Tier 3

Stream Inventory Project

Fisheries Habitat Survey

Importance

Many species of warm water and cold fishes inhabit California streams and rivers. Although most species' habitat requirements are known, the status the required habitat features in California waters is not known. This inventory protocol attempts to collect information on the status and condition of fisheries habitat in surveyed streams.

Method

A team consisting of a minimum of three volunteers collects data at study points located along a stream. At each study point the team enters the creek to determine a variety of habitat characteristics important to fish. The team proceeds upstream a minimum of four habitat units (a habitat unit is defined by common stream flow and substrate attributes). classifying these habitat units according to a system used by the California Department of Fish and Game.

Equipment

- Watch
- Thermometer
- 100 meter tape
- 50 meter tape
- Staff Gauge
- Clip Board
- Data Sheets
- Habitat Type List

Constraints

This protocol focuses on quantifying fisheries habitat conditions rather than providing a census of fish or other aquatic organisms. Data taken reflect the environmental factors of the creek as they relate to potential support for various fish species at the particular time of the survey. No attempt is made to extrapolate to conditions which might be present at other times of the season or at different flow regimes.

Quality Assurance

The fisheries team should be periodically joined in the field by California Department of Fish and Game (CDFG) fisheries biologists, fisheries seasonal aides or fisheries biologists familiar with the Department of Fish and Game's fisheries habitat classification system.

Data Value

The data accumulated through these surveys will augment those collected by CDFG personnel. The data will assist local and regional agencies in determining the condition of fish habitat and planning for fish restoration projects.

Instructions

At each study point (located 500 meters apart) fish habitat will be described in a variable-length transect extending four habitat units upstream of the point. For the purpose of this study, a habitat unit is described as a change from a riffle, pool, run, or glide to another such habitat type. Habitat variables such as unit length and width, substrate size, water temperature, and cover vegetation of each habitat unit will be measured and recorded. The fisheries habitat assessment will be based upon stream conditions at the time of the survey. If the stream is not flowing or is completely dry, habitat characterization will be suspended or moved to a study point where flowing conditions occur. The presence of visible fish will be recorded as anecdotal information; no effort will be made to collect or identify fish in this assessment.

Methodology

Upon entering the creek area, the group will break up into sections according to task:

- habitat typing,
- habitat characterization,
- substrate characterization,
- instream and overhead shelter characterization,
- and a general "anecdotal" description of the site and its condition.

Data recorders should be designated for each subgroup. The data-recorders should not help take measurements: measurers will call the data to the recorder.

Before beginning data collection procedures, review any safety considerations presented by the site (deep water, difficult terrain, pollution or debris, etc.). In the event that a measurement cannot be safely taken, make a note on the data sheet that the data was unavailable due to safety considerations. Give an estimate of the untaken measurement if possible, and clearly describe the situation in your notes (for example: maximum depth measurement unavailable due to safety considerations -- maximum depth occurs at central left bank: depth estimated at over three meters, water swift moving , approach unsafe).

The most important elements of data collection are **consistency** and **completeness**. Work carefully and methodically to be sure your data are accurate and complete. Data taken incorrectly cannot be recollected at a later date: each data collection event is the only chance that year to get information on that particular site. Watch the position of decimal points and the legibility of the writing. Whenever possible, teams of volunteers should "specialize" in an area of habitat characterization, collecting data for the same parameters from week to week. This greatly increases the consistency of the information.

Data will be taken in metric units (meters, centimeters). Take all data to the tenth of a centimeter (for example, 0.01 meter) where possible.

The first data to be taken are the start time and the air and water temperature. The air temperature must be taken before the water temperature. Take all temperature measurements in the shade. Look to see if fish are present and note any other items of interest before the water gets stirred up.

Habitat Typing

This team will determine the type and boundaries of each habitat unit. Habitat types are generally broken down into Riffle, Pool, Glide, and Run, with specific designations for some subtypes of habitat (for example, low-gradient vs. high gradient riffle). Habitat types are clearly shown and described in the "Santa Clara County Stream Fishery Habitat Program -- Habitat Types List" provided by the field leader of the group -- this group should be familiar with the list before beginning the inventory. As each unit is typed, be sure the entire group knows what the designation and boundaries are (and agrees). This is critical if each subgroup is using a separate data sheet -- the information and designations must correspond for entry into the computer.

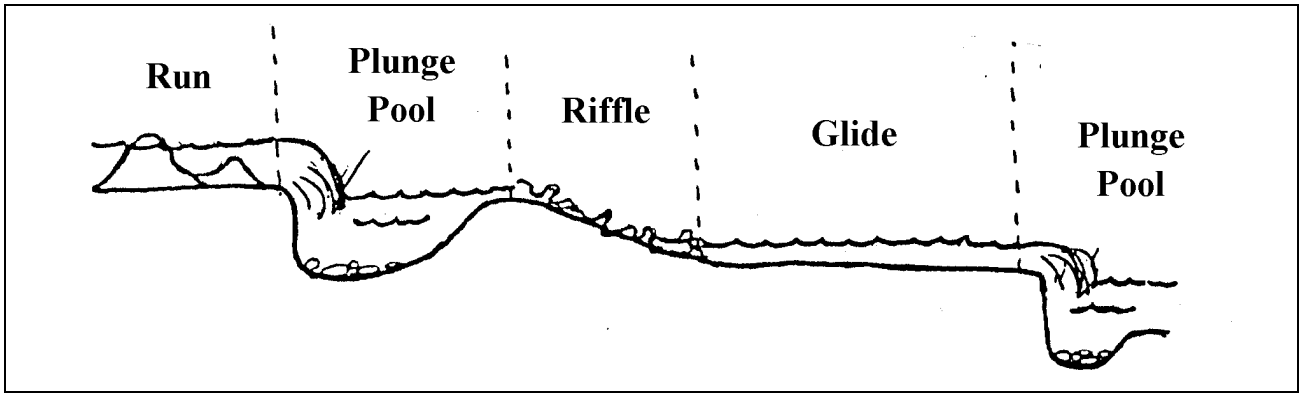
"Typing" the habitat and establishing its boundaries is perhaps the most challenging data to collect. Rely on common sense and the consensus process to determine your answers. **The most important thing is to be consistent.** Call the same habitat condition the same name each time you see it. Habitat typing is a skill which comes with experience -- the same team should be responsible for all the typing whenever possible.

Four habitats will be characterized for each study point. The first habitat to be typed and studied will be intersected by the point marker. Begin the measurement of this habitat unit at the downstream end, then proceed three additional habitat units upstream. A habitat unit could be described as a section of creek similar in nature which is longer than the wetted channel of the creek is wide, bounded by sections of the creek which have different attributes which are also longer than the channel is wide.

Changes in habitat types which are shorter than the wetted channel is wide are not considered habitat units, and should not be separately measured. Include such an area in the measurements of the adjacent habitat most closely associated with it.

Habitat Characterization

This group performs the measurements of air and water temperature, average length and width, and average and maximum depth of each habitat unit.



Five random measurements of length, width, and depth per habitat unit will be recorded on the data sheets, with averages determined after the measurements are completed.

Length

The length measurement can be tricky if the boundary between habitat units is unclear. Find the boundary between units by identifying the place where the water flow changes (look for a

change in substrate, depth, speed of flow of the water, etc.). The length measurement is an absolute, rather than an average. Begin the length measurement for one habitat unit at the same place you ended the measurement of the last unit: the four habitats you type will be contiguous.

Average Width

Five width measurements should be taken within the habitat. Measurements should be called to a data-taker as they are taken. Record the five measurements on the data sheet, then average them and record the average width in the top (grayed) cell.

Average Depth

Five depth measurements should be taken within the habitat unit. Take these measurements at the same locations as the width measurements. They should be representative of both the shallow and the deep parts of the habitat. Record the raw data as it is taken on the data sheet, find the average, and record it in the top (grayed) cell.

Maximum Depth

Find this number through as many measurements as you wish -- the measurer can simply keep checking depth until a maximum is found and recorded.

Substrate Characterization

This group will characterize the dominant and subdominant substrates present within each habitat unit. Working from the downstream end of each habitat unit, examine all the types of

Depth Measurements	**2.57m**	**0.86**	**10.26**	**5.18**	**5.04**			
	2.05	0.89	10.05	5.5	4.65			
	3.24	0.92	11.15	4.85	5.05			
	2.58	0.68	9.86	6.6	4.5			
	2.36	0.99	8.25	4.0	6.22			
	2.61	0.82	12.0	4.95	4.8			

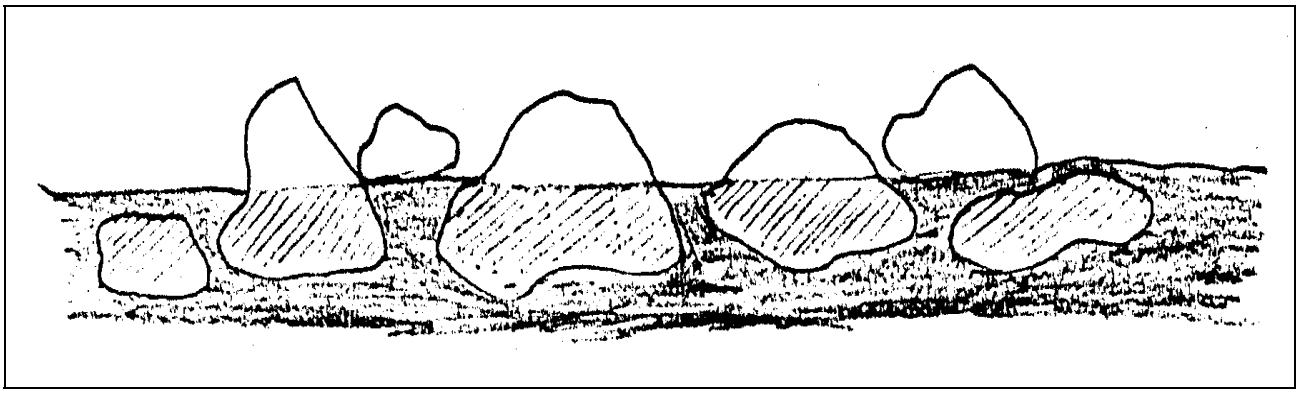
substrate present. Substrate types are defined as silt/clay, sand, small/medium/large gravel, small/med/large cobble, small/large boulder and bedrock. Looking at the entire habitat unit, determine which type of substrate is most prevalent according to **surface area**. This is the "dominant" substrate. It may very well not be the biggest substrate present: do not underestimate the presence of silt or sand during this examination. Where the water is deep or turbid, you may need to make this determination by feel with your feet. Use visual inspection primarily, as well as "hand-scoops" to make a determination. The "subdominant" substrate is the second most prevalent substrate. These data will be marked on the first page of the data sheet. Take notes on the second sheet if you would like to make additional comments. Make every effort to be "representative" in the description of present substrate.

Embeddedness

Embeddedness relates to the degree to which the gravel or cobble substrate is surrounded by clay or silt. Evaluate the stream bed for embeddedness by randomly picking up and inspecting representative rocks. Generally the area which had been embedded will be free of organic growth and may actually appear cleaner than that area which was exposed to the water. Estimate the percent of the rock which was covered by silt or clay to the nearest 25% and repeat the exercise several times to attain an average percent embeddedness.

Instream/Overhead Cover

This group will define cover provided by vegetation and other matter. Instream shelter types are listed on the data sheets as large substrate, undercut bank, sm/large woody debris, rootwad, terrestrial/aquatic vegetation, surface turbulence, and bedrock ledge. This are generally materials providing escape/cover from other aquatic threats (bigger fish, turtles). The types and percentage of cover present are noted and a "shelter value" is determined based on the complexity and the percentage of cover present for each habitat unit. "Instream" cover refers to the presence of any of these items below the surface of the water. "Overhead" cover is restricted in this assessment to material between 0 and 0.5 meters (roughly 18 inches) above the water surface. This is cover generally protecting fish from terrestrial threats (birds, raccoons,



humans). The types of cover and the percent of coverage is noted.

General Description

The general description of the site will note information not specifically requested by the data sheet. These notations can be made on the back of a data sheet. The presence of visible fish or other species of interest, barriers to fish migration, evidence of illegal dumping or vegetation removal, contamination, and illicit drain lines, and other information of note should be documented for future consideration.

Review the data

Once all the information has been collected for the site, the volunteers should review the data as a group. Each set of data should be checked for completeness, readability, and reasonableness. The position of decimal points should be double-checked

This review is critical. Any "questionable" data should be remeasured, and noted along with the original measurement. Keep clear notes of all procedural problems and decisions for future review.

Note the finish time on the data sheet and you're done!

Fisheries Habitat Data

FISH HABITAT SURVEY		
Creek Name		
Survey Point		
Date	Time Start	Time Finish
Page of		

Participants	
	Recorder

	Habitat Unit Number							
Habitat Character								
Habitat Type								
Habitat Length								
Average Width								
Average Depth								
Maximum Depth								
Width Measurements								
Depth Measurements								
Substrate								
Silt/Clay								
Sand								
Small Gravel (1/16 - 1”)								
Medium Gravel (1 - 2”)								
Large Gravel (2 - 3”)								
Small Cobble (3 - 6”)								
Medium Cobble (6 - 9”)								
Large Cobble (9 - 12”)								
Small Boulder (12 - 24”)								
Large Boulder (>24”)								
Bedrock								
Embeddedness (%)								
Instream Shelter/Cover	See explanation for shelter types and complexity value on back							
Shelter Type(s)								
Complexity Value								
% Unit Covered								
Overhead Cover Types								
Overhead % Unit Cov.								

Instream Shelter Type	Description
1	Boulder (diameter > 25 cm.)
2	Undercut bank
3	Small woody debris (diameter <30 cm.)
4	Large woody debris (diameter >30 cm.)
5	Rootwad
6	Terrestrial vegetation
7	Aquatic vegetation
8	Bubble curtain (such as at base of waterfall)
9	Bedrock ledge
10	Water depth > 0.5M (applies to overhead cover only)

Shelter Value	Instream Shelter Complexity
0	No shelter
1	Relatively simple instream cover; e.g., cobble: 6.4-25.4 cm. (2.5-10.0"), single bedrock ledge, and/or algae.
2	More complex cover such as 1 or 2 pieces of large woody debris >30.5 cm. diam. (1'), 1 or 2 boulders >25.4 cm. (10.0"), or a single rootwad piece.
3	High complexity; may include combinations of single pieces of: Large woody debris / boulder / stump-rootwad Multiple pieces : >2 large woody debris complex Multiple pieces: >2 boulder / rock matrix Overhanging banks / live rootwad system Submerged / floating full tree crowns Bubble curtain

Habitat	Fish Observed	Comments