Klawock Lake Watershed
Sockeye Spawning Habitat Assessment

Klawock Lake Stakeholder Meeting

November 14-15, 2017

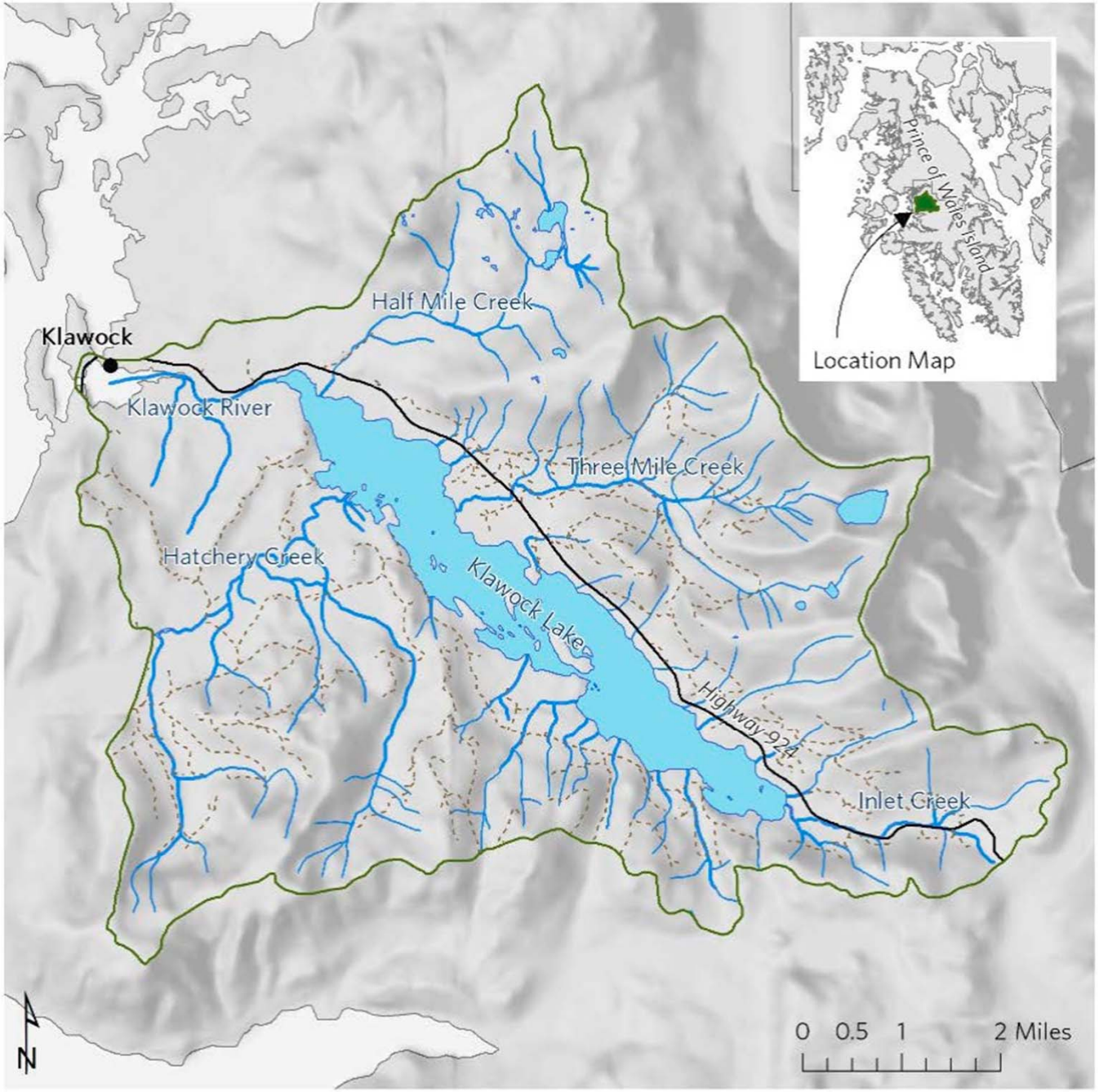
Sockeye Salmon Habitat

The Nature Conservancy has completed an assessment on three sub-basins in the Klawock Lake Watershed that gives us a picture of sockeye salmon stream habitat. This was done through:

- Spawning sockeye salmon surveys
- Aerial photography comparisons through time
- Stream habitat surveys

On Hatchery Creek, Threemile Creek and Inlet Creek

(Halfmile and Lakeshore important, but not covered due to limited resources)

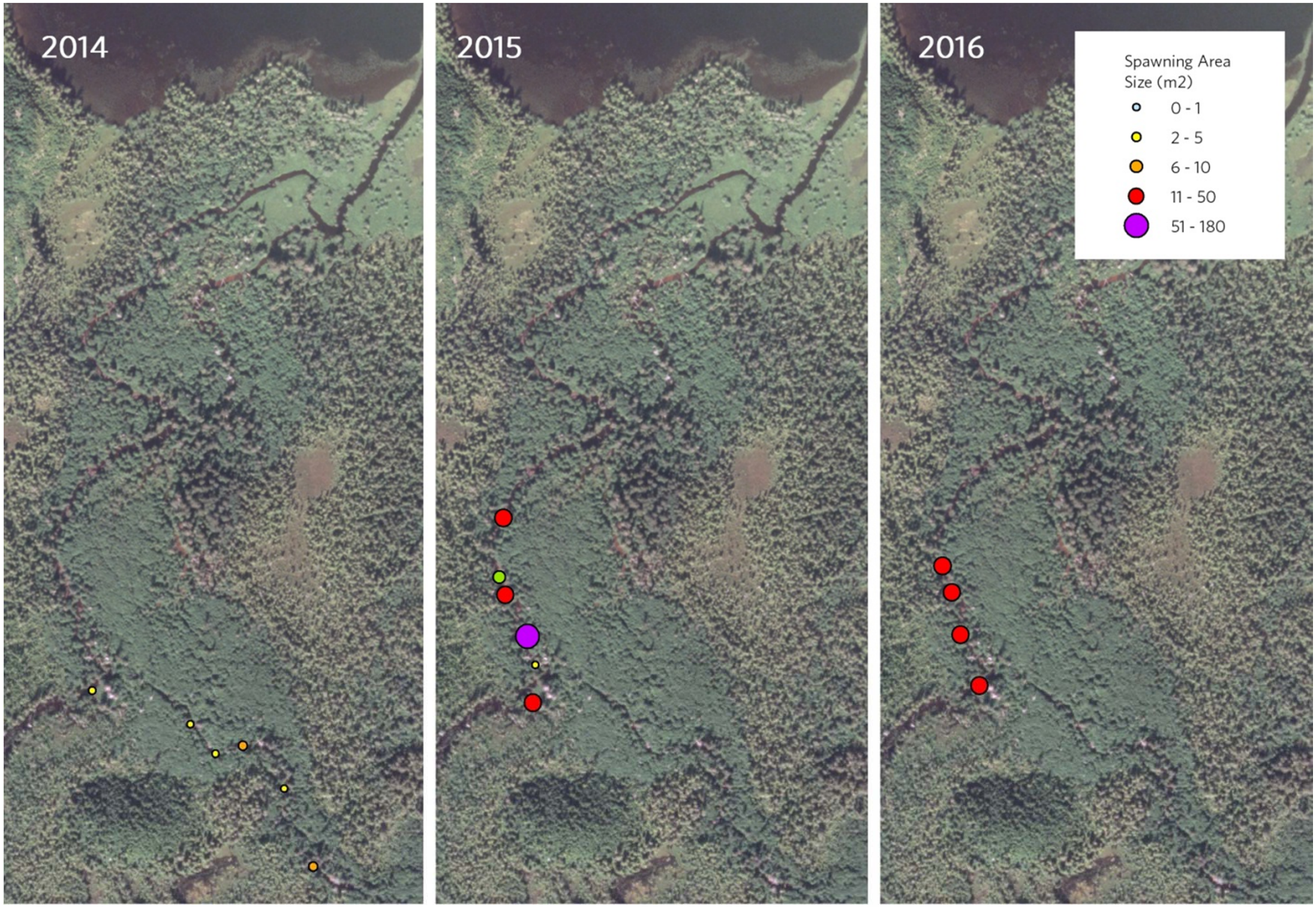

Klawock
Half Mile Creek
Klawock River
Three Mile Creek
Hatchery Creek
Klawock Lake
Highway 924
Inlet Creek
Prince of Wales Island
Location Map
N
0 0.5 1 2 Miles

Methods

- Spawning surveys consisted of walking each system weekly during the 2014-2016 season and documenting the number of adult sockeye salmon in the system and GPS marking the spawning grounds
- Aerial imagery comparison was conducted by geo-referencing 1948, 1972 and 2015 aerial imagery and depicting changes over time
- Stream habitat surveys were completed using U.S. Forest Service Teir II survey protocols. Data were converted to metrics, which were compared back to established metrics as to whether the surveyed stream is fair, good or excellent for a variety of features

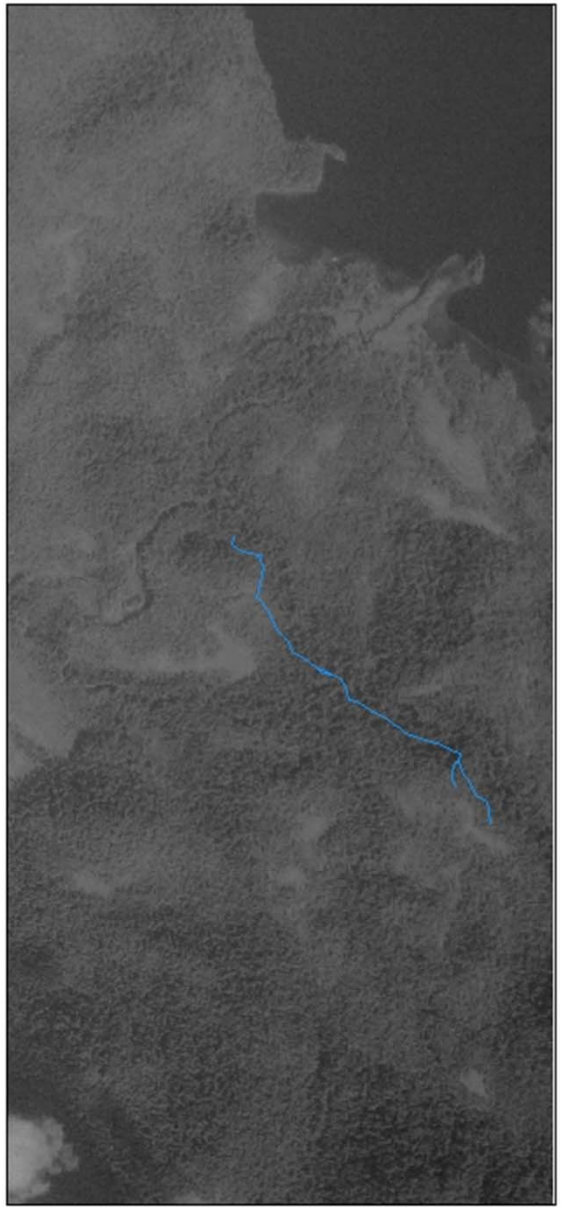
Hatchery Creek Sockeye Spawning

Hatchery Creek					
Survey Date	Live Sockeye	Spawning Sockeye	Sockeye Carcass	Redds	Spawning Area (m^2)
9/10/2014	16	11	0	6	7.5
9/15/2015	35	29	3	8	124
8/24/2016	High and dark water prevented observations				
9/14/2016	High and dark water prevented observations				
9/20/2016	15	1	14	5	112
9/30/2016	No fish in creek				


2014
2015
2016
Spawning Area Size (m2)
0 - 1
2 - 5
6 - 10
11 - 50
51 - 180
Location of Salmon Redds
Hatchery Creek - Klawock Lake
0
0.125
0.25
0.5 Miles
N
W
E
S

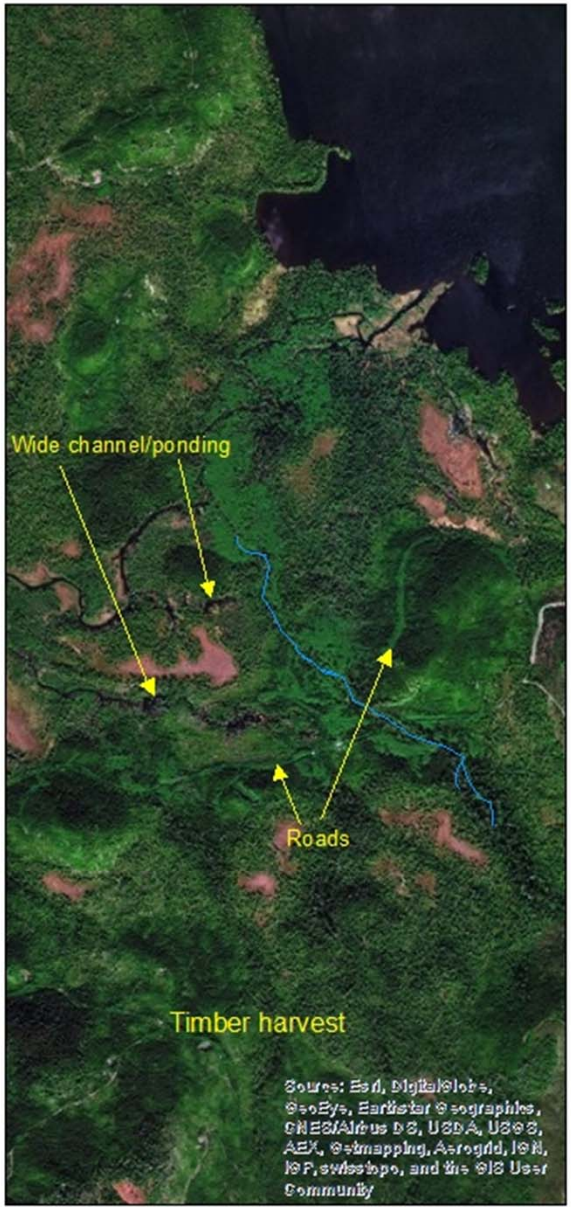
Hatchery Creek Aerial Comparison

1948 Imagery



1972 Imagery

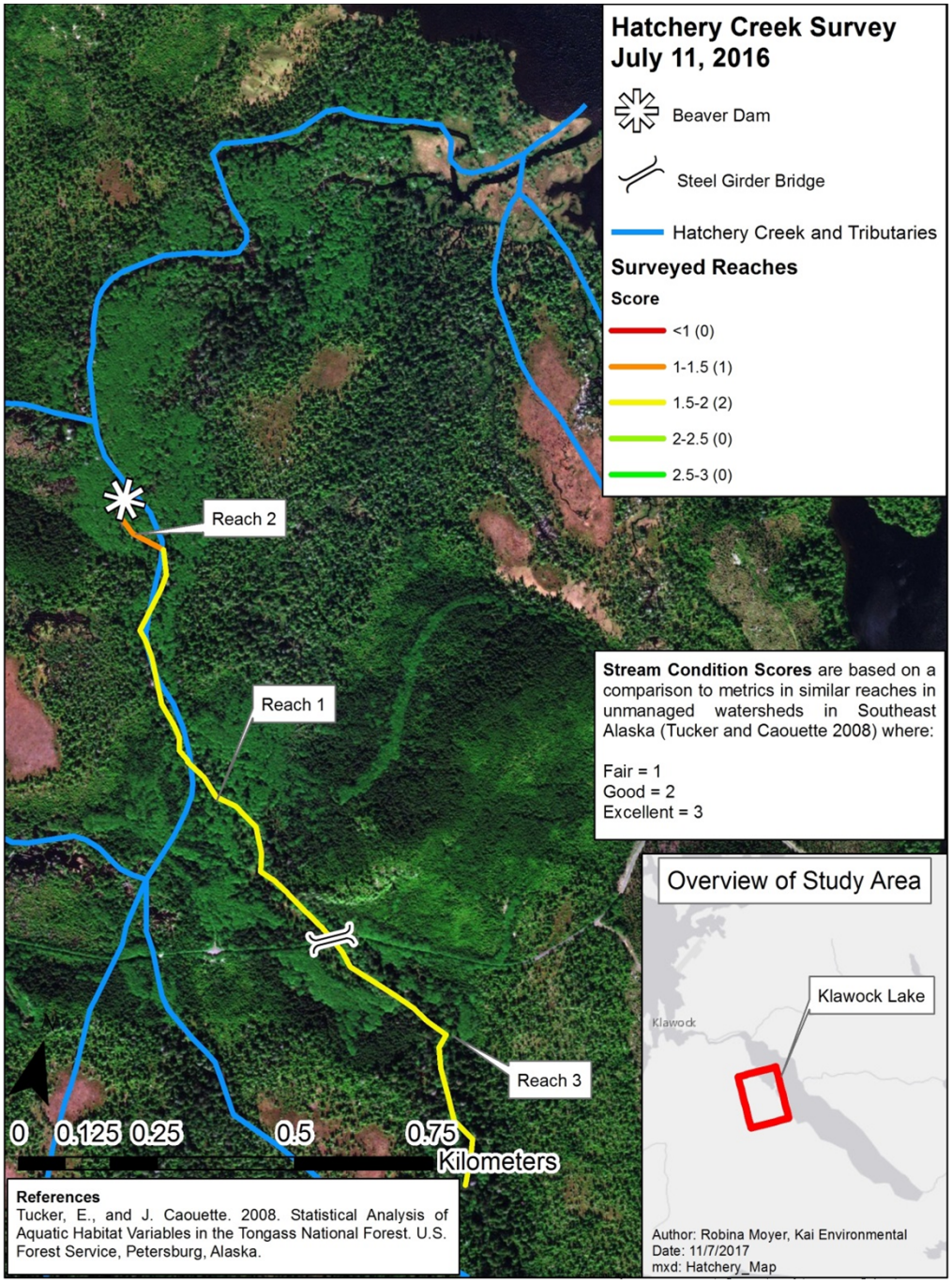
Current Imagery



Hatchery Creek

- There were three reaches surveyed on a tributary to Hatchery Creek

Reach	Width to Depth	Large Wood/Meter	Key Large Wood/Meter	Pools/ kilometer	Pool Spacing	Score
1	Fair (1)	Fair (1)	Good (2)	Excellent (3)	Good (2)	1.8
2	Good (2)	Fair (1)	Good (2)	Good (2)	Fair (1)	1.6
3	Good (2)	Fair (1)	Good (2)	Good (2)	Excellent (3)	2

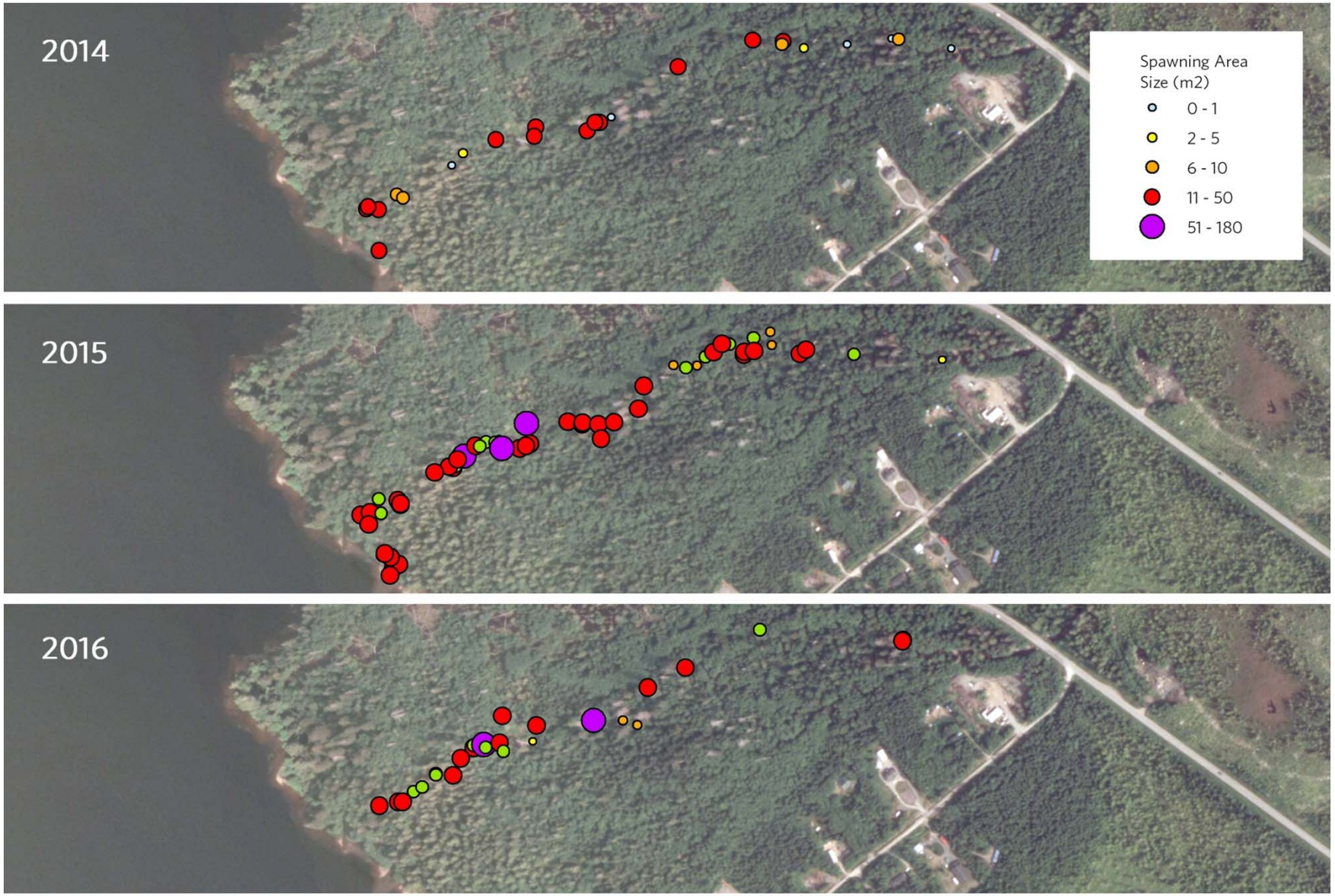

Hatchery Creek Survey
July 11, 2016
Beaver Dam
Steel Girder Bridge
Hatchery Creek and Tributaries
Surveyed Reaches
Score
<1 (0)
1-1.5 (1)
1.5-2 (2)
2-2.5 (0)
2.5-3 (0)
Reach 2
Reach 1
Reach 3
Stream Condition Scores are based on a comparison to metrics in similar reaches in unmanaged watersheds in Southeast Alaska (Tucker and Caouette 2008) where:
Fair = 1
Good = 2
Excellent = 3
Overview of Study Area
Klawock Lake
Klawock
0 0.125 0.25 0.5 0.75
Kilometers
References
Tucker, E., and J. Caouette. 2008. Statistical Analysis of Aquatic Habitat Variables in the Tongass National Forest. U.S. Forest Service, Petersburg, Alaska.
Author: Robina Moyer, Kai Environmental
Date: 11/7/2017
mxd: Hatchery_Map

Hatchery Creek Summary

- Sockeye salmon do use Hatchery Creek for spawning
- Tributary 2, the largest tributary in Hatchery Creek, does have ~2.9 kilometers of "good" habitat with current fish passage challenges due to a large beaver dam structure.
  - Reaches 1 and 2 above the dam (~1 kilometer) are limited in large wood, as well as recruitment of large wood; access for restoration is challenging.
  - Downstream implications: the beaver dam is currently storing a lot of sediment behind it, which would be introduced downstream if the structure were removed. The downstream channel type is a floodplain, which can be sensitive to additional sediment.

Threemile Creek Sockeye Spawning

Threemile Creek					
Survey Date	Live Sockeye	Spawning Sockeye	Sockeye Carcass	Redds	Spawning Area (m^2)
9/5/2014	No fish in creek				
9/9/2014	237	30	2	12	157
9/15/2014	76	6	0	1	0
9/24/2014	320	168	8	55	398
10/1/2014	136	68	4	20	48
8/26/2015	156	2	2	1	102
9/2/2015	324	115	3	33	458
9/9/2015	629	350	13	148	823
9/17/2015	253	187	20	91	302
9/22/2015	268	209	28	82	418
10/2/2015	119	6	96	44	222
8/23/2016	New beaver dam blocking fish (7 live at mouth)				
8/31/2016	32	28	0	7	53
9/13/2016	399	358	19	115	577
9/16/2016	High and dark water prevented observations				
9/21/2016	175	138	19	64	349
9/27/2016	110	105	9	30	231
10/4/2016	50	39	5	4	40


2014
2015
2016
Spawning Area
Size (m2)
0 - 1
2 - 5
6 - 10
11 - 50
51 - 180
Location of Salmon Redds
Three Mile Creek - Klawock Lake
0
0.125
0.25
0.5 Miles
N
W
E
S

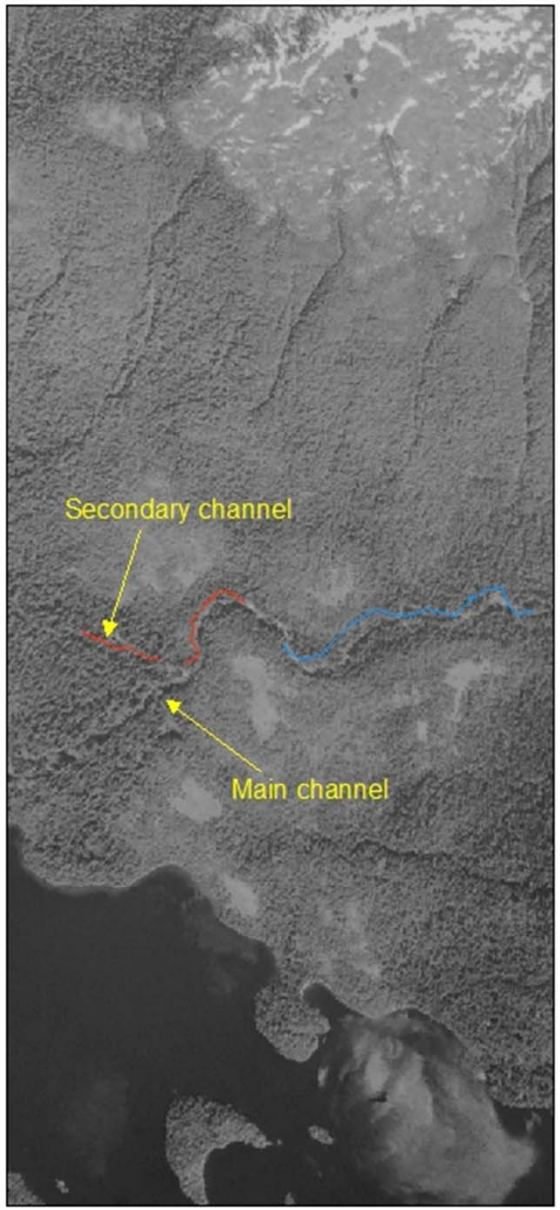
Threemile Creek Aerial Comparison

Legend

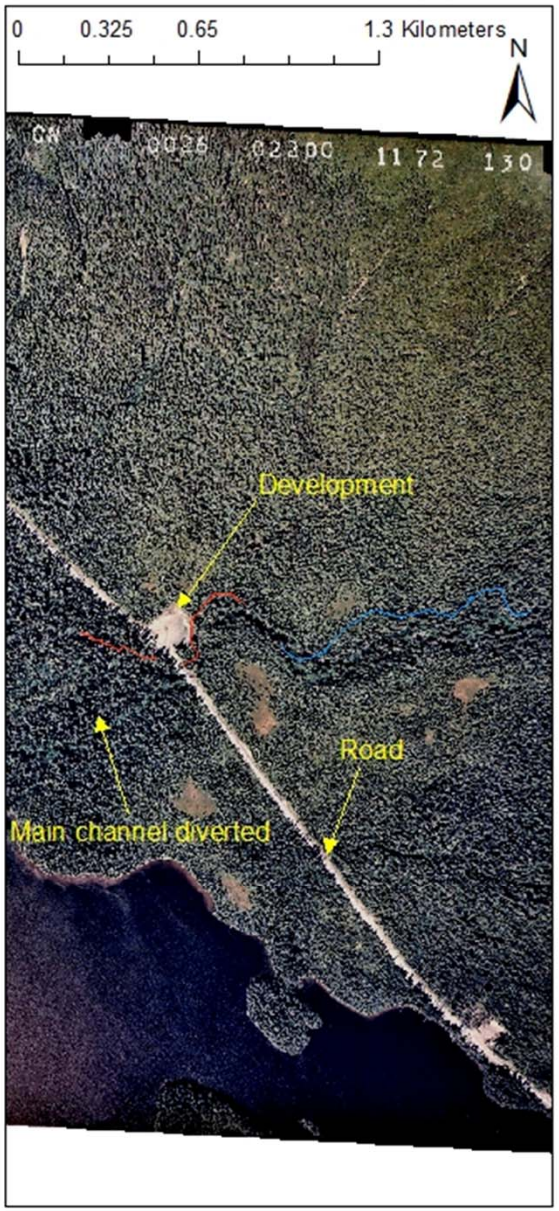
2016 survey

2015 survey

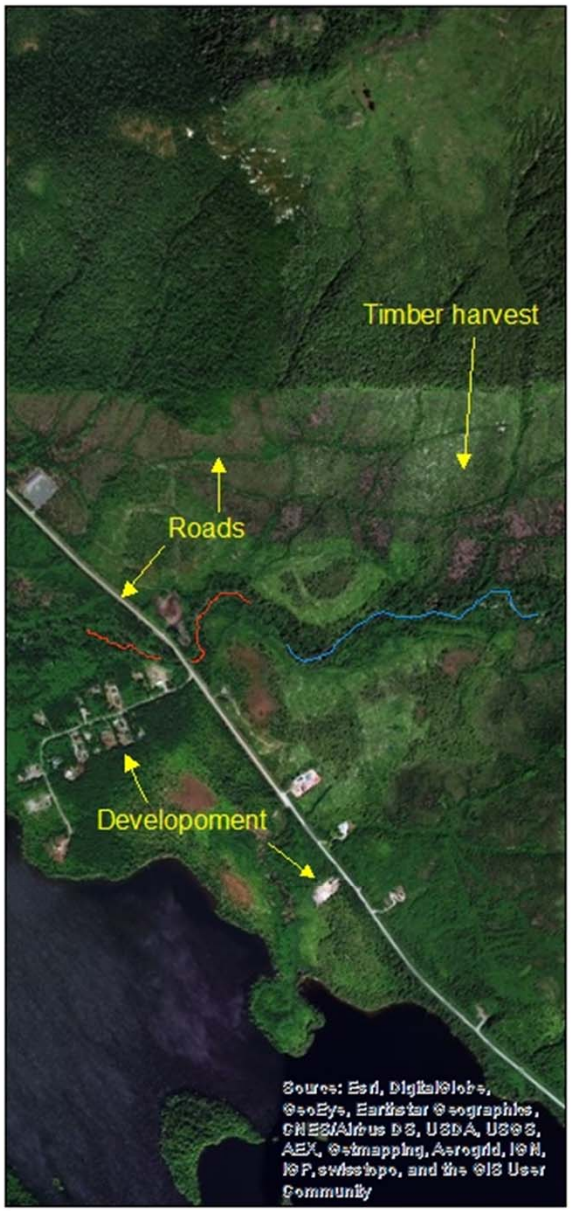
1942 Imagery



1978 Imagery



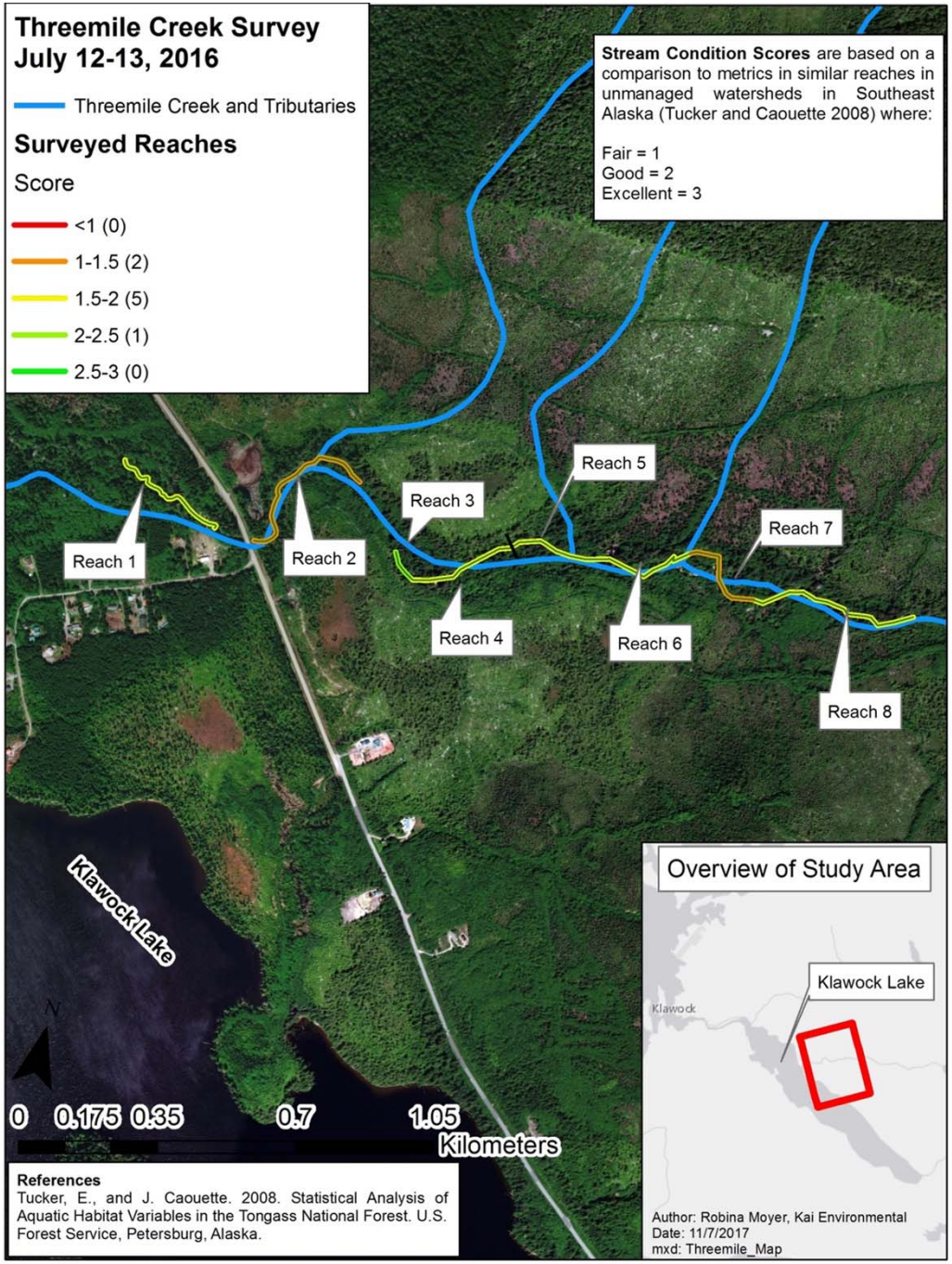
Current Imagery



Threemile Creek

- There were eight reaches surveyed on Threemile Creek

Reach	Width to Depth	Large Wood/Meter	Key Large Wood/Meter	Pools/ kilometer	Pool Spacing	Score
1	N/A	Good (2)	Good (2)	Fair (1)	Fair (1)	1.5
2	N/A	Good (2)	Fair (1)	Fair (1)	Fair (1)	1.0
3	Good (2)	Good (2)	Excellent (3)	Good (2)	Excellent (3)	2.4
4	Good (2)	Fair (1)	Good (2)	Fair (1)	Good (2)	1.6
5	Fair (1)	Fair (1)	Excellent (3)	Fair (1)	Good (2)	1.6
6	Good (2)	Fair (1)	Excellent (3)	Fair (1)	Good (2)	1.8
7	Fair (1)	Fair (1)	Good (2)	Fair (1)	Fair (1)	1.2
8	Fair (1)	Fair (1)	Good (2)	Fair (1)	Excellent (3)	1.6

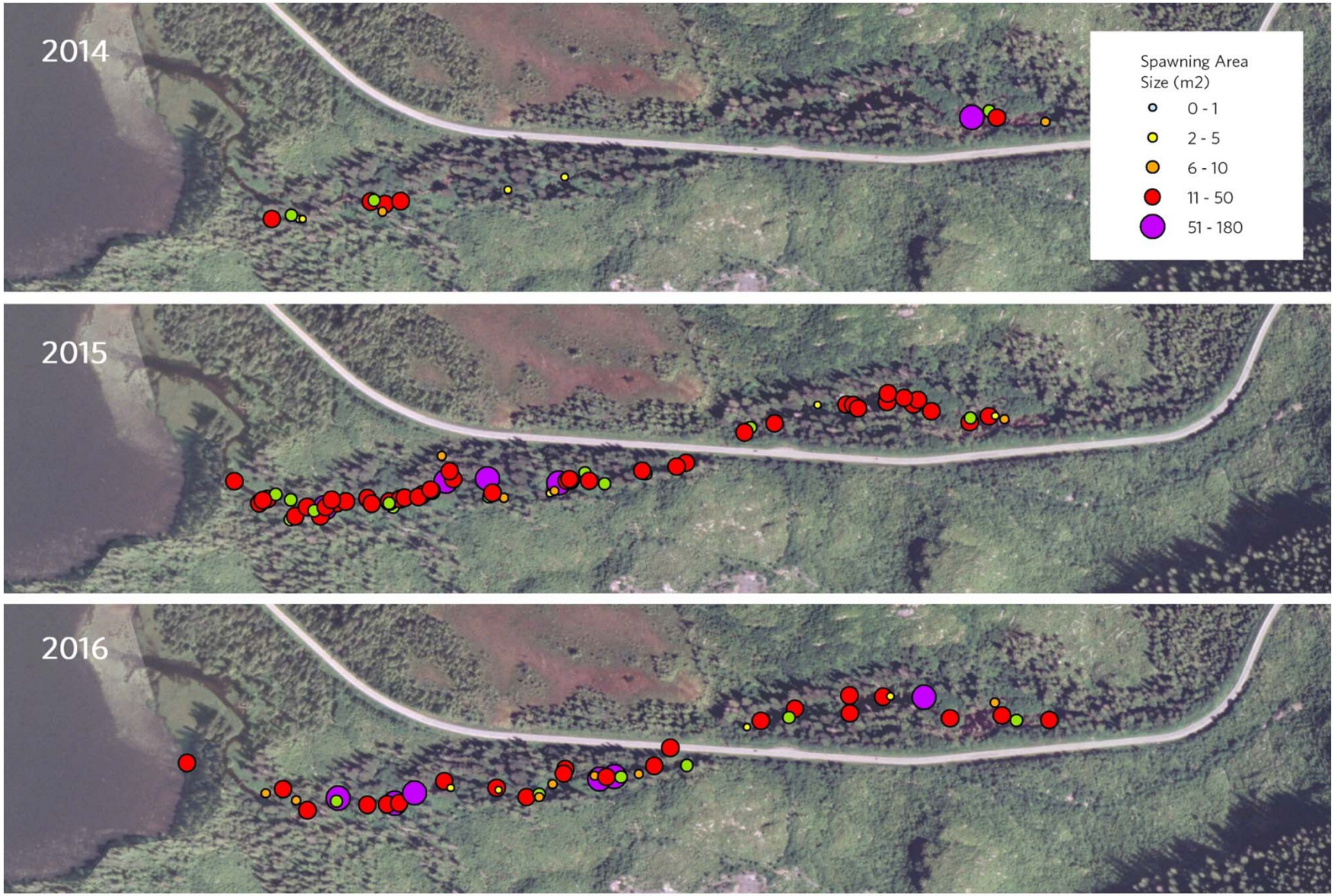

Threemile Creek Survey
July 12-13, 2016
Threemile Creek and Tributaries
Surveyed Reaches
Score
<1 (0)
1-1.5 (2)
1.5-2 (5)
2-2.5 (1)
2.5-3 (0)
Stream Condition Scores are based on a comparison to metrics in similar reaches in unmanaged watersheds in Southeast Alaska (Tucker and Caouette 2008) where:
Fair = 1
Good = 2
Excellent = 3
Reach 1
Reach 2
Reach 3
Reach 4
Reach 5
Reach 6
Reach 7
Reach 8
Klawock Lake
N
0 0.175 0.35 0.7 1.05
Kilometers
References
Tucker, E., and J. Caouette. 2008. Statistical Analysis of Aquatic Habitat Variables in the Tongass National Forest. U.S. Forest Service, Petersburg, Alaska.
Overview of Study Area
Klawock Lake
Klawock
Author: Robina Moyer, Kai Environmental
Date: 11/7/2017
mxd: Threemile_Map

Threemile Creek Summary

- Continues to be an important sockeye spawning system, despite challenges from dramatic landscape changes
- Majority of the spawning occurs below the highway crossing. The culverts likely hinders fish passage to a degree
- Upstream habitat scores are lower due to low large wood and pool metrics
- Upstream habitat could be improved with the addition of large wood, bearing in mind there may be challenges with design due to bedrock, and future large wood recruitment is limited

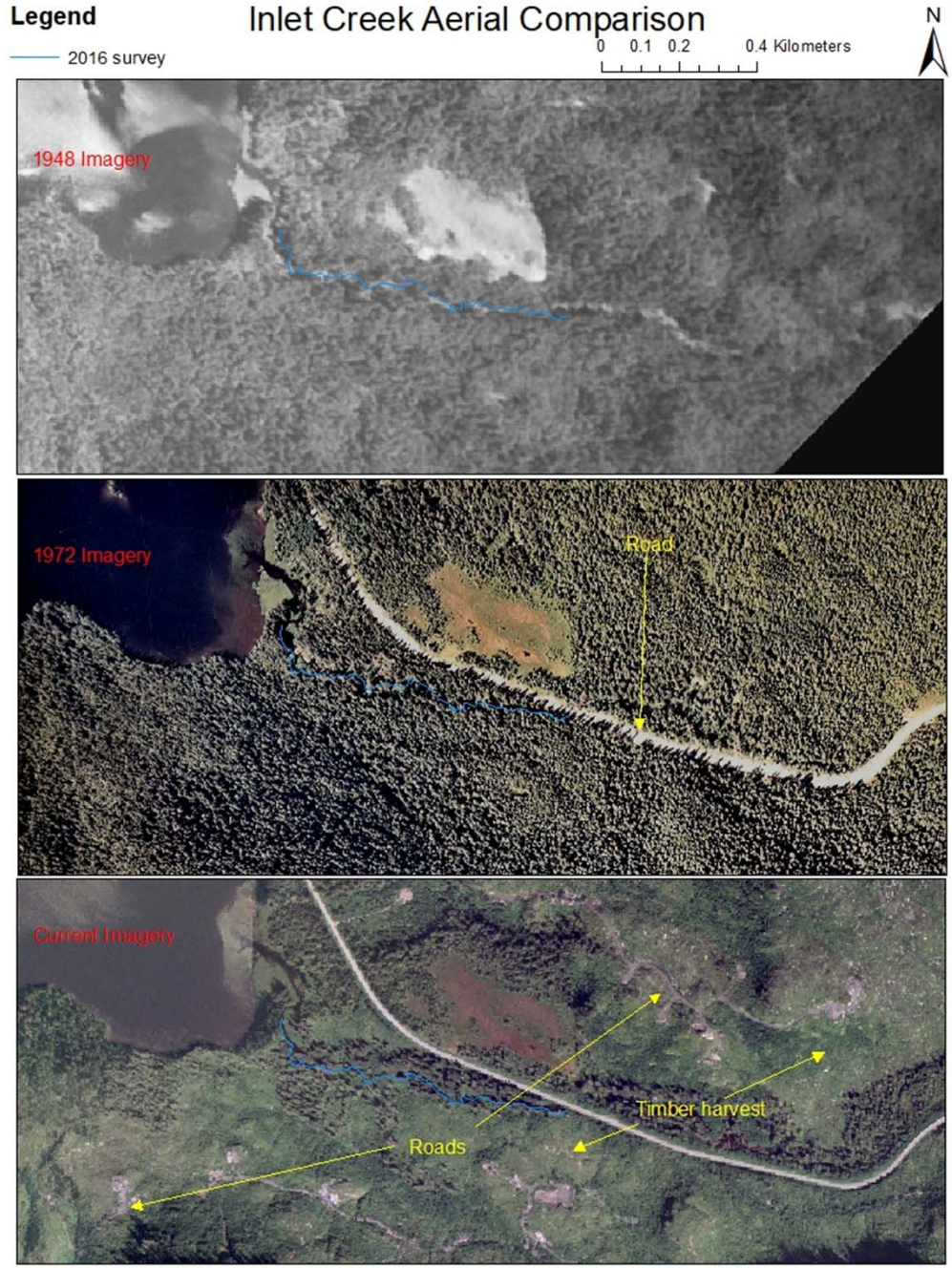
Inlet Creek Sockeye Spawning

Inlet Creek					
Survey Date	Live Sockeye	Spawning Sockeye	Sockeye Carcass	Redds	Spawning Area (m^2)
9/5/2014	84	30	1	11	27
9/17/2014	64	42	11	25	96
9/23/2014	9	9	0	3	64
9/30/2014	39	13	4	6	16
8/27/2015	77	49	0	16	192
9/1/2015	337	128	0	40	657
9/7/2015	388	268	19	80	536
9/21/2015	202	116	26	52	373
10/1/2015	21	15	2	3	24
8/31/2016	New beaver dam blocking fish (18 live at mouth)				
9/12/2016	575	531	20	135	1529
9/19/2016	264	239	67	76	400
10/3/2016	10	0	3		0
10/11/2016	No fish in creek				



Location of Salmon Redds
Inlet Creek - Klawock Lake

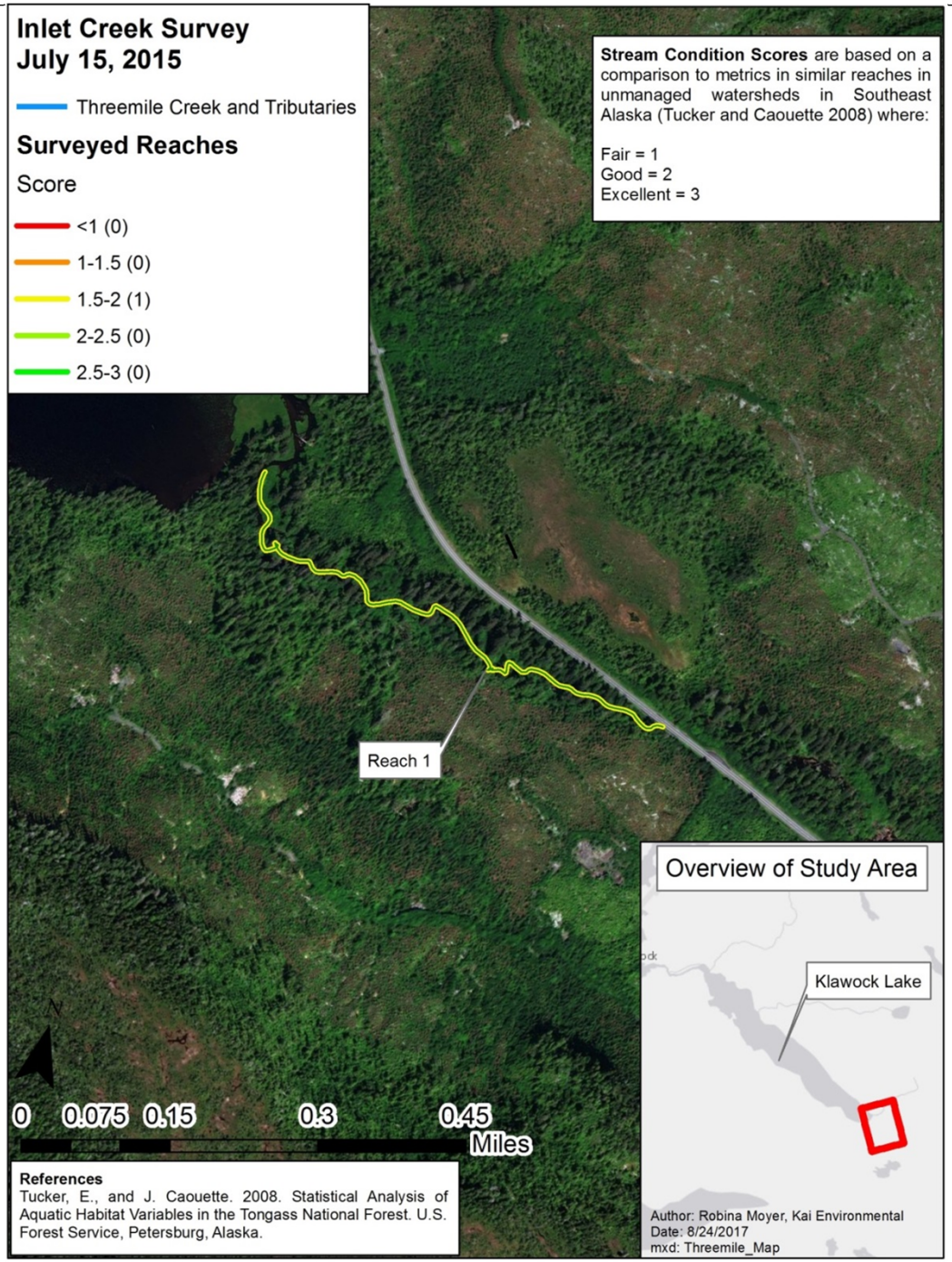
0 0.1 0.2 0.4 Miles


Legend
2016 survey
Inlet Creek Aerial Comparison
0 0.1 0.2 0.4 Kilometers
N
1948 Imagery
1972 Imagery
Road
Current Imagery
Timber harvest
Roads

Inlet Creek

- There was one reach surveyed on Inlet Creek

Reach	Width to Depth	Large Wood/Meter	Key Large Wood/Meter	Pools/ kilometer	Pool Spacing	Score
1	N/A	Fair (1)	Good (2)	Fair (1)	Excellent (3)	1.75


Inlet Creek Survey
July 15, 2015
Threemile Creek and Tributaries
Surveyed Reaches
Score
<1 (0)
1-1.5 (0)
1.5-2 (1)
2-2.5 (0)
2.5-3 (0)
Stream Condition Scores are based on a comparison to metrics in similar reaches in unmanaged watersheds in Southeast Alaska (Tucker and Caouette 2008) where:
Fair = 1
Good = 2
Excellent = 3
Reach 1
Overview of Study Area
Klawock Lake
N
0 0.075 0.15 0.3 0.45
Miles
References
Tucker, E., and J. Caouette. 2008. Statistical Analysis of Aquatic Habitat Variables in the Tongass National Forest. U.S. Forest Service, Petersburg, Alaska.
Author: Robina Moyer, Kai Environmental
Date: 8/24/2017
mxd: Threemile_Map

Inlet Creek Summary

- Continues to be an important sockeye spawning system
- Overall functions well for sockeye spawning habitat
- Lower scores driven by lack of large wood in the stream.
- While there were buffers in place when logging occurred, data indicate that large wood is not being replaced fast enough, thus there may be a future need for restoration.

Other potential future projects

- Assess Halfmile Creek and Klawock Lake lakeshore spawning habitat
- Expand assessment of Threemile Creek to include inventory of completed restoration efforts and assess if these efforts are working
  - Example: results of road closures and erosion control efforts on current sedimentation processes
  - Example: riparian thinning, was it completed?
- Is a watershed beaver management plan needed?