

Susitna-Watana Hydro Project

Technical WorkGroup Meeting
Fisheries and Aquatics

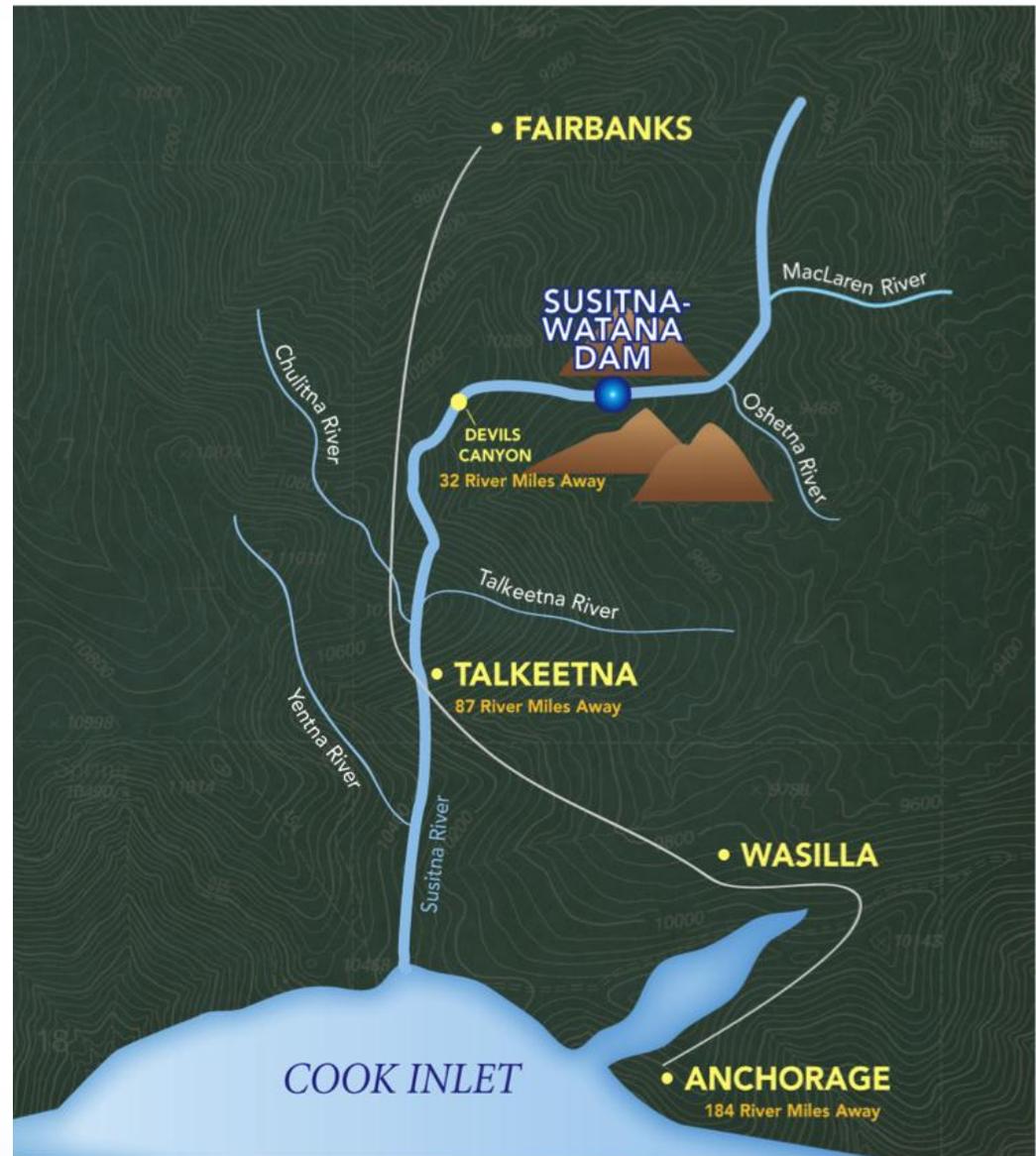
Fish Distribution and Abundance
Interim DRAFT Revised Study Plans

25 October 2012

Prepared by R2 Resource Consultants

Project Location

- Susitna-River, Mile 184
- 87 River Miles from Talkeetna
- 32 River Miles from Devils Canyon
- Remote location



Fish Distribution & Abundance

Participant	Comment	Response
USFWS	<i>A first step is to assess the seasonal distributions of target species and life stages and the physical habitat criteria that influence habitat selection and suitability. As a first step, target species have to be identified, agreed upon, and their life history and habitat use similarities to other, unstudied species (i.e., non-target species) need to be determined and described. In the study requests of the Service and other agencies, we recommended studying the baselines of all affected fish species and life stages, including all five species of anadromous salmon and all resident fish.</i>	<p>AEA will be studying seasonal distribution and life stages of all target species as described in detail in Objective 1 of the Fish Distribution and Abundance Study Plan. Target species lists were presented, discussed and agreed upon in TWG meetings in May. Since that time specific additions have been requested by ADF&G and USFWS and these requests have been added to that study plan. See RSP Section 9.6.</p> <p>In addition, AEA is proposing a habitat based sampling design for Fish Distribution and Abundance. Part of the value in this approach is that all fish species and life stages present at sampling locations will be targeted. Multiple methods will be used at each location to capture all species and life stages present, including all five species of anadromous salmon and resident fishes. See RSP Section 9.6.]</p>
USFWS	<i>Fish distribution data are needed to describe the baseline data to support and compliment other proposed study objectives, including those related to fish habitat selection and utilization. A first step to acquiring adequate fish distribution is to assess the full lateral and longitudinal profile of seasonal fish distribution, life stage periodicity, and suitable used and unused habitats that are influential in fish habitat site selection.</i>	<p>Fish distribution data will be collected as part of Objective 1 of the Fish Distribution and Abundance Study Plan. Data will be collected in representative habitats and across all seasons in the middle and lower river. Data will be collected in the open water period in the upper river.</p> <p>AEA is proposing a habitat based sampling design for Fish Distribution and Abundance. This approach includes seasonal sampling throughout that lateral and longitudinal habitats identified in the Susitna River. Part of the value in this approach is that AEA is not just going where AEA thinks fish will ,or will not, be based on 1980s data, instead AEA is proposing stratified random design to document fish presence. Multiple methods will be used at each location to attempt capture all species and life stages present. With this approach we would expect to document habitat that are and are not used by fish.</p>

Fish Distribution & Abundance

Participant	Comment	Response
USFWS	<p><i>PSP = Collect tissue samples to support the Genetic Baseline Study for Selected Fish Species (Section 7.14); (7.5 upper reach)</i></p> <p>Comment = No mention of analyzing samples; analysis mentioned in Genetic Baseline Study, but link/integration to analyzing samples collected in this study is not discussed. Will samples be analyzed? Explain.</p>	<p>Yes. AEA has included additional detail in the RSP for Fish Genetics that includes descriptions of both laboratory analysis of samples and analysis of genetic structure of Chinook salmon populations. See RSP Section 9.14.</p>
USFWS	<p><i>PSP = Document the timing of downstream movement and catch for fish species via outmigrant traps; (7.5 upper reach)</i></p> <p>Comment = Unclear if the timing of downstream movement and catch for the upper river includes or excludes addressing outmigration and winter sampling</p>	<p>AEA has included additional detail in the Fish Distribution and Abundance for the Upper River RSP regarding the location and timing of outmigrant trapping and winter sampling . See RSP Section 9.5.]</p>
USFWS	<p>The list of habitat types to be sampled in the middle and lower reaches appears longer than habitats proposed for the upper reach</p>	<p>AEA has included additional detail in the RSP to clarify that the lists of habitat types for the Middle/Lower and Upper reaches are similar, but the actual habitat types will be defined by the habitats present in the mainstem and tributaries of interest. See RSP Section 9.5, 9.6, 9.9.</p>
ADF&G	<p>Request methods for shocking to include block nets.</p>	<p>Block nets have been added to methodology in RSP. See RSP Section 9.5, 9.6.</p>
USFWS	<p>Study site selection should follow a stratified random design.</p>	<p>A stratified random design is being proposed. AEA has included additional detail and documentation in the RSP regarding the sampling effort by strata. See RSP Section 9.5,9.6. In addition, strata have been modified per review of the 2012 video in the middle and lower river. This modification is presented in both Habitat Characterization and Fish Distribution and Abundance Revised Study Plans. See RSP Section [Insert]</p>

Fish Distribution & Abundance

Participant	Comment	Response
USFWS	Michael's comment reads: "Seems to me this is at the margins of the ice cover season. Jan-Mar would seem to provide safer ice conditions for accessing sites? ...would like more discussion."	Winter access in the Middle River will be evaluated in a pilot study conducted this winter (2012-2013). Depending on the results of the pilot study AEA will add additional sampling events and locations to the Fish Distribution and Abundance Study Plan. See RSP Section 9.6.
USFWS	Is "population estimate" a necessary objective? Could do more frequent sampling for CPUE instead of population estimate sampling.	AEA has eliminated population estimation from the Fish Distribution and Abundance Studies.
USFWS	Unclear whether juvenile salmon would be included in Objective #2	AEA has added additional detail in the RSP to clarify that juvenile salmon are included in Objective #2. In addition, AEA has added additional early life history objectives. See RSP Section 9.6.
ARRI	Request that sampling be tied to species and life stage specific objectives	AEA's approach to fish sampling is habitat-based not driven by where we would expect to find individual species and life stages of fish. Sampling will be stratified by geomorphic reaches and mainstem habitat categories. Random sampling within the habitat strata will ensure that sampling is representative of all habitats present in the system and therefore will be effective at capturing all species and life stage are present within these habitats. In addition, monthly sampling in those representative sites will be implemented to determine what species and life stages are using those habitats seasonally. See RSP Section 9.5, 9.6.
ADF&G	Concerns with using PIT tags: 1) half vs full duplex tags, 2.) size of fish tagged, 3) human ingestion of tags	PIT tag systems have been evaluated. AEA is considering use of Texas Instruments half-duplex tags due to the flexibility of system and the ability to tailor it to local conditions at a reasonable cost. See RSP Section 9.5, 9.6.

Fish Distribution & Abundance

Participant	Comment	Response
ADF&G	Request grayling to be added to list of species to be radio tagged	Grayling has been added to target species list. See RSP Section 9.5, 9.6.
USFWS	<p>Comment = Study Request objectives 7-9 are not addressed in 7.5 or 7.6; there is no mention of egg incubation (rates or success), hatching (rates or success), stranding (ramping rates) or emergence (dates and times) sampling anywhere; no mention of baseline intragravel temperature or water quality monitoring of spawning and pre-emergent juvenile fish habitats; no mention of characterizing baseline water quality conditions at spawning or rearing habitats.</p> <p>Only mention is in Study Goals (6.5.1.2, page 6-10); Objective 8. Conduct a variety of post-processing comparative analyses derived from the output metrics under aquatic habitat models. Approach appears to evaluate using only physical habitat models and without empirical sampling post-spawning through emergence and for juveniles up to PIT tagging size (i.e., 60 mm).</p>	Study Request Objective 7-9 are now addressed more specifically. AEA has added a study objective focused on Early Life history of Anadromous Salmon has been added to the Fish Distribution and Abundance RSP. See RSP Section 9.6. This study objective includes efforts to evaluate emergence, early movements, and stranding of fry/parr. In addition a hyporheic study will address water quality in spawning areas. See RSP Section 8.5].
USFWS	Only winter sampling I see proposed in the upper reach includes using DIDSON and video cameras in 10 "selected" sloughs and side channels; how were/will sites be selected?; What other habitat types are available and why are they not being sampled? Is this sufficient to get at winter distribution and abundance for all life stages?; will not likely be able to identify juvenile species using these techniques (therefore, no distribution and abundance information and habitat use by species, particularly for early life stages (<60 mm); other winter sampling (using gill nets, minnow traps, and trot lines) is listed in the schedule section (and not in methods), but it is not described.	AEA has added additional detail in the Fish Distribution and Abundance RSP for the Middle/Lower River by including an objective for winter sampling and describing the techniques, locations, and timing of proposed sampling. See RSP Section 9.6. In addition, a study objective focused on Early Life history of Anadromous Salmon has been added to focus sampling on this species and life stages. See RSP Section 9.6.

Fish Distribution & Abundance

Participant	Comment	Response
USFWS	There does not appear to be any studies to collect baseline biological or physical spawning habitat information between the time eggs are deposited in redds and the time of fry emergence	The Inter-gravel Study will collect data on the physical characteristics of spawning habitat. See RSP Section 8.5.
USFWS	Unclear if Biotelemetry objective includes or excludes PIT tagging juvenile anadromous salmon.	AEA has added additional detail in the RSP to clarify that that juvenile salmon will be included in PIT tagging efforts. See RSP Section 9.5, 9.6.
USFWS	The Middle/Lower River study objective 'characterize the age structure, growth, and condition of juvenile anadromous and resident fish by season' is not in the Upper River PSP. Is this study objective limited to juveniles or should it say "all" resident fish.	AEA has added the objective to characterize the age structure, growth, and condition of juvenile anadromous and all resident fish by season to the Upper River RSP. See RSP Section 9.5.
ADF&G	Minnow trapping under ice should be used during the winter, in all habitat types.	Winter access in the Upper River will be evaluated in a pilot study conducted this winter (2012-2013). Depending on the results of the pilot study AEA will add minnow trapping under ice in multiple locations to Middle River sampling methodology in the RSP. See RSP Section 9.6.
ADF&G	Evaluate the feasibility of under ice videography	Winter access in the Upper River will be evaluated in a pilot study conducted this winter (2012-2013). Depending on the results of the pilot study AEA will add video under ice in multiple locations to Middle River sampling methodology in the RSP. See RSP Section 9.
ADF&G	Request use of trot lines in winter	Winter access in the Upper River will be evaluated in a pilot study conducted this winter. Depending on the results of the pilot study AEA will add the use of trot lines for winter sampling in the Middle River to the RSP in RSP for the Middle and Lower River. See RSP Section 9.6.

Fish Distribution & Abundance

Participant	Comment	Response
USFWS	USFWS recommended Beechie as opposed to USFS which was developed for small SE streams and relative to forest practices	The methods for habitat characterization were discussed and approved in an agency meeting in May 2012 . The USFS method is a standardized approach that is widely used in many rivers, including larger waters. In addition, to using that protocol for habitat characterization, AEA has revised the the Habitat Characterization study plan to include the delineation and characterization of “edge habitat” in mainstem reaches. See RSP Section 9.9.
ADF&G	Request for details of surgical methods, battery life and specifications which determine battery life.	Additional detail has been added to the study plan on tagging and tags. However, detail on tag specifications and battery life will be available post RSP in an study implementation plan.
ADF&G	Request a table in RSP which includes: proposed tagged species, type of tagging, number of individuals, and any discrepancies.	A table with detail on target species and sample sizes has been added to the Fish Distribution and Abundance Study plans. See RSP Section 9.5, 9.6.
ADF&G	Burbot sampling methodologies. Suggested burbot be captured with hoop traps for radio tagging; trot lines are lethal to burbot.	AEA has added hoop traps to capture methods in the RSP. See RSP Section 9.6.]
USFWS	Request data on movement (and timing) of newly emergent fish from spawning to rearing areas or movement of juvenile fish <60 mm in winter. Specifically: <ol style="list-style-type: none"> 1. How will the Project effect changes in temperature and survival? (There will be an Inter-gravel study in the ISF program). 2. How will flow fluctuations affect early life history? (The ISF physical habitat model will address this) 3. When are fish active- day vs. night? 4. Timing of movements with respect to flows to understand Project flow effects 	<p>Aobjectives on early life history of anadromous salmon has been added to the Fish Distribution and Abundance study plan. This objective includes subobjective to address timing, movements, and diurnal behavior of anadromous salmonids in the Middle/Lower River.</p> <p>In addition there has been an intergravel study component added to the the Instream Flow Study Program to help collect baseline information that will be used to evaluate project effects on incubating embryos. See RSP Section 8.5.</p>

Fish Distribution & Abundance

Participant	Comment	Response
USFWS	<p><i>PSP = Collect tissue samples from juvenile salmon and opportunistically from all resident and non-salmon anadromous fish to support the Genetic Baseline Study (Section 7.14). (7.6 middle and lower reach)</i></p> <p>Because PSP is not structured similarly to our study requests, why is this study objective limited to juvenile salmon? This may be okay, because genetic sampling included in Salmon Escapement Study, though no mention in study of analyzing samples or overall links between studies. Without providing linkages between studies, there is a lot of searching required to find if, where, and how information is being collected.</p>	<p>Genetic sampling in the Fish distribution and Abundance Study is indeed complimentary to Adult Escapement study. As such the Fish Distribution and Abundance study plan does not address collecting samples from adult salmon; that is included in the Genetics study plan. This is addressed by the new section describing study interdependencies and the interdependencies flow chart.</p>
USFWS	<p><i>PSP = Characterize the age structure, growth, and condition of juvenile anadromous and resident fish by season; (7.6 middle and lower reach)</i></p> <p>Comment = Is there a difference between Document (as requested) and Characterize (as proposed)? Explain Is this study objective limited to juveniles or should it say "all" resident fish.</p> <p>This objective is not included in upper reach; should at least characterize age structure for all resident and anadromous fish by season</p>	<p>AEA has revised the terminology in the RSP to use the term "document" instead of the term "characterize". This objective will be applied to all fish species collected and has been added to study plan for Upper River. See RSP Section 9.5, 9.6.</p>
USFWS	<p><i>PSP = Document the timing of downstream movement and catch for all fish species using outmigrant traps; (7.6 middle and lower reach)</i></p> <p>Comment = Unclear if this includes or excludes addressing outmigration</p>	<p>The use of outmigrant traps is intended to address downstream movements of fish species that have known out migrations. The placement of the traps will reflect locations where the likelihood of intercepting target species is high. This is described in the RSP. See RSP Section 9.5, 9.6.</p>

Fish Distribution & Abundance

Participant	Comment	Response
USFWS	<p><i>PSP = Describe seasonal movements of selected fish species such as rainbow trout, eulachon, Dolly Varden, whitefish, northern pike, Pacific lamprey, and burbot) using biotelemetry (PIT and radio-tags) with emphasis on identifying foraging, spawning and overwintering habitats within the mainstem of the Susitna River and its associated off-channel habitat; (7.6 middle and lower reach)</i></p> <p>Comment = Also, mentions installing up to 10 antenna arrays; is that sufficient to determine movement of juveniles in and out of habitats by reach? When, where, and how will sites be selected? What is rationale and assumptions for selecting habitat types and sites?</p>	<p>AEA has added additional detail in the RSP on radio telemetry of target species and array design. See RSP Section 9.5, 9.6.]</p>
ARRI	<p>Sampling frequency: suggested bi-weekly sampling during the critical periods for early life stages of salmon</p>	<p>Biweekly sampling has been added to the study plan for the objective related to early life history of salmon. See RSP Section 9.6.</p>
USFWS	<p>Jeff Davis asked what classification scale critical sites (addressing specific life stages of fish) will be based on.</p>	<p>As described in the RSP fish sampling will occur at several habitat categories including the mainstem habitat, mesohabitat and edge habitat levels. These levels vary with the size and complexity of the river system. It is possible that one life stage of a species, including critical life stages will be sampled at all or some of these three different levels in different part of the river This should not be unexpected as fish move between habitats both within and across seasons and sampling will occur on a seasonal or monthly basis.</p>
USFWS	<p>Existing cisco whitefish data. Recent studies by Brown 2008-2011 (unpub) have ID'ed relative abundance, distribution, age camp, and spawning timing; suggest dropping cisco from list of species</p>	<p>Will consider dropping cisco from list of focal species in study</p>

Fish Distribution & Abundance

Participant	Comment	Response
USFWS	Requests the periodicity data sources be referenced.	Sources for periodicity tables used in Project studies will be given proper citations.
USFWS	Requests clarification on the sampling approach in the lower river due to the more broad habitat classification applied.	The Habitat Characterization Plan has been revised and includes clarifying information on the habitat mapping approach for the Lower River and the limitations of delineating at a scale finer than mainstem habitats.



Revised Study Objectives

1. Describe the seasonal distribution, relative abundance, and fish-habitat associations;
2. Describe seasonal movements with emphasis on identifying foraging, spawning and overwintering habitats within the mainstem;
 - A. Document the timing of downstream movement using outmigrant traps;
 - B. Describe seasonal movements using biotelemetry;
3. Describe early life history, timing, & movements of salmon;
 - A. Describe emergence timing of salmonids;
 - B. Determine movement patterns & timing of juvenile salmonids from spawning to rearing habitats;
 - C. Determine juvenile salmonid diurnal behavior by season;
 - D. Collect baseline data to support Stranding & Trapping (ISF Study);



RSP Revisions Objective 3:

Task A: Emergence timing

Species: Salmon

Sites: Selected Focus Areas

- Collaborate with Intragravel Monitoring component of ISF Study.
- Bi-weekly sampling using fyke nets, seines, electrofishing and minnow traps in known salmon spawning areas



Task B: Movement patterns & timing- spawning to rearing habitats

Species: Juvenile salmon

Sites: Focus Areas

- Focus on timing of emergence and movement of newly emergent fish from spawning to rearing areas
- Focus on movement of juvenile fish <50 mm in winter (i.e., the post-emergent lifestages most vulnerable to load-following operations)
- DIDSON or underwater video to monitor movement into or out of specific habitats
- Outmigrant traps, electrofishing, seining, & fyke nets



Task C: Diurnal behavior by season

Species: Juvenile salmon

Sites: Selected Focus Areas

- Stratified time of day sampling to determine whether fish are more active day/night
- Methods based on results of 2012-2013 Winter Pilot Study
- DIDSON and/or underwater video methods to observe fish activity
- Potentially electrofishing and seining



Task D: Collect baseline data to support ISF Study

Species: Juvenile Salmon

Sites: At selected outmigrant trap & PIT tag array sites

- Support Stranding and Trapping component of ISF Study
- ID seasonal timing, size and distribution among habitat types for fish <50 mm in length.
- Focus on slough and other mainstem lateral habitats
- DIDSON, underwater video, electrofishing, seines, outmigrant traps and fyke nets.
- Monthly measurements of fish size/ growth
- ID When fish exceed 50 mm length



Proposed Study Objectives

4. Document winter movements and timing & location of spawning for burbot, humpback whitefish, and round whitefish;
5. Document the seasonal age class structure, growth, and condition by habitat type;
6. Document the seasonal distribution, relative abundance, & habitat associations of invasive species (northern pike); and
7. Collect tissue samples to support Genetic Baseline Study.



Objective 4: Winter movements, timing & location of spawning

Species: Burbot, Humpback whitefish, Round whitefish

Sites: Mainstem

- Up to 30 radiotags implanted in each species; distributed temporally & longitudinally.
- Capture burbot for radio tagging using hoop traps late Aug- Oct
- Capture whitefish for radio tagging using fishwheels opportunistically and directed efforts with seines & gillnets.
- Use aerial & snow machine tracking to pinpoint winter aggregations of fish;
 - Sample areas with trot lines.
 - Trot lines are lethal sampling;
- Collect, examine, and preserve gonads to determine spawning status.



Proposed Sampling Approach

Fish Distribution

vs

Relative Abundance

- Single pass sampling
 - Presence/Absence
 - Standardized sites and methods
- Multi pass sampling
 - CPUE
 - Standardized sites and methods

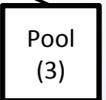
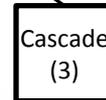
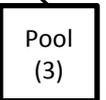
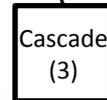
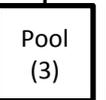
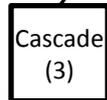
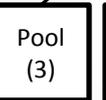
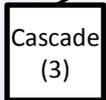
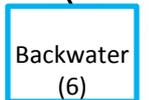
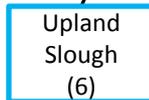
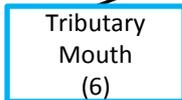
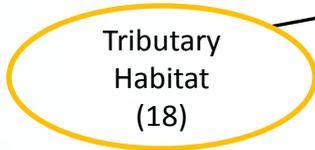
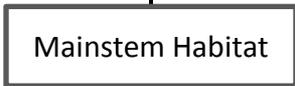
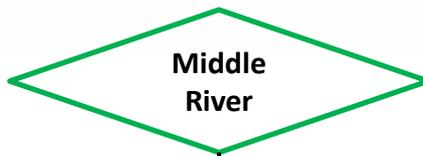


Study Site Selection Comments

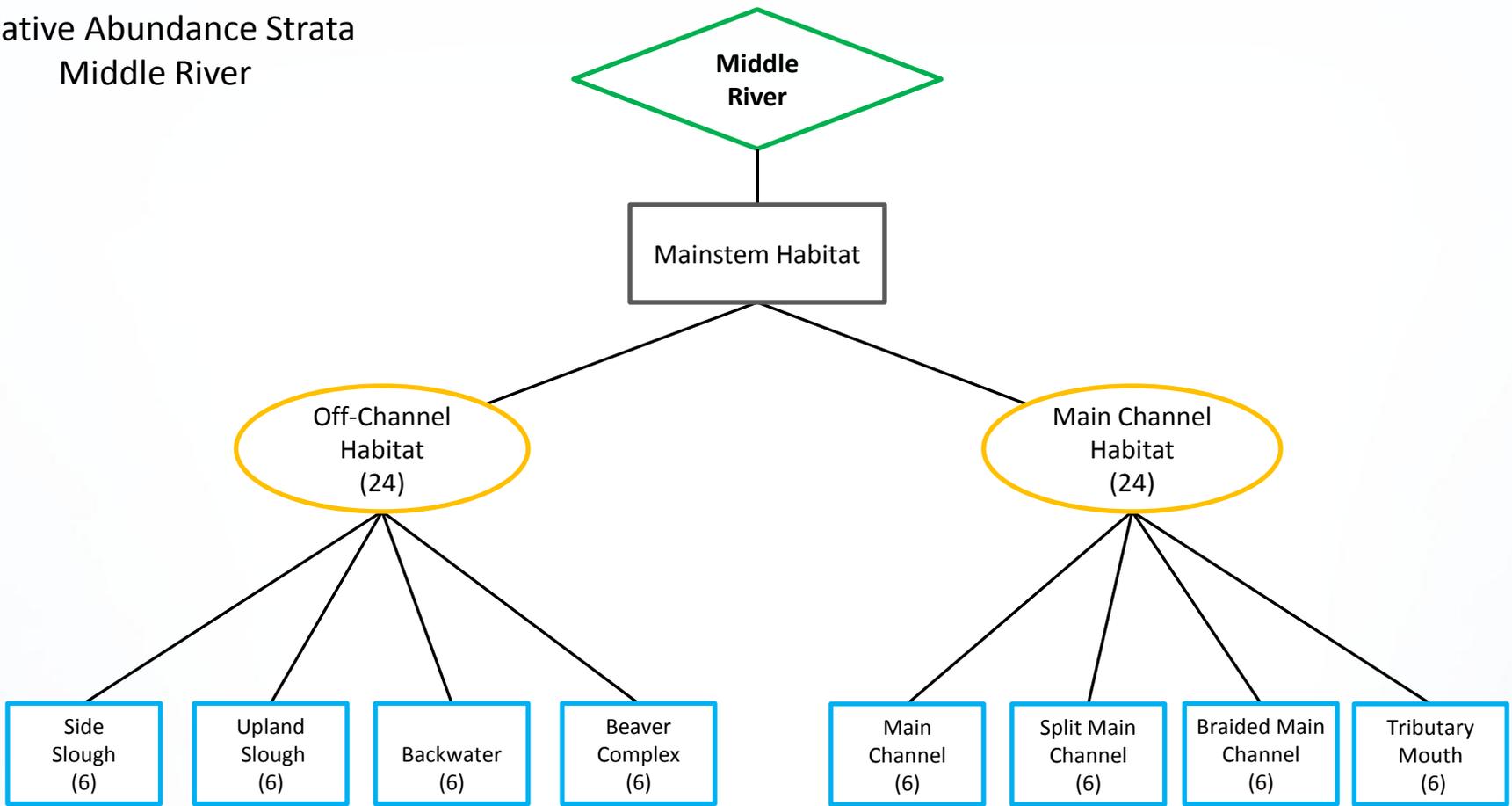
- Requested stratified random design
- More detail
 - How sites will be selected
 - What habitat types will be represented
 - Number of sites



Fish Distribution Strata
Middle River



Relative Abundance Strata
Middle River



Relative Abundance Focus Areas

