INDIAN RIVER WATERSHED COLLABORATIVE MANAGEMENT STRATEGY

A Blueprint for Sustainable Management of Indian River, Sitka Alaska

By: Steve Paustian (Sitka Hydro Science) and

Jennifer Hamblen (Project Coordinator, Sitka Tribe of Alaska)

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Contributors:

Neil Stichert, US Fish and Wildlife Service

Aaron Prussian, US Forest Service SRD

Andrew Thoms, Sitka Conservation Society

Tory O'Connell, Sitka Sound Science Center

Angie Bowers, Sitka Sound Science Center

Shilo Williams, City & Borough of Sitka, Environmental Superintendent

Chris Sergeant, National Park Service RO

Brinnen Carter, Sitka National Historical Park

Jennifer Cross, Alaska Raptor Center

Dave Griffin, Alaska Mental Health Trust

Cliff Richter, Baranof Island Housing Authority

Troy Tydingco, Alaska Department of Fish and Game

Matt Goff, Naturalist

Kitty LaBounty, University of Alaska Southeast

Eric Coonradt, Alaska Department of Fish and Game

Linda Speerstra, US Army Corps of Engineers

Megan Bosak, City & Borough of Sitka, Planner

Katherine Prussian, US Forest Service SO

Marlene Campbell, City of Sitka, Coastal Management Coordinator (retired)

Scott Wagner, Northern Southeast Regional Aquaculture Association

Mark Buggins, City & Borough of Sitka (retired)

Roger Schmidt, Sitka Fine Arts Camp

Allison Gillium, Southeast Alaska Land Trust

Chohla Moll, Mt Edgecumbe High School

Scott Gende, National Park Service RO

Greg Albrecht, Alaska Department of Fish and Game

Chad Holtz, National Park Service RO

Heather Bauscher, Sitka Conservation Society

Callie Simmons, Sitka Sound Science Center & National Park Service

Leigh Engel, Sitka Tribe of Alaska

Tommy Sheridan, Silver Bay Seafoods

Ben Adams, Northern Southeast Regional Aquaculture Association

Helen Dangel, Sitka Tribe of Alaska

Bill Foster, Community Member

Caitlin Purdome, Outreach Intern for US Forest Service & Sitka Conservation Society

Marty Becker, US Forest Service SRD

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ABBREVIATIONS

Alaska Department of Fish and Game ..... ADF&G

Alaska Department of Natural Resources ..... ADNR

Baranof Island Housing Authority ..... BIHA

City and Borough of Sitka .....CBS

Sheldon Jackson Hatchery.....SJH

Sitka Sound Science Center .....SSSC

Sitka Tribe of Alaska.....STA

Sitka National Historical Park ..... SNHP

National Park Service ..... NPS

United States Fish and Wildlife Service ..... FWS

United States Forest Service ..... USFS

United States Geological Survey ..... USGS

Best Management Practices (water quality) ..... BMP's

Cubic feet per second (streamflow rate) ..... cfs

Million gallons per day (water use rate) .....mgpd

OVERVIEW OF WORKING GROUP PROCESSS

The Indian River watershed is an important asset with significant economic, ecological and cultural value to the community of Sitka, Alaska. The Indian River Working Group was formed to improve communication and cooperation between different agencies, nonprofit organizations, businesses, and community members with interests in the watershed. In addition to their participation as stakeholders, members also have voiced personal and organizational interest to ensure that Indian River is managed to maintain or improve watershed values. These values include trail systems, fishing and hunting opportunities, and the ability of Sitkans to explore intact old growth forest just out Sitka's back door. Primary goals informing the working group effort are:

1. Bring together stakeholders to develop a feasible watershed management strategy.
2. Provide a unique opportunity for collaboration and effective communication between stakeholders in the Indian River watershed.
3. Engage Sitka Tribe of Alaska (STA) to facilitate group discussions, manage data, develop partnerships and gain insights into watershed management techniques shared by other experienced natural resource managers serving in the working group.
4. Develop a prioritized list of action items to improve watershed stewardship and accomplish restoration objectives.

This effort has also been informed by the City and Borough of Sitka's (CBS) Indian River Corridor and Watershed Master Plan (Summit 2004). Several of the goals outlined by the master plan have been carried forward into this document.

WATERSHED MORPHOLOGY AND HYDROLOGY

WATERSHED CHARACTERISTICS:

Indian River drains a 12.3 square mile (7,900 acre) basin with an elevation range from sea level to 3,700 ft (fig 1). This typical coastal temperate rain forest watershed setting sees an average annual precipitation of around 90 inches per year near sea level. North Pacific storms bring large rainfall events in fall and winter months (average October rainfall is 13 in). In this cool maritime climate, average air temperatures range from 34 to 55 degrees at sea level. Substantial winter snowpack accumulates at higher elevations in most years and is a major contributor to stream runoff in late spring and early summer.

Indian River is situated in a glacially sculpted U-shaped valley (fig 1). The broad valley bottom is characterized by extensive bogs (muskegs) and large stands of old growth riparian forests adjacent to main stem river and tributary streams. Most of the watershed is covered by dense hemlock-spruce conifer forest on steep valley slopes. The slopes are heavily dissected by deep ravines cut by headwater tributary channels. Dominant natural disturbances are snow avalanches and small-scale landslides. These events are sources of sediment and organic debris to tributary drainages that are eventually incorporated into the main stem floodplain sediment supply. Watershed landscapes above 2,000 ft are composed of alpine bog, brush fields and exposed bedrock.

References: Neal 2004, Summit 2004

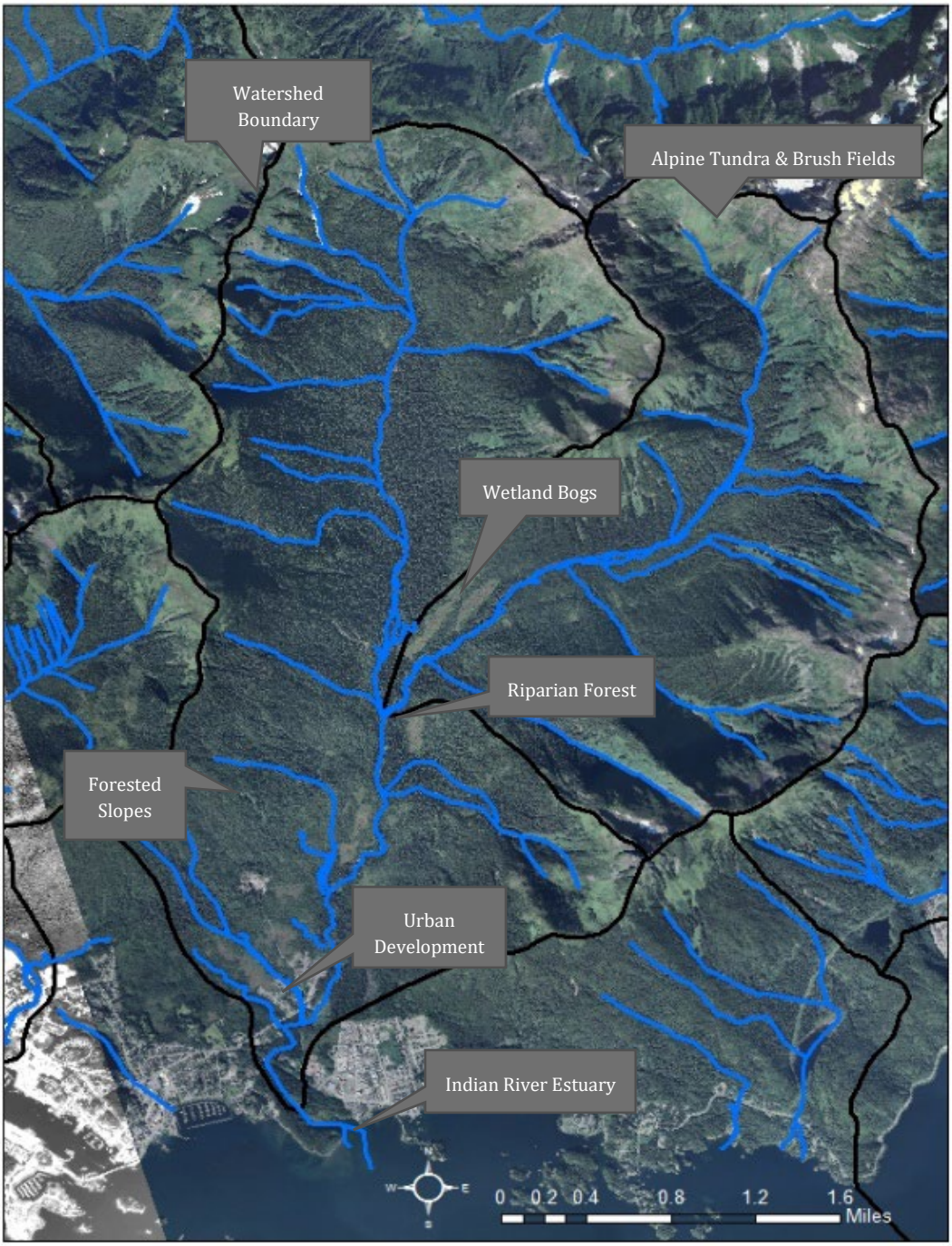

Figure 1 Indian River Watershed Overview

HYDROLOGY:

Indian River streamflow exhibits strong seasonal patterns. Peak flow and flood events occur between August and December. Higher than average streamflow that occurs between May and June is associated with runoff from winter snow pack. Flood events tend to be flashy, with a quick rise in stage followed by a quick decrease in stage once rainfall subsides. Floods typically last less than 24 hours due to steep terrain and shallow soils covering most of the basin. The maximum instantaneous stream discharge during the period of stream gauge record is 6,500cfs, recorded in November of 1993, which would correspond to a river stage increase of about 7 ft measured at the stream gauge site. Low flow events, with an average discharge of 19 cfs, occur both during the summer and winter. The lowest recorded flow at the lower gauge site below the Sitka Sound Science Center Sheldon Jackson Hatchery (SJH) diversion was 5 cfs in March of 2014. Average annual runoff for the basin is 123 inches.

References: Neal 2004, Summit 2004, Paustian 1995

PROPERTY OWNERSHIP AND LAND USE DESIGNATIONS

There are multiple property ownerships in the lower portion of Indian River Watershed (as shown in Figure 2). The City of Sitka (CBS) owns 160 acres of land along the riparian corridor above Sawmill Creek Road. The Alaska Raptor Center owns 30 acres of land on both sides of the river from Sawmill Creek Road to the SJH diversion dam. Both parcels are reserved to preserve water resource and aquatic habitat and to protect water supply infrastructure. Sitka National Historical Park (SNHP) owns a 63-acre reserve at the mouth of the river that is managed to protect cultural sites, visitor interpretation, and aquatic resource protection. Municipal properties include Indian River Road and the associated subdivisions that occupy about 40 acres along the west side of the river corridor above Sawmill Creek Road. There is another 267-acre private (Baranof Island Housing Authority, BIHA) parcel on wetlands located Northwest of the existing housing developments.

The remaining lands in the upper watershed are now all under State of Alaska and US Forest Service (USFS) ownership (fig 2). A 1400-acre state land parcel in the upper river valley was reserved to maintain public recreation access and to protect watershed values. The remaining headwater areas of the Indian River watershed are managed by the US Forest Service as a municipal water supply reserve. Management activities are limited to watershed, fish and wildlife habitat improvements, and dispersed recreation uses that will not impact water quality and stream flow regime. A 375-acre parcel of State of Alaska Department of Natural Resources Mental Health Trust land, that bounds private and CBS land to the South, is in the process of being transferred to the US Forest Service (fig 2). This land will be incorporated into the US Forest Service and State of Alaska municipal watershed reserves.

Reference: Summit, 2004

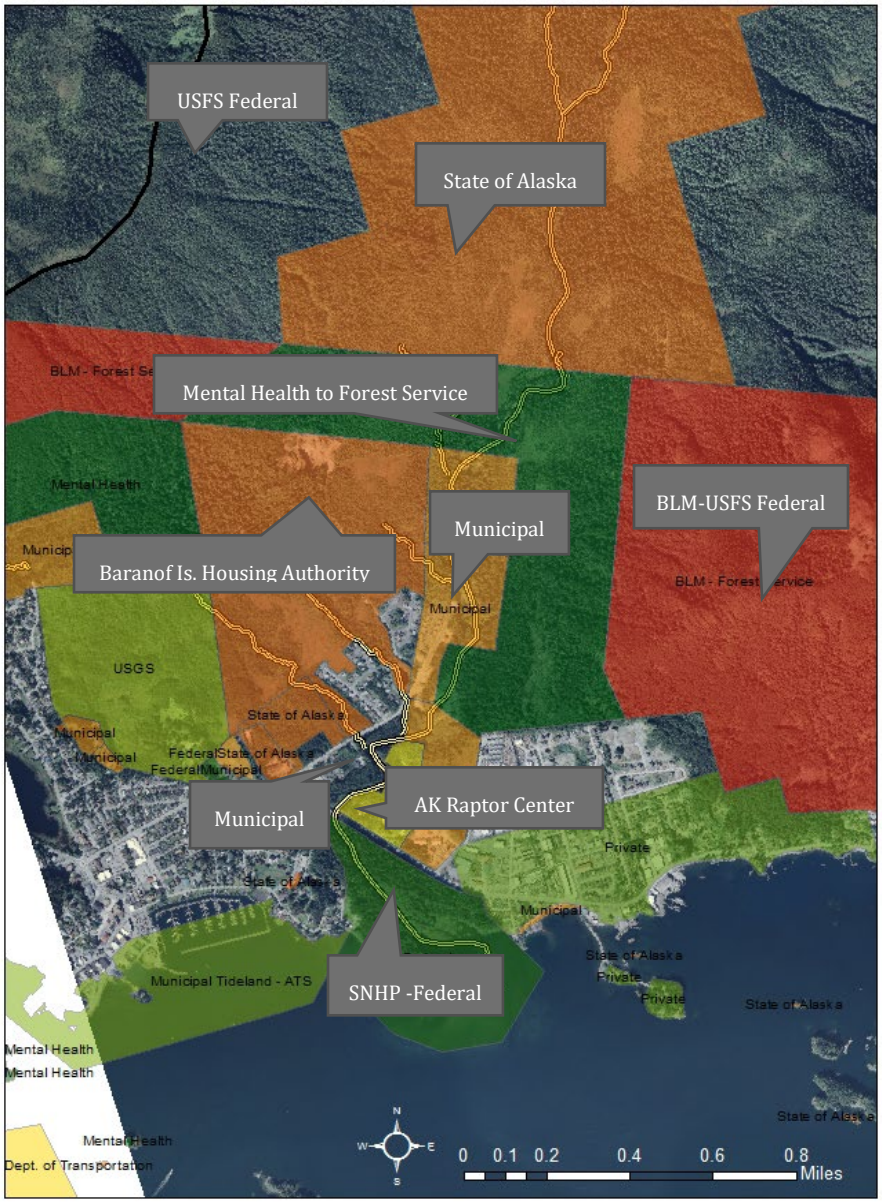

Figure 2 Indian River Ownerships

WATER BODY CONDITION

RIVER INFRASTRUCTURE:

Within the lower two miles of Indian River, several hydraulic structures in the river and floodplain affect natural processes and aquatic ecosystems to varying degrees (fig 4). The National Park Service (NPS) constructed a 500 ft. rock channel revetment along the west bank of the estuary to protect the historic Tlingit fort site within Sitka National Historic Park (SNHP, fig 3). The NPS recently rebuilt a concrete pier pedestrian footbridge use by visitors for trail access and wildlife viewing (fig 3). The main highway bridge crossing for Sawmill Creek Road is located at the northern boundary of the park. Just upstream from the bridge, NPS in cooperation with the US Geological Survey (USGS) maintains a stream gauging and water quality monitoring station (figs 4-5). At river mile 0.8, the SJH rubble dam diverts river water to a pipeline and open flume through the Sitka Fine Arts Campus (formerly Sheldon Jackson College) to the Sitka Sound Science Center (SSSC) SJH facility a Crescent Harbor (fig 4). An abandoned log stringer bridge at mile 1.0 has collapsed into the channel (fig 4). Two tributary streams enter the main stem channel adjacent to the Indian River BIHA subdivision. These streams are connected to storm water drainage and water detention structures within the developments. These channels along with a constructed pond (Kaelke pond) provide important salmonid rearing habitat. The last developed site is the City of Sitka (CBS) municipal water supply and treatment facility at river mile 1.4 (fig 4). This is a secondary or backup water supply for the CBS and is not currently in operation.

Reference: Summit 2004

Figure 3 SNHP Pedestrian Bridge (left); Fort Site rock rip-rap (right)

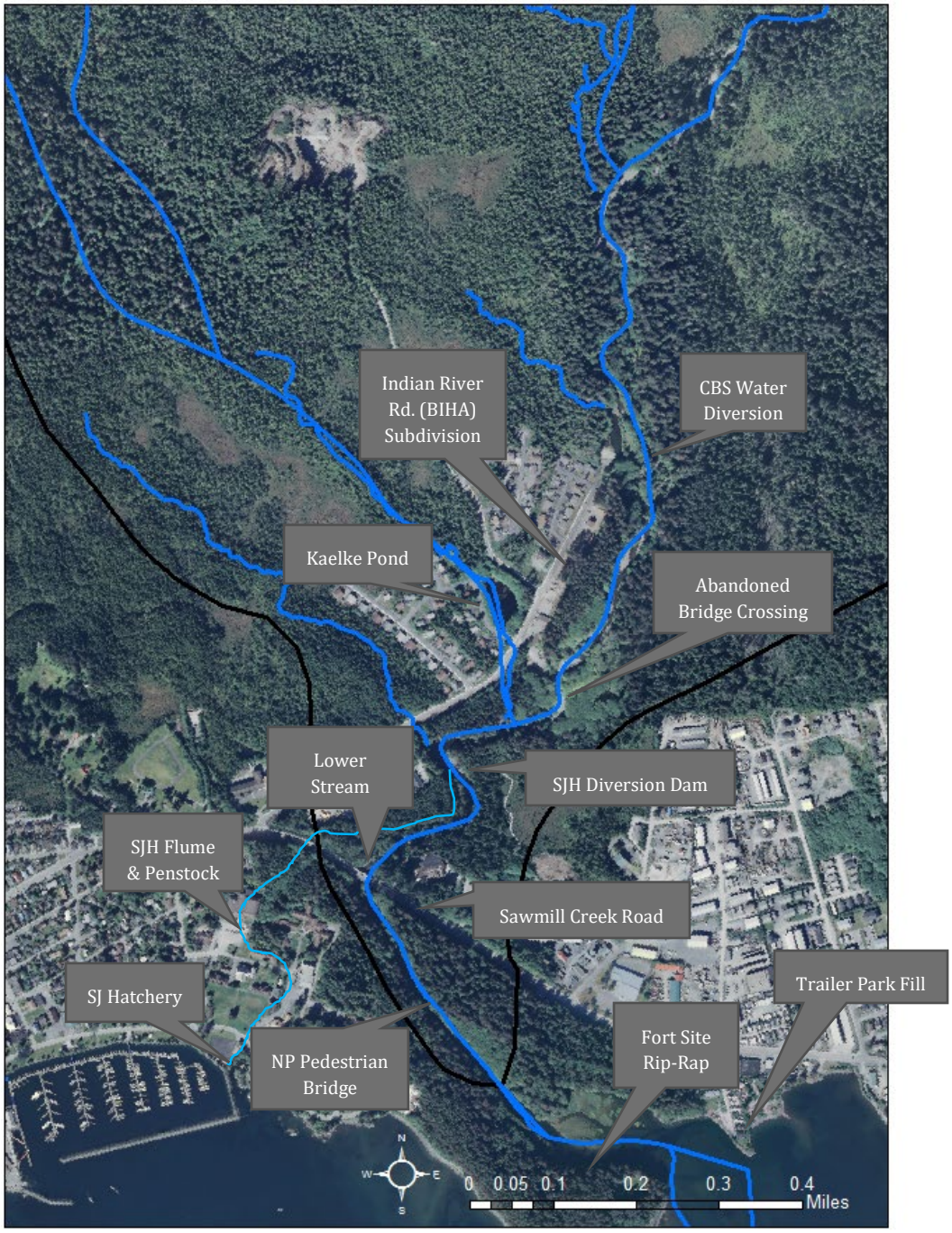

Figure 4 Key features, lower Indian River

WATER QUALITY

The NPS initiated several water quality monitoring studies focusing on conditions in lower Indian River, which date back to 1995. Results consistently show little variability between the lower river and undeveloped upstream reaches. Samples of macro invertebrate benthic fauna communities taken in 1995 and 2001 in both upstream and downstream reaches had diverse taxa, indicative of good to excellent water quality (Paustian 1995 and Neal 2004). The 2001-2002 USGS study looked at a full array of chemical parameters (pH, alkalinity, suspended sediment, total dissolved solids, dissolved oxygen) that were all in compliance with State Water Quality Standards (Neal 2004). Trace elements including arsenic, chromium, copper, nickel and zinc were found in bed sediments but at levels below toxicity thresholds. Concentrations of nitrogen and phosphorus compounds were very low which is typical for undisturbed watersheds in this region. The biggest water quality risk to Indian River is associated with non-point source pollution from urban development. Storm water runoff from roads and subdivisions can introduce chemical residues, petroleum products, heavy metals, sediment and bacteria to natural drainageways. A storm water protection plan and BMP mitigation measures for non-point source pollution have been implemented for the Indian River developments as recommended in the Indian River Master Plan (Summit 2004 and Tetra Tech 2013).

Figure 5. Stream Gauge and Water Quality Monitoring Site near Sawmill Creek Bridge.

NPS maintains water quality instrumentation at the Indian River gauge site for continuous monitoring of temperature, dissolved oxygen, pH and specific conductivity (fig 5). Measurements show rare instances of low dissolved oxygen that are potentially harmful to aquatic organisms. This phenomenon has occurred naturally in Southeast Alaska watersheds in conjunction with warm water temperature, low stream flow and large numbers of spawning adult salmon (Sergeant 2014). An

extended period of dissolved oxygen depletion (below the standard of 5mg/l) from late August to early September of 2013 resulted in pre-spawning adult salmon mortality in lower Indian River. Dissolved oxygen levels as low as 1.7 mg/l were measured during this event.

References: Neal 2004, Sergeant 2014, Paustian 1995, Summit 2004, Tetra Tech 2013

WATER QUANTITY: WATER RIGHTS AND WATER WITHDRAWALS

Four Indian River Working Group members have designated water rights (by the Alaska Department of Natural Resources, ADNR) in the river. CBS holds the oldest (1914) priority water right of 4 cubic feet per second (cfs) to withdraw water for its municipal water supply. CBS also applied for an additional 5.4 cfs to meet additional water demands of the current population. Sheldon Jackson College had a 1934 water right of 30 cfs that was transferred to the SSSC for operation of SJH. The original water right was designated for hydropower generation and hatchery operations (fig 6). The hydropower facility was decommissioned in 1988 therefore, SJH generally uses less than the current 30 cfs allocation.

Figure 6. SJH flume and water supply pipeline near the Sitka Fine Arts Campus

The Alaska Dept of Fish and Game (ADF&G) holds a 1989 water reservation for instream flow in Indian River that varies seasonally from 35 cfs to 101 cfs. By State law this junior reservation does not constrain water rights held by CBS and SSSC. NPS claims an unquantified Federal Reserved water

right with a priority date of 1890 to maintain fish habitat, historical interpretation and recreation uses in SNHP.

Stream flow in Indian River is insufficient during periods of low flow to accommodate the full amount of water withdrawal allocated to users (Summit 2004). The USGS study in 2001 found that ADF&G's desired instream flow quantities were not achieved for a total of 236 days (Neal 2004). Reduced flows below the amount of the ADF&G flow reservation were attributed to withdrawals at the SJH diversion for 140 days. Natural low flow conditions in the river were attributed to the additional 96 days where desired instream flow levels were not attained. The graph in Figure 7 compares mean monthly flow (20 yr. period of record) for the upper gauge site (located above all water diversions) to average water demand of all designated water users including instream flow for fisheries. Note that water withdrawal and instream flow requirements in July and August are nearly equal to the average monthly flow for these months. This example assumes that CBS withdraws 7 cfs for domestic water supplies. However, CBS water withdrawals would likely occur only in an emergency for a limited time.

The USGS calculates that daily mean flow in Indian River is less than 50 cfs for 40% of the time. Therefore, water user demand will exceed available water during periods of lower than average stream flow. The lowest measured stream flow for Indian River was 5 cfs at the Sawmill Creek gauge which is located below upstream diversions.

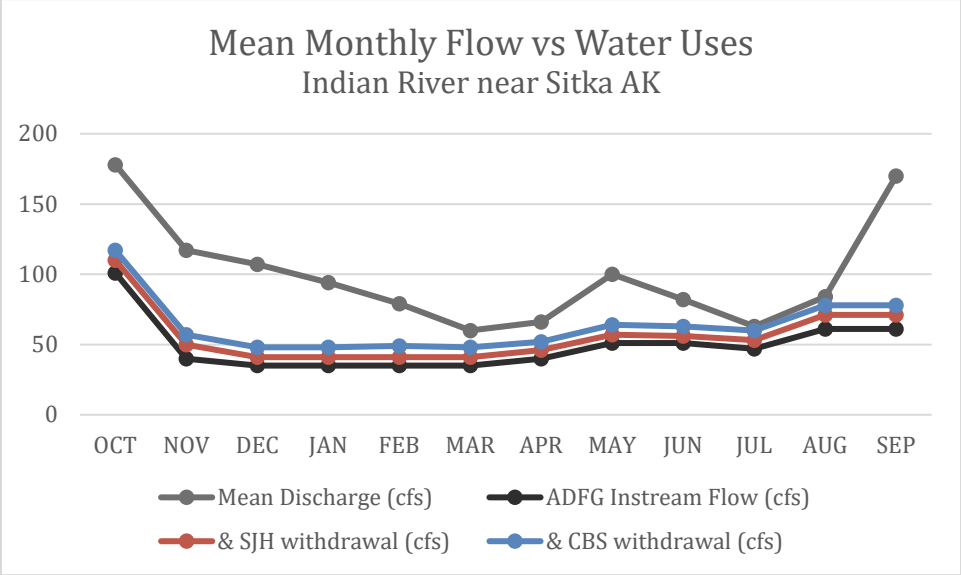

Figure 7 Cumulative water use projections compared to mean monthly flow at upper Indian River gauge.

The Indian River Master Plan recognized that Indian River stream flows may not fully satisfy water demands for all beneficial uses. A formal water rights adjudication process to address potential water deficits has not yet been initiated for Indian River. In the interim, the plan recommended that stakeholders "devise a long-range water management plan that will maintain balance among all beneficial users of Indian River" (Summit 2004).

References: Summit 2004, Neal 2004

STREAM CHANNEL CONDITION

Development activities dating back to the early 1900s along the lower Indian River corridor have resulted in substantial changes to channel morphology and fluvial processes. Some of the biggest impacts have been associated with gravel borrow activities in the river estuary beginning in 1940 and continuing to 1978 (Paustian 1995). Destabilization of the estuary channel network triggered accelerated bank erosion across the inter-tidal zone. Log-crib bank protection revetments constructed by the US Navy in 1945 were ineffective. Boulder rip-rap stream bank protection was placed by NPS in 1961 along a 100 m section the west river bank and was followed by a major rip-rap rock structure extending 300m downstream to the 1804 Fort site (fig 3). Consistent with NPS's legislated mandate and General Management Plan, SNHP managers will continue to maintain these bank protection structures for preservation of cultural resources associated with the fort and battlefield site. An unauthorized rock fill pad was constructed along the east bank of the estuary for a trailer park development in 1978 (fig 4). NPS is concerned about ongoing effects of the trailer park fill on estuary circulation and sediment deposition processes. However, the overall estuary channel configuration has remained relatively stable over the last 20 years.

Figure 8. Evidence of recent stream bank erosion and channel entrenchment along the SNHP reach.

The SNHP pedestrian bridge intersects the primary pink salmon spawning beds in lower Indian River (fig 3). Monitoring results comparing channel cross-section, longitudinal gradient and bed substrate size distribution in 1995 and 2017 show only minor changes in channel condition. Localized bank erosion associated with foot trafficking was observed immediate downstream of the bridge on the east bank.

The channel segment from 100 m above the pedestrian bridge to the Sawmill Creek Road show signs of vertical instability and accelerated erosion along the east bank (fig 8). This area was not included in the 1995 river morphology study therefore, the rate of change in this reach is difficult to quantify. Numerous bedrock outcrops along the opposite (west) bank of this reach maintain a very stable streambank configuration. The east streambank is composed of easily eroded gravel and sand. Significant bank sluffing is evident along the entire reach (fig 8). Channel downcutting in this reach recently exposed remnants of a historic bridge pilings (fig 8). The specific cause of channel instability is unknown; however, a high frequency of large flood events 2014-2017 and disruptions to normal bedload sediment transport at upstream impoundments are the most likely causative factors.

Various dam and water intake installations for SJH have been in place since 1934. The current structure consists of a boulder-rubble dam, aluminum fish pass and a concrete water intake gallery feeding a 42" diameter metal pipeline flowing into the hatchery flume and raceway, and a 12" diameter pipe that serves as the hatchery freshwater supply (figs 6, 9). Large volumes of sediment are trapped behind the diversion dam and must be periodically dredged to maintain the functionality of the water intake and fish ladder. Stream bed aggradation above the dam also increases the risk of the river being diverted around the structure during a large flood event (fig 9). The 2004 Indian

Figure 9 SJH diversion structure, fish pass and rubble dam at base flow (left) and flood flow (right)

River Master Plan recommended periodic dredging of sediment to maintain the integrity of diversion structures or alternatively installing weir structure that would allow bedload sediment to be flushed from the impoundment during higher flow events.

Similar problems of sediment aggradation and channel braiding were noted further upstream at an abandoned bridge crossing adjacent to the Indian River subdivision. Log stringers from the bridge have collapsed into the river diverting flow and trapping sediment (fig 10). This situation may reduce flood flow conveyance and potentially increase the flooding risk in the nearby residential development. The quality of fish habitat in this reach is also reduced by this structure.

Figure 10 Remnants of abandoned log stringer bridge adjacent to the Indian River Subdivision

Maintenance of the CBS secondary water diversion facilities is also impacted by dynamic flow and sediment transport characteristics in Indian River. The diversion and infiltration gallery are operated only as an emergency backup water supply for the City. There are two main channel braids in the diversion reach. A large portion of the normal flow is directed toward the left channel bypassing the right channel braid where the water intake structure is located (Summit 2004). In-channel excavation work and modification of the diversion dam is required each time the system is brought on-line. The Indian River Master Plan recommended pursuing channel restoration and reconstruction of the water intake diversion dam with an estimated cost between $300,000 and $400,000.

References: Summit 2004, Paustian 1995

AQUATIC HEALTH:

An abundance of healthy aquatic habitat is relatively rare in most urban watersheds. Robust anadromous and resident fish populations in Indian River are important resources for community members and visitors to Sitka. Easy access for viewing large numbers of spawning salmon is a major draw for visitors to SNHP in the late summer and early fall. The Indian River watershed is also an important contributor to commercial and recreational fisheries.

As noted above, good water quality and healthy benthic fauna communities are important factors in maintaining healthy fish populations. Primary anadromous fish species utilizing Indian River include pink, coho and chum salmon, steelhead trout and sea-run Dolly Varden char. A few king salmon (likely strays) have also been observed. Predominant resident fish species are Dolly Varden and rainbow trout.

Fish habitat conditions in main stem Indian River are well document by surveys in 1995 and 2003 (Paustian 1995 and Summit 2004). The low gradient estuarine and floodplain reach from the stream mouth to Sawmill Creek road (fig 4) provides good spawning habitat for pink salmon. Habitat is characterized by a predominance of riffles and a few deep pools associated with bedrock outcrops. There are relatively low amounts of large wood structure and streambank features that provide

cover habitat for juvenile salmonids. A narrow bedrock gorge extends upstream from Sawmill Creek Road to just below the SJH impoundment. This moderate gradient contained reach is characterized by steep riffle and cascade habitat units that have limited value as spawning or rearing fish habitat. A short (200m) channel segment above the hatchery impoundment (fig 4) is predominantly shallow glide and low gradient riffle habitat also with limited value for spawning. A long (600m) floodplain reach, adjacent to the Indian River subdivision, is characterized by low gradient, braided channels and extensive red alder riparian forest. Riffle and glide categories comprise 80% of the habitat units in this reach. This river reach contains little habitat diversity due to the lack of large wood and pool habitat, however this reach contains a significant amount of suitable spawning gravel. The floodplain reach that begins below the CBS water intake (fig 4) extending for 1.5 miles upstream, exhibits habitat conditions typical of very productive, undisturbed watersheds in southeast Alaska (Summit 2004). Riparian vegetation is dominated by large spruce-hemlock conifer forest. Large wood habitat is twice as abundant as in downstream reaches. The distribution of riffle vs pool habitat 56% and 36% is also favorable. Overall this reach provides the most diverse and highest quality salmon habitat in the river.

SJH is an important component of Indian River fish production. The hatchery currently produces pink (2.7 million), chum (2.7 million) and coho (200,000) salmon fry for common property fisheries (estimated annual value is $1.5 million). When pink salmon escapement counts began in the 1960's and early 1970's a few hundred fish returned to the river to spawn. Pink escapement counts jumped to 17,500 fish in 1977 two years after SJH operation began. After a fish pass was constructed at the diversion dam in the 1980's, significantly more river spawning habitat became accessible. In 2005, a record number (376,000) of pink salmon returned to spawn in Indian River. Several thousand pink salmon return to Indian River annually, with the exception of a period between 1987 and 1993. Increased productivity is likely attributable to both natural conditions and hatchery production. Coho salmon escapement to Indian River is relatively low, ranging between 30 to 600 fish annually. Chum salmon escapement numbers are also modest, typically range between 125 and 2,200 fish (Stopha 2015).

ADF&G manages wild salmon from Indian River and fish produced by SJH as a single stock. Fish returning to spawn in the river and SJH raceway have comingled for a period of 40 years due to the shared water source. Returning fish may home in on either river water piped to the hatchery raceway or to water flowing into the Indian River estuary. ADF&G and NPS biologists conducted independent studies to estimate the number of hatchery produced pink and coho salmon homing to Indian River spawning beds. Estimates of the percentage of hatchery pinks that spawned in the river between 2012 and 2015 ranged between 5% and 33 %. Hatchery salmon were found to represent a higher proportion of river coho spawners--47% and 63%-- based on samples taken in 2014 and 2015 (Medley 2012, Stopha 2015, Gende 2017).

References: Summit 2004, Paustian 1995, Gende 2017, Stopha 2015, Medley 2012

STAKEHOLDER CONCERNS AND MANAGEMENT OBJECTIVES

WORKING GROUP ISSUES AND CONCERNS

Over the course of the past year, the working group participants were engaged in wide ranging discussions of current watershed management issues and concerns that are summarized below. An outgrowth of these discussions was a list of specific management objectives that the group felt would improve ecological sustainability and maintain beneficial resource uses in the Indian River Watershed.

Key stakeholder issues include:

- The Sheldon Jackson Hatchery -Sitka Sound Science Center is concerned about the current state of the hatchery diversion structure. The diversion design requires frequent and sometimes costly repairs after flood events. The associated fish pass structure also needs frequent maintenance. The hatchery requires consistence flows for hatchery operations including higher water demand during salmon spawning season. Maintenance of the flume and penstock drainageway through the Sitka Fine Arts Campus is also integral to the hatchery operation.
- Baranof Island Housing Authority maintains substantial residential holdings adjacent to the Indian River floodplain. Sediment deposition and channel braiding in the river associated with an abandoned logging road bridge structure and the hatchery diversion impoundment could negatively affect flood flow conveyance in this river reach.
- Sitka National Historical Park and other stakeholders are concerned about retaining ecological function and integrity of the Indian River corridor. However, SNHP will apply measures such as stream bank revetments and woody debris removal if necessary to protect the 1804 Fort Site from river erosion and the Pedestrian Bridge from flood borne debris accumulations. SNHP also continues to be concerned about ecological impacts associated with unauthorized rock fill that was placed along the eastern edge of the Indian River estuary.
- The City of Sitka is concerned about retaining Indian River as a secondary municipal water supply for the community. Costly upgrades to the city water intake infrastructure and construction of a water filtration-chlorination plant would be needed to be fully in compliance with current drinking water regulations.
- Various stakeholders are concerned about meeting water needs for current beneficial water uses of Indian River; these include: backup municipal water supply for Sitka, sufficient water for SJH operations, and instream flows for sustaining salmon and other aquatic species.
- Sitka Fine Arts Camp is concerned about the integrity of the historic hatchery flume and underground penstock. Seepage from the flume ditch and underground wood stave penstock affect foundations of campus structures.
- The National Park, Alaska Department of Fish and Game, and Sheldon Jackson Hatchery are concerned that large hatchery returns may home in on the river, resulting in over-escapement of pink salmon to Indian River spawning beds. This may negatively affect natural reproduction of fish in the river system and reduce the number of salmon available to harvest for hatchery cost recovery.

- Various stakeholders are concerned with maintaining access to recreational hiking, fishing, visitor interpretation, and subsistence gathering opportunities along the river corridor. Maintenance and improvements to the Sitka National Historic Park and Indian River trail systems, managed by the US Forest Service, are core elements of their concerns.

MANAGEMENT OBJECTIVES

The following list of management objectives were brought forward to the working group for consideration. A total of 5 objectives (italicized in bold) were selected as consensus priorities to be addressed in the initial implementation phase of this strategy. Action items have been developed for each priority objective in the last section of this report. Several of these objectives align closely with recommendations contained in the 2004 Master Plan. As our strategy is implemented, the working group anticipates revisiting the broader list of objectives and developing additional action items in the future. Note that objectives are not listed by priority.

1. ***Develop plans for Sheldon Jackson Hatchery diversion and fish passage improvements that address concerns associated with flood conveyance, bedload sediment routing, upstream fish migration and maintaining adequate water supply for hatchery operations.***
2. ***Maintain and improve salmon and aquatic habitat in lower Indian River by addressing concerns associated with water quality (non-point source pollution), stream channel stability, and aquatic habitat complexity.***
3. ***Maintain the status of Indian River as a Municipal Watershed and as a secondary water supply for the City of Sitka.***
4. ***Develop a cooperative water management plan that will help meet the water supply needs of all beneficial water uses by defining viable contingencies for dealing with periods of low water flow in the river.***
5. ***Fill data gaps and monitoring needs associated with priority objectives and action items listed above.***
6. Maintain and improve storm water Best Management Practices and storm drainage structures in the Indian River housing development.
7. Remove or reposition debris from the abandoned log stringer bridge (at river mile 1.0) to improve channel stability, flood water conveyance and fish habitat conditions.
8. Assess the integrity and maintenance needs of the Sheldon Jackson Hatchery flume and penstock structures located on the Sitka Fine Arts Campus.
9. Facilitate user access to the river corridor by maintaining and improving trails on public lands. Assure that maintenance of the existing trail network and new trail construction incorporates water quality Best Management Practices. Consider advantages and disadvantages of linking the Sheldon Jackson Hatchery flume trail to the National Park Service and US Forest Service trail networks.
10. Facilitate communication between the Alaska Department of Fish and Game, National Park Service and Sitka Sound Science Center regarding management of anadromous fish populations in lower Indian River.
11. Monitor long-term risk to watershed health from potential future development activities and potential impacts related to climate change.

The following list of actions items will be updated at least annually. Timing for addressing new objectives in the strategy document will be dictated by public interest and funding opportunities. For example, SNHP is developing a trail plan in FFY 2019-2020; therefore, the issue of trail

improvements within the Indian River corridor will likely be addressed in the NPS trail planning effort.

STRATEGY ACTION ITEMS

HATCHERY DIVERSION IMPROVEMENTS

There is broad support within the working group for a proposal to complete additional topographic survey, conduct a hydraulic analysis and geomorphic assessment, and develop a suite of conceptual designs for the SJH diversion reach of Indian River. After completion of this assessment and conceptual design, the working group will host a stakeholder workshop to evaluate design constraints, risks and opportunities. Design criteria and objectives for this assessment may include: cost, low maintenance, improved upstream fish passage, sediment transport and fate of deposition, water rights and flow management, and channel avulsion (the rapid abandonment of a river channel and formation of a new river channel during a flood) and dam failure risk from large flood events. Outcomes for the conceptual design and subsequent workshop will be selection of the best design and development of specifications for the final design phase.

The US Fish and Wildlife Service Fish Passage Program secured fiscal year 2018 funding to partner with SSSC through a cooperative agreement to hire qualified design consultants to conduct the assessment and conceptual design and facilitate the design workshop. Sitka Tribe of Alaska applied for a 2018-2019 National Forest Foundation Community Capacity grant for continuation of the working group collaborative process and to collect additional field data needed to refine design criteria and specifications for the hatchery diversion structure. Once the final design is completed, working group members will seek state and federal grant funding for project implementation (in 2020 or beyond).

PROTECT AND IMPROVE SALMON HABITAT IN LOWER INDIAN RIVER

The working group acknowledges the importance of retaining ecological functions in the Sitka National Historical Park reach of Indian River, while at the same time facilitating visitor access and enjoyment of the natural riparian environment and important cultural sites along the river corridor. Under recently revised SNHP management guidelines, large wood naturally recruited to the channel will be left in place to enhance aquatic habitat diversity. Some larger trees (greater the 70' long and 18" diameter) that enter the channel upstream of the pedestrian bridge may be anchored in place or partially removed. This approach would be used to reduce the risk of large trees transported downstream during floods causing structural damage to the pedestrian bridge. Trees that enter the channel downstream from the pedestrian bridge will not be removed or cut in the future. In addition, future dredge and fill activity in the Indian River estuary will be prohibited except for necessary repairs to the 1804 Fort Site bank revetment.

In 2017, STA and local high school students remeasured 1995 era channel morphology transects in the Indian River estuarine channel segment. This information provided important insights into river geomorphic processes and fish habitat conditions over time. In 2018, STA expanded the survey to incorporate a channel segment between the Park pedestrian bridge and the Sawmill Creek bridge crossing. These additional monitoring sites will provide useful information on rates of channel entrenchment and accelerated stream bank erosion that are significant concerns in this portion of

the river. Periodic remeasurements of key channel morphologic parameters will be needed to evaluate changes in streambed substrate, as well as fish spawning and rearing habitat condition in this important reach. This monitoring will also provide a benchmark for determining if proposed improvements to upstream diversion structures are effective in restoring natural sediment transport processes in the lower river (refer to information needs discussion below).

MAINTAIN AND PROTECT MUNICIPAL WATER SUPPLIES

Indian River is the secondary water supply for the City of and Borough of Sitka. CBS holds a water right of 2.5 million gallons per day (mgpd) or 3.9 cfs. However, current average use by the city is 3 mgpd or 4.6 cfs with a peak demand of 4.5 mgpd or 7 cfs. Recent changes in drinking water regulations require river water to be filtered and meet chlorine contact time before it can be distributed to users. CBS currently uses a rudimentary system in place to pump water into the water distribution system in an emergency. However, a city-wide boil water notice would be required. Under these circumstances, water needs for schools, restaurants, medical providers and seafood processors could not be met and this would result in significant economic impacts to the community. If temporary (and expensive) water treatment of Indian River water was necessary for an extended period (like 2014 during the Blue Lake Dam project) the city would also need to obtain additional water rights through a temporary water-use permit to fully meet domestic water use demand.

The working group recognizes the critical function of Indian River as a backup municipal water supply. The upper portion of the river (above the CBS water intake) should remain undeveloped and remain in protected status as a municipal watershed reserve. When emergency water withdrawals are needed, in-channel structural work is required periodically to maintain consistent flow to the water distribution system. The proposed water management plan (discussed below) should incorporate the potential for short-term emergency water demands for domestic water supply.

DEVELOP A COOPERATIVE WATER MANAGEMENT PLAN

Utilize the working group framework to develop sideboards for a collaborative water management plan for Indian River water rights holders. Key steps for effectively managing water withdrawals from the river include:

1. Review hydrologic data from the watershed to better define the timing of seasonal low flow events.
2. Define seasonal instream flow rates necessary for sustaining critical spawning and rearing habitat.
3. Review baseline water requirements for SJ Hatchery operations. Define additional water quantity and timing requirements to operate the hatchery raceway and provide attractant flow during spawning season.
4. Consider the impact of additional water demand from the CBS city backup domestic water supply. Determine the best timeframe for scheduled CBS water withdrawals that would have the least impact to other beneficial water uses.
5. Convene water rights holders to document a protocol or decision matrix that will guide water withdrawals during periods of critically low stream flow.

FILL INFORMATION NEEDS

The working group acknowledges the importance of good resource data sets to assess aquatic ecosystem health and watershed capacity to sustain beneficial uses. For executing this management plan, key elements of information and monitoring needs include:

1. Continue operation of the USGS stream gauging station (annual cost $25,000). Real time stream discharge data is critical for implementing water withdrawal protocols. Indian River stream flow data is also an extremely important tool for predicting risk of natural disasters caused by floods and major landslides.
2. Channel morphology monitoring within the SNHP reach of Indian River should be conducted at 5- to 10-year increments (estimated cost per cycle $2,000). This information is needed to determine the trajectory of bank erosion, channel downcutting and bed substrate armoring in the reach (fig 12).
3. Collect basic channel morphology data needed to advance the re-design of Sheldon Jackson Hatchery Diversion. Cost for this work is included in the STA 2018- 2019 NFF grant proposal (refer to hatchery diversion action item above).
4. Implement recommendations of the USGS Water Quality Monitoring Strategy (Neal 2007) for Indian River (estimated cost $10,000 per cycle). This information is needed to validate water quality findings from 1995 and 2002 surveys for current conditions in the river. The strategy incorporates 3 new monitoring sites in small tributary streams (fig 11) located near developed areas of the watershed. Water quality monitoring stations would be sampled over a range of streamflow on a 5 to 10 yr. cycle. Monitoring will include a comprehensive suite of physical and chemical parameters in addition to benthic invertebrate water quality indicator taxa.
5. Continue to maintain the Park Service automated water quality instruments at the stream gauging station. This monitoring provides a long-term record for several basic water quality indicators (annual cost $5000).
6. Periodically (5-10 yr. cycle) evaluate changes in fish habitat condition and availability using results from the 1995 and 2003 habitat surveys as benchmarks (cost per cycle $5000).

Figure 11 Proposed water quality monitoring sites Tributary 2 (left) and Tributary 3 (right)

The locations of existing and proposed monitoring sites are shown in Figure 13. To fully implement this action item, working group members will need to marshal additional funding from Federal, State sources and/or Non-Government Organization (NGO) grants.

References: Neal 2007, Paustian 1995, Summit 2004

Figure 12 Channel morphology monitoring station SNHP reach.

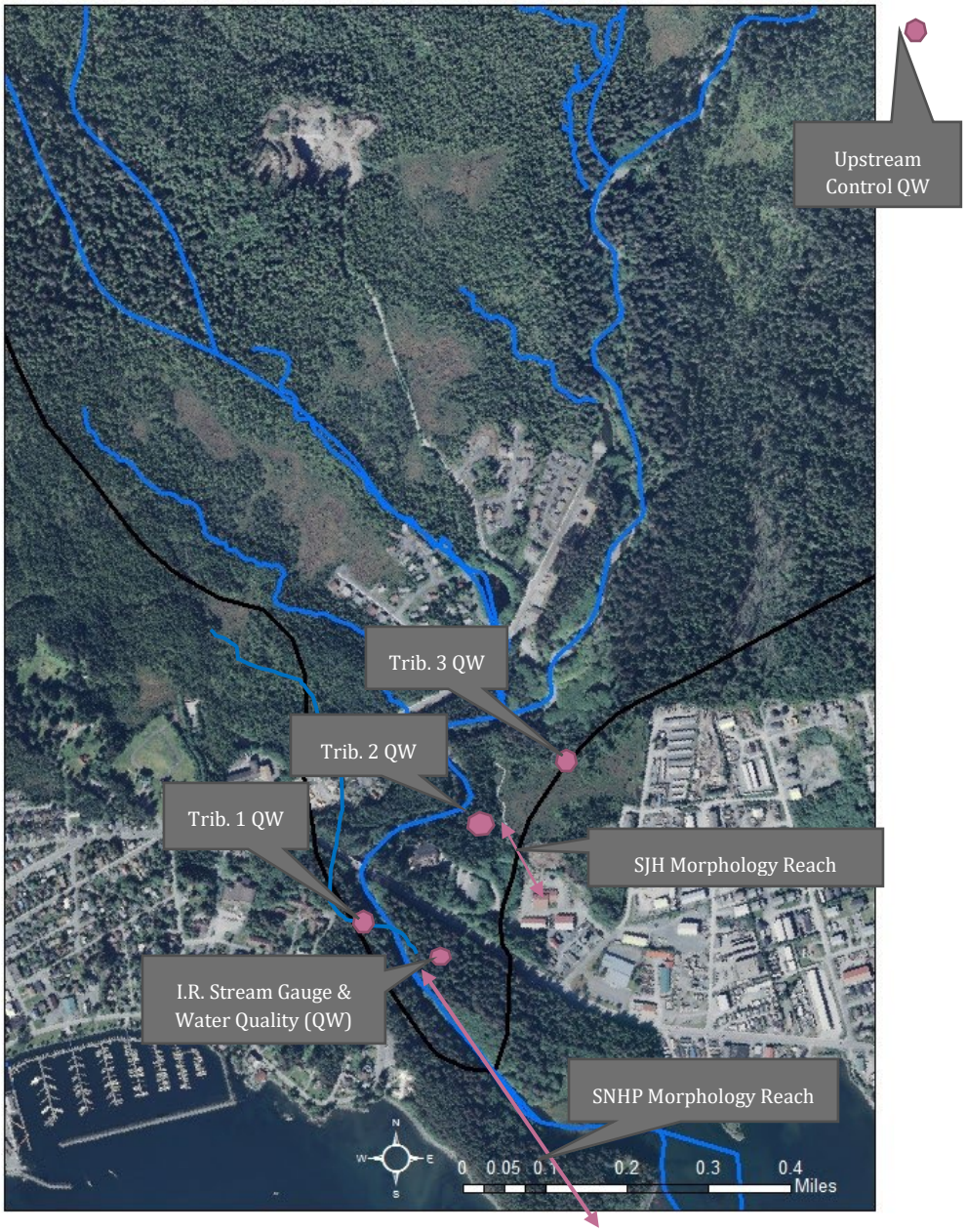

Figure 13 Current & proposed monitoring sites

TASK GROUPS

To assist working group leads with completing the action items, Jennifer Hamblen suggested that the group form task groups. Leigh Engel (STA), facilitator of the working group as of August 2018 (NFF funding pending), will maintain contact and monitor progress with the leads for each task group. The three task groups are:

1. Diversion design workshop planning and funding – this group will be headed up by Angie Bowers (SSSC), fisheggenator@gmail.com, and will consist of Andrew Thoms (SCS), Scott Wagner (NSRAA), Brinnen Carter (SNHP/NPS through spring 2019), Leigh Engel (STA), and Neil Stichert (FWS). Primary duties include setting up the logistics of the design workshop and actively seeking funding opportunities for the next steps of diversion construction, as well as other funding needs, such as water quality monitoring and surveying.

2. Field work – this group will be headed up by Steve Paustian (STA), pausnels@gmail.com, and will consist of KK Prussian (USFS), Chris Sergeant (NPS), Callie Simmons (SSSC/SNHP) and STA and SSSC summer staff. They will assist Steve with performing field work to collect needed survey data for the upcoming design workshop; if time and funding allows, they will assist Steve with water quality monitoring and benthic macroinvertebrate sampling.

3. Local expert advisory group – This group will be headed by Aaron Prussian (USFS), aaronprussian@fs.fed.us, and will consist of KK Prussian (USFS), Shilo Williams (CBS), Chris Sergeant (NPS), Scott Wagner (NSRAA) and(after spring 2019) Brinnen Carter (SNHP/NPS). This group will serve as a voluntary, experienced group of local resource managers and scientists who can assist other stakeholders in the Indian River watershed. The advisory group can advise on questions regarding resource management, riparian area construction and development, fish population management, problems with downed or partially downed trees in sensitive habitat, etc. They advisory group could also potentially help advise on other natural resources within the Sitka area.

PLAN EVOLUTION

The Indian River Collaborative Watershed Management Strategy should be treated as an evolving document. The working group will revisit plan content on an annual basis. The discussion of proposed action items will need to be updated and amended as details of project tasks and costs are refined. As specific action items are completed, the working group will need to consider adding new proposals based on the list of deferred watershed management objectives.

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