14a. Streams and Fish Habitat: Aquatic Habitat

Goal: Maintain or restore the natural range and frequency of aquatic habitat conditions on the Tongass National Forest to sustain the diversity and production of fish and other freshwater organisms

Objectives: Use baseline fish habitat objectives, identified in the Forest Plan Standards and Guidelines, to evaluate the relative condition of riparian and aquatic habitat. Monitor representative fish populations to determine whether trends attributable to current forest management are evident

Background: Fish and aquatic resources on the Tongass National Forest provide major subsistence, commercial, and sport fisheries. Abundant rainfall and watersheds with high densities of streams provide a high quantity and diversity of freshwater fish habitats. The Tongass National Forest provides spawning and rearing habitat for the majority of wild fish produced in Southeast Alaska. Maintenance of this habitat and associated waters is a focal point for the public, State and Federal agencies, and Native organizations.

Streams and Fish Habitat Question: *Is the range and frequency of aquatic habitat conditions maintained?*

In order to answer this question, we have compiled a database of aquatic habitat surveys from reference channels. We define a reference channel as one which has no timber management, road building or other urban effects upstream or adjacent to the stream. We use summary statistics from these channels to define the natural range of variation (NRV) for our baseline fish habitat objectives.

The baseline fish habitat objectives are a suite of descriptive statistics taken from reference stream systems. These statistics, put forth as ranges and quartiles or 10 habitat variables (Table 4) are broken out by geomorphic process group and channel type (Paustian 1992, revised 2010). The original suite of descriptive statistics was published as an evaluation of the effect of sample size on statistical power (Bryant 2004), and two additional metrics were added from the Channel Condition Assessment project (Woodsmith 2005).

In 2008, a re-evaluation of the descriptive statistics identified several channel types where small samples sizes limited their value (Tucker and Caouette 2008). We proposed a 4-year project beginning in 2010 to focus field data collection in reference reaches for the specific purpose of increasing sample size and improving the value of the statistics. The first 3 years of the project were focused on data collection while the fourth year, FY2013 focused on analysis and reporting. In addition, we accepted reference data taken in other channel types to continue to increase sample sizes in all types of channels.

An additional and complicating aspect of this project was that the updated statistics would be run using the national Aquatic Surveys database. This step was included to comply with national direction, provide an additional measure of data validation, and enable further statistical analysis of these data in the future. Data migration to the national database is the current priority for this project.

Stream and Fish Table 4. Fish habitat objectives

Channel Type		FP		FPS		FPM		FPL				MM		MMS	
Harvest Status		no	yes	no	yes	no	yes	no	yes			no	yes	no	yes
	n w/data	43	28	16	9	19	12	8	7		n w/data	49	39	45	27
	0	4.8	9.2	4.8	9.4	15.5	9.2	18.4	30.9		0	3.48	1.56	3.5	1.6
	0.25	16.5	18.5	11.6	13.7	18.7	21.3	24.2	32.0		0.25	10.57	12.35	10.3	13.2
	0.5	19.3	27.8	14.9	18.8	20.2	27.8	27.2	38.6		0.5	15.34	17.29	14.2	16.7
	0.75	26.0	38.8	18.5	22.2	30.7	33.5	41.8	52.8		0.75	22.27	25.15	21.8	22.5
WD	1	77.8	79.1	24.7	46.1	46.0	79.1	77.8	76.7		1	52.61	44.55	52.6	37.9
	mean	23.1	31.0	15.0	20.3	24.8	30.8	15.0	20.3		mean	17.83	19.54	17.4	18.2
	stdev	12.9	18.5	5.4	11.0	9.1	18.5	5.4	11.0		stdev	10.98	9.48	11.4	8.3
	cv %	55.6	59.6	36.0	54.3	36.7	60.0	36.0	54.3		cv %	61.6	48.5	65.6	45.6
	n w/data	44	83	16	27	23	26	5	29		n w/data	41	35	39	25
	0	0.10	0.00	0.19	0.00	0.13	0.09	0.10	0.00		0	0.08	0.03	0.08	0.15
	0.25	0.26	0.21	0.25	0.25	0.31	0.22	0.15	0.10		0.25	0.27	0.29	0.28	0.36
	0.5	0.36	0.39	0.39	0.45	0.37	0.48	0.17	0.32		0.5	0.38	0.39	0.38	0.46
	0.75	0.50	0.60	0.53	0.58	0.50	0.61	0.46	0.60		0.75	0.50	0.53	0.51	0.57
	0.9	0.64	0.77	0.64	0.66	0.62	0.79	0.48	0.79		0.9	0.71	0.78	0.73	0.98
TLWD/M	1	1.68	1.31	0.68	0.78	1.68	1.31	0.49	1.19		1	1.03	4.74	1.03	4.74
	mean	0.41	0.41	0.41	0.41	0.45	0.46	0.41	0.41		mean	0.41	0.54	0.43	0.67
	stdev	0.25	0.28	0.17	0.21	0.31	0.29	0.17	0.21		stdev	0.24	0.77	0.24	0.88
	cv %	61.12	67.32	42.5	51.4	67.6	62.2	42.5	51.4		cv %	56.7	142.7	55.5	132.9
	n w/data	41	73	17	25	20	21	4	26		n w/data	42	27	39	20
	0	0.01	0.00	0.02	0.00	0.01	0.00	0.01	0.00		0	0.01	0.00	0.02	0.00
	0.25	0.04	0.01	0.04	0.02	0.06	0.01	0.02	0.00		0.25	0.06	0.02	0.07	0.06
	0.5	0.10	0.03	0.10	0.05	0.10	0.03	0.03	0.01		0.5	0.11	0.07	0.12	0.10
TKWD/M	0.75	0.15	0.08	0.17	0.11	0.15	0.09	0.06	0.03		0.75	0.14	0.12	0.14	0.13

Channel Type		FP		FPS		FPM		FPL				MM		MMS	
Harvest Status		no	yes	no	yes	no	yes	no	yes			no	yes	no	yes
	0.9	0.23	0.15	0.23	0.16	0.20	0.16	0.09	0.08		0.9	0.19	0.19	0.19	0.21
	1	0.25	0.30	0.25	0.30	0.25	0.27	0.12	0.26		1	0.27	0.23	0.27	0.23
	mean	0.11	0.06	0.12	0.08	0.11	0.06	0.12	0.08		mean	0.11	0.08	0.11	0.10
	stdev	0.07	0.07	0.08	0.07	0.07	0.07	0.08	0.07		stdev	0.06	0.07	0.06	0.07
	cv %	64.93	123.60	62.52	93.32	59.89	117.58	62.52	93.32		cv %	59.93	88.41	57.03	70.75
	n w/data	52	86	19	27	25	29	8	29		n w/data	49	38	45	27
POOLS/ KM	0	7.85	0.00	23.81	0.00	8.07	8.92	7.85	0.00		0	0.01	0.02	0.01	0.03
	0.25	30.23	17.59	50.10	33.44	31.01	28.20	9.69	7.02		0.25	0.04	0.04	0.05	0.05
	0.5	44.98	32.15	66.67	50.63	41.02	38.14	18.37	16.79		0.5	0.06	0.06	0.06	0.07
	0.75	66.38	50.47	75.47	69.13	57.48	49.18	22.59	24.61		0.75	0.07	0.09	0.07	0.09
	1	118.00	171.04	118.00	171.04	76.69	113.64	49.61	130.43		1	0.16	0.13	0.16	0.13
	mean	48	39	65.41	56.67	44.13	42.10	65.41	56.67		mean	0.06	0.06	0.06	0.07
	stdev	25	33	24.72	40.04	18.04	22.72	24.72	40.04		stdev	0.03	0.03	0.03	0.03
	cv %	52.36	83.11	37.80	70.67	40.89	53.98	37.80	70.67		cv %	43.03	50.51	39.73	38.11
	n w/data	52	81	19	25	25	28	8	27		n w/data	47	36	43	26
Pool spacing	0	0.88	0.25	1.17	1.30	0.88	0.61	1.07	0.25		0	0.77	1.03	1.4	1.0
	0.25	1.43	1.59	2.19	2.70	1.26	1.47	1.92	1.41		0.25	2.87	2.67	2.9	2.7
	0.5	2.20	2.46	3.22	4.36	1.78	2.01	2.67	2.16		0.5	3.95	3.98	4.0	3.9
	0.75	3.44	4.18	5.06	7.41	2.23	2.38	3.11	3.01		0.75	5.72	5.12	5.7	5.1
	1	9.56	44.68	7.32	44.68	9.56	6.12	6.32	10.74		1	15.16	12.33	15.2	12.3
	mean	2.82	4.15	3.60	7.52	2.22	2.19	3.60	7.52		mean	5.00	4.19	5.10	4.19
	stdev	1.86	5.91	1.74	9.31	1.85	1.17	1.74	9.31		stdev	3.57	2.17	3.66	2.40
	cv %	65.86	142.27	48.46	123.87	83.03	53.55	48.46	123.87		cv %	71.33	51.86	71.78	57.40
	n w/data	52	32	19	9	25	13	8	10		n w/data	46	29	42	23

Channel Type		FP		FPS		FPM		FPL				MM		MMS	
Harvest Status		no	yes	no	yes	no	yes	no	yes			no	yes	no	yes
RPD/CBW	0	0.00	0.03	0.00	0.05	0.00	0.03	0.00	0.03		0	0.00	0.00	0.00	0.02
	0.25	0.03	0.03	0.05	0.06	0.04	0.04	0.02	0.03		0.25	0.06	0.05	0.06	0.05
	0.5	0.04	0.04	0.06	0.07	0.04	0.04	0.03	0.03		0.5	0.07	0.06	0.08	0.08
	0.75	0.06	0.05	0.09	0.08	0.05	0.04	0.03	0.03		0.75	0.10	0.10	0.10	0.11
	1	0.13	0.11	0.13	0.11	0.08	0.05	0.04	0.04		1	0.17	0.18	0.17	0.18
	mean	0.05	0.05	0.07	0.07	0.04	0.04	0.07	0.07		mean	0.08	0.08	0.08	0.09
	stdev	0.03	0.02	0.04	0.02	0.01	0.00	0.04	0.02		stdev	0.04	0.04	0.04	0.04
	cv %	60.64	42.57	55.27	27.08	34.30	11.19	55.27	27.08		cv %	53.01	56.10	46.57	49.83
	n w/data	43	32	18	10	19	13	6	9		n w/data	44	28	40	22
D50	0	1.04	2.23	5.21	14.00	6.00	2.23	1.04	5.95		0	7.76	7.07	7.8	7.1
	0.25	16.68	17.35	22.77	17.52	14.93	21.73	17.29	17.80		0.25	26.98	24.81	26.5	23.8
	0.5	24.00	26.56	27.16	26.59	19.10	25.47	19.69	27.11		0.5	34.83	33.50	34.8	30.5
	0.75	36.24	38.84	36.89	35.48	31.62	38.00	44.79	50.00		0.75	55.31	50.21	52.0	46.0
	1	109.00	86.00	56.00	86.00	109.00	68.00	109.00	59.00		1	122.00	210.00	103.0	178.0
	mean	31.39	31.33	28.81	31.55	32.20	31.66	28.81	31.55		mean	44.15	52.14	42.19	40.52
	stdev	25.63	19.53	12.53	21.23	30.63	20.20	12.53	21.23		stdev	26.83	51.13	24.72	36.45
	cv %	81.66	62.33	43.48	67.27	95.11	63.78	43.48	67.27		cv %	60.78	98.08	58.59	89.95
	n w/data	32	24	15	9	12	8	5	7		n w/data	41	29	39	24
POOL LENGTH/M	0	0.11	0.02	0.20	0.35	0.11	0.02	0.12	0.10		0	0.07	0.15	0.1	0.2
	0.25	0.34	0.39	0.36	0.39	0.43	0.52	0.18	0.39		0.25	0.28	0.29	0.3	0.3
	0.5	0.51	0.54	0.58	0.50	0.54	0.60	0.42	0.51		0.5	0.42	0.35	0.4	0.3
	0.75	0.69	0.59	0.66	0.55	0.70	0.84	0.44	0.55		0.75	0.47	0.45	0.5	0.5
	1	0.84	1.21	0.84	0.70	0.75	1.21	0.69	0.64		1	0.80	0.67	0.8	0.7
	mean	0.50	0.53	0.53	0.50	0.52	0.64	0.53	0.50		mean	0.41	0.38	0.41	0.38

Channel Type		FP		FPS		FPM		FPL				MM		MMS	
Harvest Status		no	yes	no	yes	no	yes	no	yes			no	yes	no	yes
	stdev	0.21	0.24	0.20	0.11	0.21	0.36	0.20	0.11		stdev	0.19	0.14	0.19	0.14
	cv %	41.17	45.52	37.17	22.01	39.75	56.20	37.17	22.01		cv %	46.08	36.28	46.49	36.54

Definitions of Habitat Management Objectives (see Tucker and Caouette, unpublished, for complete definitions)

WD = channel width-to-depth ratio (Bankfull width / mean bankfull depth)

TLWD/M = Total Large Wood pieces / meter (Total Pieces / meters surveyed)

TKWD/M = Total Key pieces Large Wood/meter (Total Key pieces / meters surveyed)

POOL/KM = Pools/Km (Total number of Pools / meters surveyed * 1000)

POOL SPACE = Pool Spacing (Length of stream surveyed / channel bed width / total number of pools)

RPD/CBW = Residual Pool Depth/Channel Bed width (Average of all pool residual depth / average channel bed width)

D50 = median particle size of streambed

PLNGTH/M = Pool Length/meter (Total pool length / total length of stream surveyed)

REL_SUBMRG = Relative Submergence (Mean bankfull depth / D50)

POOL_SIZE = Pool Size (Average residual pool depth / average bankfull depth)

Definitions of channel types (see Paustian 1992 for complete definitions)

FP = floodplain process group MM: moderate grade mixed control process group

FPS = small floodplain channel MMS: small moderate grade mixed control channel

FPM = medium floodplain channel

MM = moderate grade mixed control process group

MMS = small moderate grade mixed control channel

FPL = large floodplain channel

Note: This table is an update of the original publication of quartiles to include the sample sizes, full ranges of the data, mean, standard deviation, and the coefficient of variation expressed as a percentage of the mean. It also shows both harvested and unharvested channels – the source data for t-test analysis comparisons.

Evaluation Criteria

During the 2014 field season, we continued to add channels to the reference database, sampling 18 sites (Table 5). These sites come from the Watershed Restoration Effectiveness Monitoring (WREM) and Management Indicator Species (MIS) projects. The data from these sites were entered to the corporate Natural Resources Information System (NRIS) Aquatic Surveys database in preparation for analysis and reporting.

Stream and Fish Table 5. Sites sampled in 2014

Site Name	Location	Drainage	Channel Type
11 Mile	Prince of Wales Island	11 mile	FPM
Salmon Creek	Baranof Island	Salmon Lake	FPM
Rising Stream	Kupreanof Island	Towers	FPS
Newlunberry	Prince of Wales Island	Thorne River	FPS
ZZ Top	Kupreanof Island	Towers	MCS
Dehydration	Kupreanof Island	Towers	FPM
Upper East	Kupreanof Island	Towers	MMM
Thirty Trap	Kupreanof Island	Towers	MMS
Easy Street	Kupreanof Island	Towers	FPS
Camelot	Kupreanof Island	Towers	MMM
Football Field	Kupreanof Island	Towers	MMS
Old Ohmer	Mitkof Island	Ohmer	MMS
Super Trap	Mitkof Island	Ohmer	MMS
Bit Of Bedrock	Mitkof Island	Ohmer	MMS
Porcupine	Mitkof Island	Ohmer	MMS
Fairyland	Kupreanof Island	Big John Bay	MMS
Last Ditch	Chichagof Island	Peril Strait	MMS
Indian Tributary	Baranof Island	Indian River	FPS

Definitions of channel types (see Paustian [1992] for complete definitions):

FPS: small floodplain channel
FPM: medium floodplain channel
FPL: large floodplain channel
MCS: small moderate gradient contained channel
MMS: small moderate gradient mixed control channel
MMM: medium moderate gradient mixed control channel

Sampling/Reporting Period

The sampling period is annual and the reporting period is five years.

Monitoring Results

The 2014 field season focused on adding reference sites from other projects and collation and organization of the data. We were able to add data from 12 MIS monitoring project sites and 6 WREM sites that were sampled in 2014. While those channel types were not targeted specifically in the reference reach project, increases in sample size – especially when they improve our geographic distribution of

reference reach sites – improve the strength of the overall data set.

Evaluation of Results

This project set aside FY2014 to focus on data entry and analysis. The data were first entered into the NRIS database. This step standardizes and validates the data, enabling queries to extract the summary metrics. Currently, we are working to incorporate legacy habitat data into the NRIS environment. We are also developing the reporting tools to extract summary statistics from each survey.

Action Plan

In FY2015, we will continue to focus on data entry and analysis creating a useful and available analytical product. The goal for this project is to produce an interactive suite of statistics generated from data relevant to project needs. As any new site is surveyed, it will be compared to the existing suite of statistics and added to the overall dataset. The complete dataset summary, currently a static product, will be a user-generated output.

Citations

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