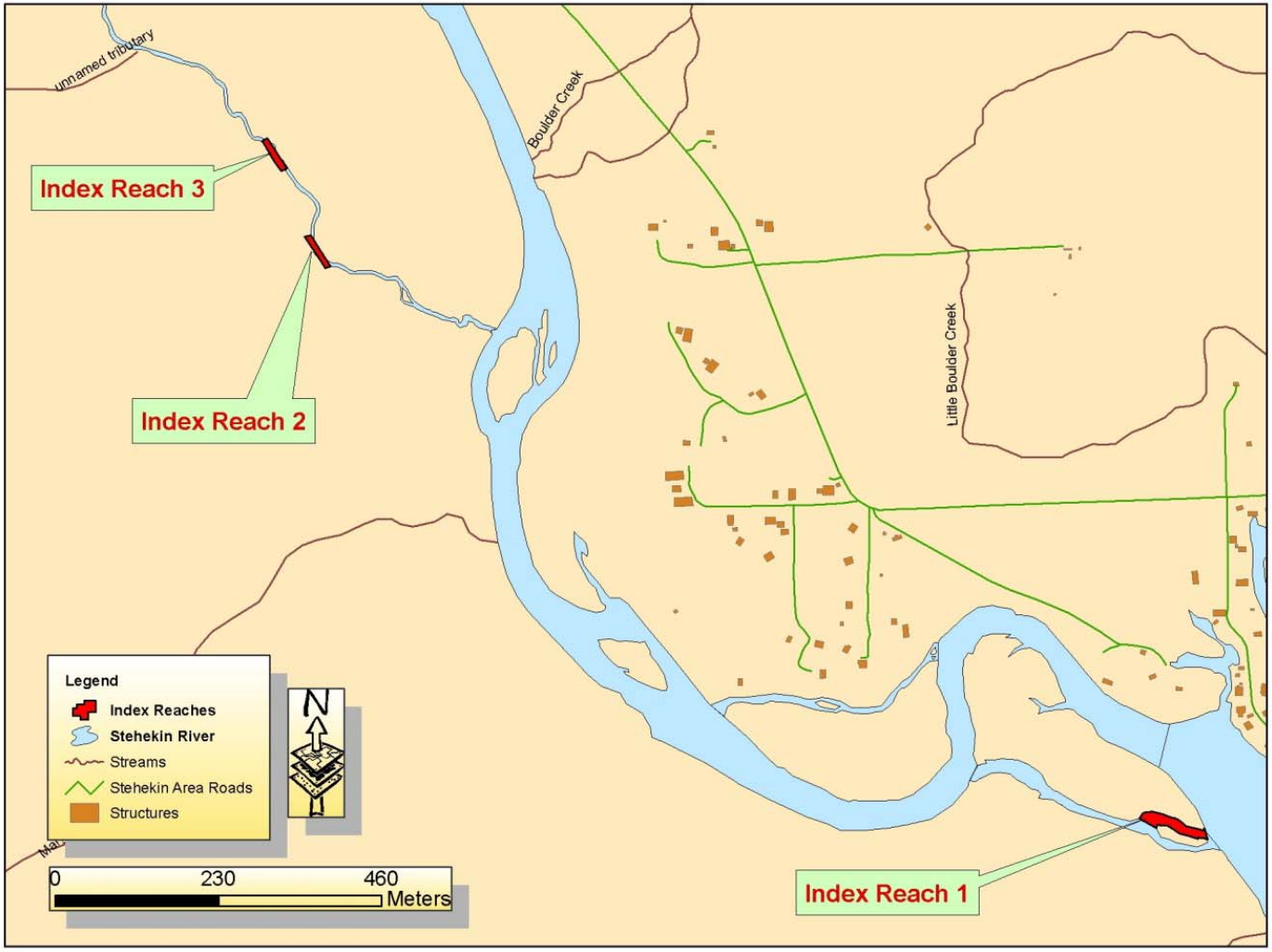

Exhibit 2. Location of index reaches 1-3.

Appendix A. Lower Stehekin River cutthroat trout spawning survey index reaches (continued).

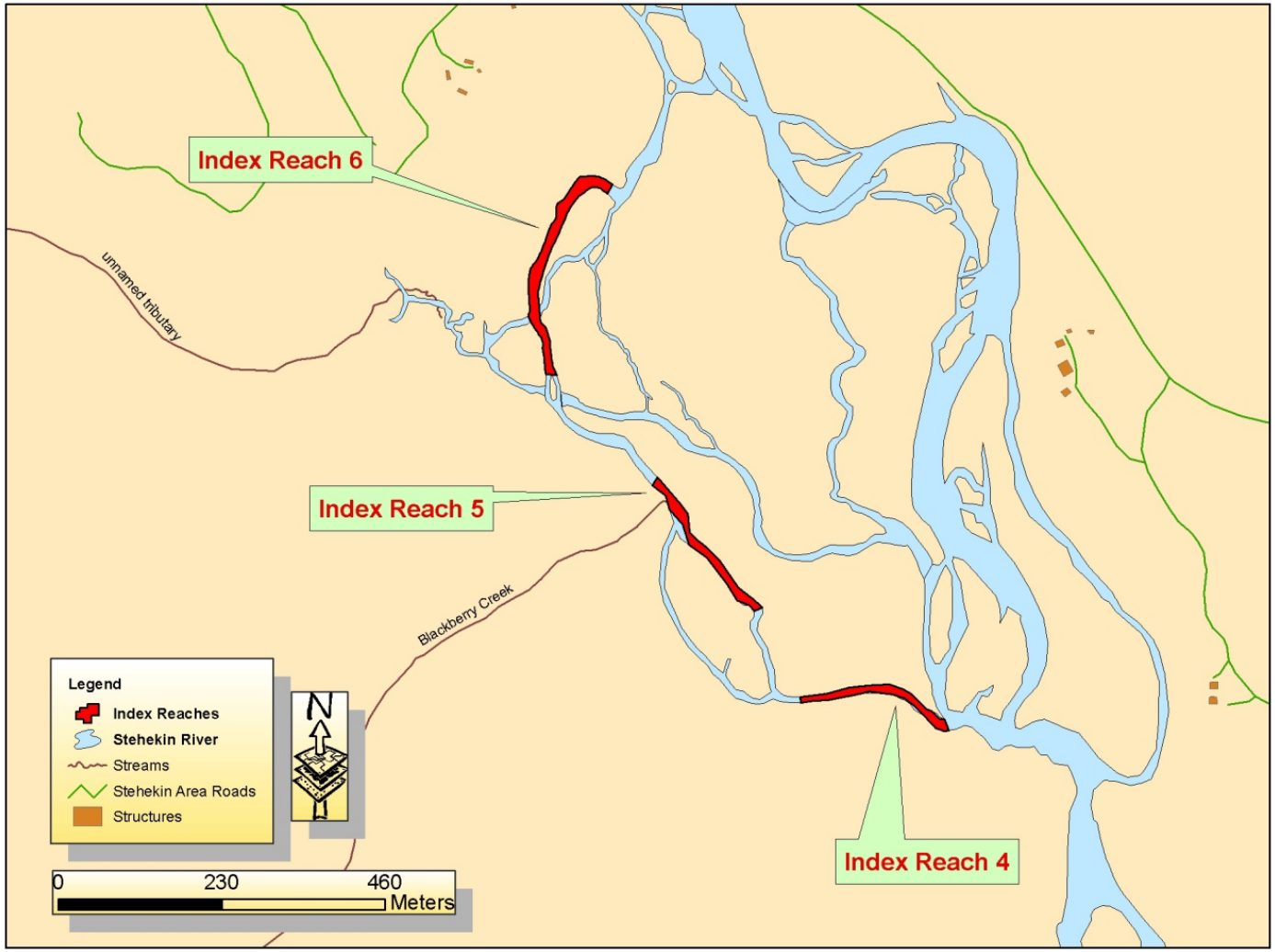

Exhibit 3. Location of index reaches 4-6.

Appendix A. Lower Stehekin River cutthroat trout spawning survey index reaches (continued).

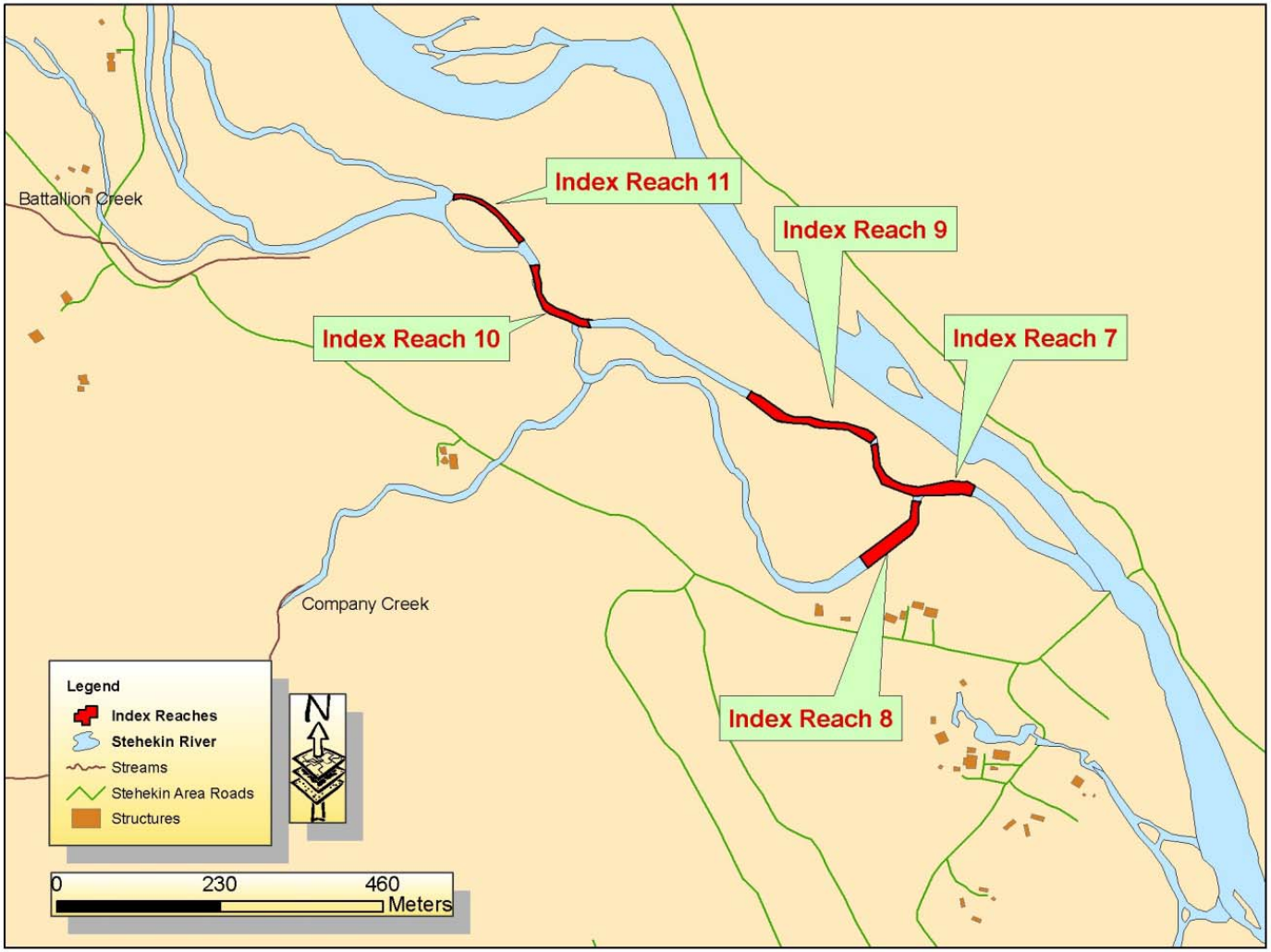

Exhibit 4. Location of index reaches 7-11.

Appendix A. Lower Stehekin River cutthroat trout spawning survey index reaches (continued).

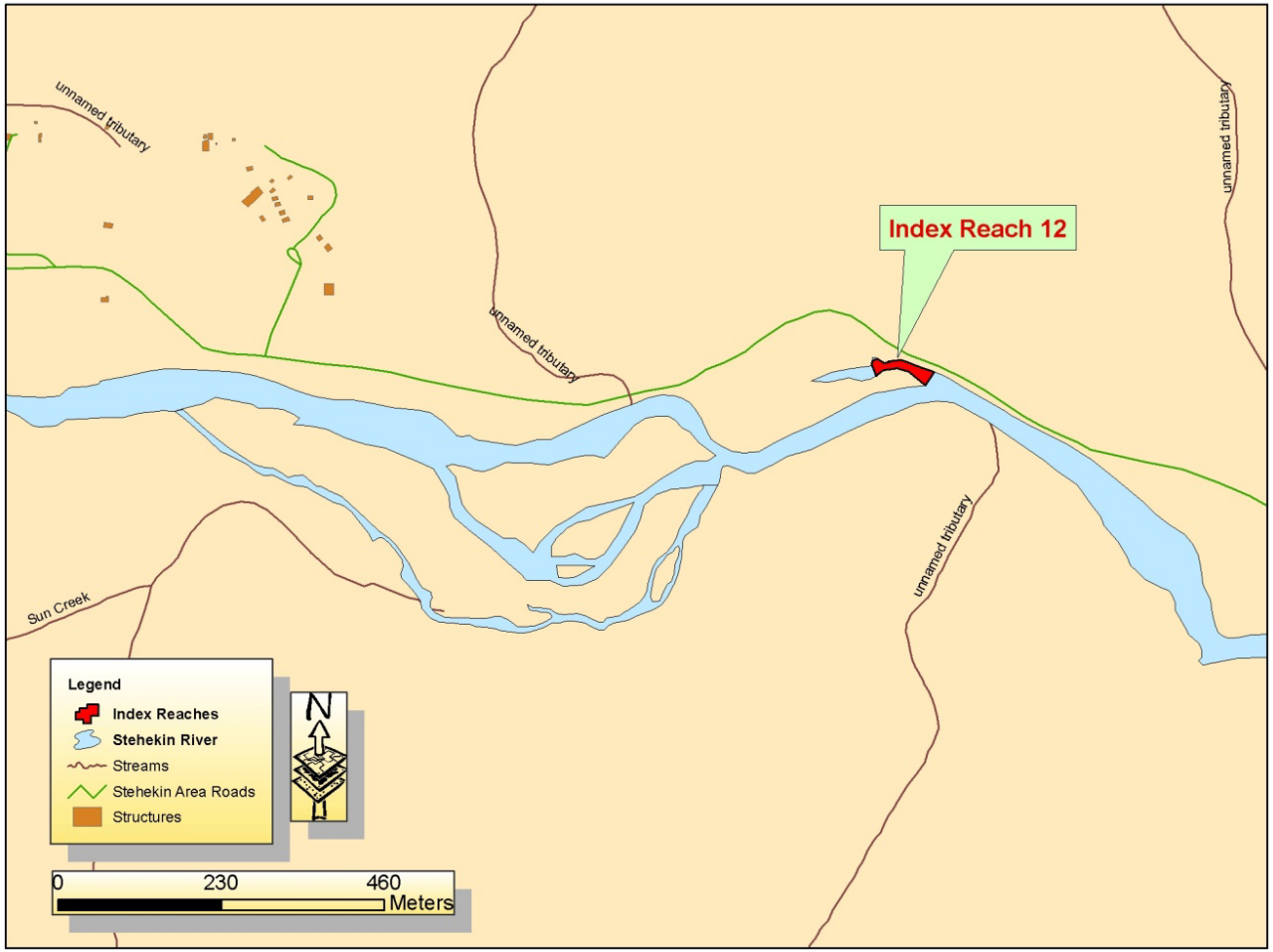

Exhibit 5. Location of index reach 12.

Appendix B. Fish observation and redd parameter datasheets.

Stehekin Cutthroat Trout Spawning Survey

Survey Date	Observer	Recorder	%Cloud Cover	Precip.	Water Condition	Water Temp °C	USGS Discharge cu.ft/sec	Visibility (m)

Cloud Cover- Estimate % cloud cover in 10% increments
Precipitation- none (n), light rain (lr), heavy rain (hr), snow (s)
Water Condition- low flow, clear (lc), low medium clear (lmc), low muddy (lm)
medium flow, clear (mc), medium/medium clear (mmc), medium/ muddy (mm)
high clear (hc), high medium clear (hmc), high muddy (hm), flooding (fld)
Discharge- Discharge is taken from the USGS website: http://waterdata.usgs.gov/nwis/uv?12451000 for each survey date.
Comments- Include zeros present, other fish and wildlife observations, photo #, disturbance to channel, ect…

				Bottom of Reach		# of New Redds			# of Fish observed			
									Cutthroat	Rainbow	Unknwn	
Site #	Index Site ID	Length (m)	Width (m)	UTM_E	UTM_N	Cutthroat	Rainbow	Unknwn	<6"/ >6"	<6"/ >6"	<6"/ >6"	Comments
i1	Ste-dev-i2	115	11	672055	5354398							
i2	Ste-orc-i2	44	3	670890	5355168							
i3	Ste-orc-i1	43	2	670805	5355338							
i4	Ste-s14a-i1	217	12	669828	5356291							
i5	Ste-s14a-i2	245	15	669587	5356441							
i6	Ste-s14a-i3	292	15	669300	5356744							
i7	Ste-cc-i1	189	9	669147	5357764							
i8	Ste-cc-i3	134	6	669134	5357759							
i9	Ste-cc-i2	176	9	669015	5357843							
i10	Ste-cc-i5	125	8	668606	5358009							
i11	Ste-cc-i7	116	4	668512	5358132							
i12	Ste-up-i1	85	5	664675	5360456							

Additional Comments:

Appendix B. Fish observation and redd parameter datasheets (continued).

Stehekin Cutthroat Trout Spawning Survey/ Redd parameters

Survey Date	Observer	Recorder

Redd Number	Index Reach ID	Number and species of Fish on Redd	Redd Diameter	Gravel Size	Depth	Water Temp	Habitat Description
1							
2							
3							
4							
5							
6							
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Comments