STREAM INVENTORY REPORT

Tom Gulch

INTRODUCTION

A stream inventory was conducted during the summer of 1994 on Tom Gulch to assess habitat conditions for anadromous salmonids. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Tom Gulch. The objective of the biological inventory was to document the salmonid species present and their distribution. After analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

There is no known record of spawning surveys having been conducted on Tom Gulch. The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout.

WATERSHED OVERVIEW

Tom Gulch is a tributary to South Fork Elk River, a tributary to Elk River, a tributary to Humboldt Bay, which drains to the Pacific Ocean. It is located in Humboldt County, California. Tom Gulch's legal description at the confluence with South Fork Elk River is T04N R01W S35. Its location is 40.6925 degrees north latitude and 124.1428 degrees west longitude. Tom Gulch is a second order stream and has approximately 1.7 miles of blue line stream according to the USGS Fields Landing 7.5 minute quadrangle. Tom Gulch drains a watershed of approximately 2.2 square miles. Summer base runoff is approximately ≤0.1 cfs at the mouth. Elevations range from about 80 feet at the mouth of the creek to 800 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is privately owned and is managed for timber production. Vehicle access exists via U.S. Highway 101 at the Elk River Road exit, thence approximately 5.7 miles east on Elk River Road to its terminus at the Elk River Timber property line. Tom Gulch is approximately 800' down the first right-hand turn past the locked gate at the property line.

METHODS

The habitat inventory conducted in Tom Gulch follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The California Conservation Corps (CCC) Technical Advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Tom Gulch personnel were trained in June, 1994, by Gary Flosi and Scott Downie. This inventory was conducted by a two-person team.

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HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Tom Gulch to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated. Flows should also be measured or estimated at major tributary confluences.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.

3. Temperatures:

Both water and air temperatures are measured and recorded at each tenth unit typed. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Tom Gulch habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. Channel dimensions were measured using hip chains, range finders, tape measures, and stadia rods. Unit measurements included mean length, mean width, mean depth, and maximum depth. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were taken in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Tom Gulch, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4).

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Tom Gulch, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300, and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two respectively.

8. Canopy:

Stream canopy is estimated using handheld spherical densiometers and is a measure of the water surface shaded during periods of high sun. In Tom Gulch, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results recorded.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Tom Gulch, the dominant composition type and the dominant vegetation type of both the right and left banks were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual.*

Biological inventory was conducted in Tom Gulch to document the fish species composition and distribution. Four sites were electrofished in Tom Gulch using one Smith-Root Model 12

electrofisher. Each site was end-blocked with nets to contain the fish within the sample reach. Fish from each site were counted by species, measured, and returned to the stream.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following six tables:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Tom Gulch include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in low gradient riffles
- Percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

The habitat inventory of July 7 through July 11, 1994 was conducted by Chris Coyle and Craig Mesman (CCC). The total length of the stream surveyed was 5,472 feet.

Flow was estimated to be ≤0.1 cfs during the survey period.

Tom Gulch is an F5 channel type for the first 1,043 feet of stream surveyed (Reach 1), an F4 for the next 185 feet (Reach 2), and an F5 for the remaining 4,244 feet (Reach 3). F-channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios. F4 channels have gravel-dominant substrates. F5 channels have sand dominant substrates.

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Water temperatures ranged from 52 to 55 degrees Fahrenheit. Air temperatures ranged from 53 to 60 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent occurrence, pools made up 55%, flatwater types 24%, and riffles 21% (Graph 1). Pool habitat types made up 59% of the total survey length, riffles 22%, and flatwater 19% (Graph 2).

Thirteen Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent occurrence were mid-channel pools, 40%; low gradient riffles, 21%; and runs, 14% (Graph 3). By percent total length, mid-channel pools made up 47%, low gradient riffles 22%, and runs 9%.

One-hundred-twenty-five pools were identified (Table 3). Main channel pools were most often encountered at 74% and comprised 80% of the total length of pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Sixty of the 125 pools (48%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 120 pool tail-outs measured, four had a value of 1 (3%); two had a value of 2 (2%); three had a value of 3 (3%); and 111 had a value of 4 (92%). On this scale, a value of one is the best for fisheries (Graph 6).

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Pool habitat types had the highest shelter rating at 37. Riffle habitats followed with a rating of 19 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 41. Main channel pools had a shelter rating of 39 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large and small woody debris are the dominant cover types in Tom Gulch. Graph 7 describes the pool cover in Tom Gulch.

Table 6 summarizes the dominant substrate by habitat type. Sand was the dominant substrate observed in 41 of the 48 low gradient riffles (85%). Gravel was the next most frequently observed dominant substrate type and occurred in 15% of the low gradient riffles (Graph 8).

One percent of the survey reach lacked shade canopy. Of the 99% of the stream covered with canopy, 82% was composed of deciduous trees, and 18% was composed of coniferous trees. Graph 9 describes the canopy in Tom Gulch.

Table 2 summarizes the mean percentage of the right and left stream banks covered with vegetation by habitat type. For the stream reach surveyed, the mean percent right bank vegetated was 90%. The mean percent left bank vegetated was 92%. The dominant elements composing the structure of the stream banks consisted 100% sand/silt/clay (Graph 10). Grass was the dominant vegetation type observed in 52% of the units surveyed. Additionally, 4% of the units had deciduous trees as the dominant vegetation type, and 4% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Four sites were electrofished on July 12, 1994, in Tom Gulch. The units were sampled by Chris Coyle and Craig Mesman (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled included Habitat Units #031 through #034, a run/log enhanced lateral scour pool/log enhanced lateral scour pool/run combination approximately 763 feet from the confluence with South Fork Elk River. This site had an area of 321 square feet and a volume of 158 cubic feet. The unit yielded six steelhead ranging from 32 millimeters to 48 millimeters, 39 coho ranging from 41 millimeters to 67 millimeters, seven three-spine stickleback ranging from 35 millimeters to 56 millimeters, one Pacific lamprey amnocete, and one red-legged frog.

The second site sampled included Habitat Units #040 and #041, two mid-channel pools located approximately 927 feet above the creek mouth and just upstream from a suspected low-flow barrier. This site had an area of 420 square feet and a volume of 420 cuboc feet. The site yielded five steelhead ranging from 86 millimeters to 112 millimeters, four coho ranging from 59 millimeters to 70 millimeters, and ten three-spine stickleback ranging from 46 millimeters to 58 millimeters.

The third site sampled included Habitat Units #181 through #186, a mid-channel pool/low gradient riffle/mid-channel pool/corner pool/run/mid-channel pool combination located approximately 4,366 feet above the creek mouth. The site had an area of 630 square feet and a volume of 442 cubic feet. The site yielded ten coastal cutthroat trout ranging from 38 to 120 millimeters.

The fourth site sampled was a plunge pool located approximately 70 feet up the left fork at the 1994 end of survey and approximately 5,542 feet above the creek mouth. The site had an area of 70 square feet and a volume of 56 cubic feet. The site yielded two coho ranging from 59 millieters to 61 millimeters, and one 125 millimeter coastal cutthroat trout.

DISCUSSION

Tom Gulch has two channel types: F4 and F5. F4 and F5 channel types are considered good for bank-placed boulders; fair for low-stage weirs, single and opposing wing deflectors, channel constrictors, bank cover, and log cover structures; and poor for medium-stage weirs and random boulder placement.

The water temperatures recorded on the survey days July 7 through July 11, 1994 ranged from 52 to 55 degree Fahrenheit. Air temperatures ranged from 53 to 60 degree Fahrenheit. This is an excellent water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

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Flatwater habitat types comprised 19% of the total length of this survey, riffles 22%, and pools 59%. The pools are relatively shallow, with only 60 of the 125 pools having a maximum depth greater than two feet. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat. In first and second order streams a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

One-hundred-fourteen of the 120 pool tail-outs measured had embeddedness ratings of 3 or 4. Only four had an embeddedness value of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. In Tom Gulch, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for pools was low with a rating of 37. The shelter rating in the flatwater habitats was lower at 18. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by large and small woody debris in all habitat types. Log and root wad cover structures in the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Forty-one of the 48 low gradient riffles had sand as the dominant substrate. This is generally considered unsuitable for spawning salmonids. Tom Gulch appears to be used primarily as a rearing stream by anadromous salmonids, with juvenile fish migrating from mainstem South Fork Elk River into Tom Gulch.

The mean percent canopy for the stream was 99%. This is a very high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams.
The percentage of right and left bank covered with vegetation was high at 90% and 92%, respectively. In areas of stream bank erosion or where bank vegetation is at unacceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Tom Gulch should be managed as an anadromous, natural production stream.

2) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

3) Increase woody cover in the pools and flatwater habitat units. Adding high quality complexity with woody cover is desirable and in some areas the material is at hand.

4) Spawning gravel on Tom Gulch are limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.

5) There are several log debris accumulations present on Tom Gulch that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

PROBLEM SITES AND LANDMARKS

The following landmarks and possible problem sites were noted. All the distances are approximate and taken from the beginning of the survey reach.

Position (ft):	Comments:
0'	Start of survey at confluence with South Fork Elk River. Channel type is F5. Substrate consists largely of sand deposits measured up to 3' deep.
377'	Flatcar bridge measures 20' long x 40' wide x 11' high.
880'	Two foot plunge through small woody debris.
1043'	Channel type changes to F4.
1228'	Channel type changes to F5.
1292'	Log debris accumulation (LDA) measures 6' high x 20' wide x 30' long. It is retaining sand 2' deep at base.
1631'	Small LDA measures 4' high x 20' wide x 8' long. It is not retaining gravel.
1836'	LDA measures 5' high x 15' wide x 10' long. It is retaining sand 2' deep at base.
2279'	Dry left bank tributary.
3184'	Embedded log diverting flow into right bank. Does not appear to be causing serious erosion or passage problem.
3416'	LDA measures 4' high x 15' wide x 15' long. It is not retaining gravel.
3890'	LDA measures 5' high x 20' wide x 12' long. It is retaining a volume of sand

measuring 3' deep x 15' wide at base.

4613' LDA measures 6' high x 25' wide x 50' long. It is retaining a volume of sand measuring 1-2' deep x 15' wide at base.

4664' Right bank tributary with residual surface flow. Not accessible to fish.

5063' Dry left bank tributary.

5404' LDA measures 5' high x 20' wide. It is retaining a volume of sand measuring 2' deep x 15' wide at base.

5472' Channel forks. End of survey due to lack of observed anadromous fish habitat.

LEVEL III and LEVEL IV HABITAT TYPE KEY

RIFFLE		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
CASCADE		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
FLATWATER		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
MAIN CHANNEL POOLS		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
SCOUR POOLS		
Corner Pool	[CRP]	5.1
Lateral Scour Pool - Log Enhanced	[LSL]	5.2
Lateral Scour Pool - Root Wad Enhanced	[LSR]	5.3
Lateral Scour Pool - Bedrock Formed	[LSBk]	5.4
Lateral Scour Pool - Boulder Formed	[LSBo]	5.5
Plunge Pool	[PLP]	5.6
BACKWATER POOLS		
Secondary Channel Pool	[SCP]	6.1
Backwater Pool - Boulder Formed	[BPB]	6.2
Backwater Pool - Root Wad Formed	[BPR]	6.3
Backwater Pool - Log Formed	[BPL]	6.4
Dammed Pool	[DPL]	6.5

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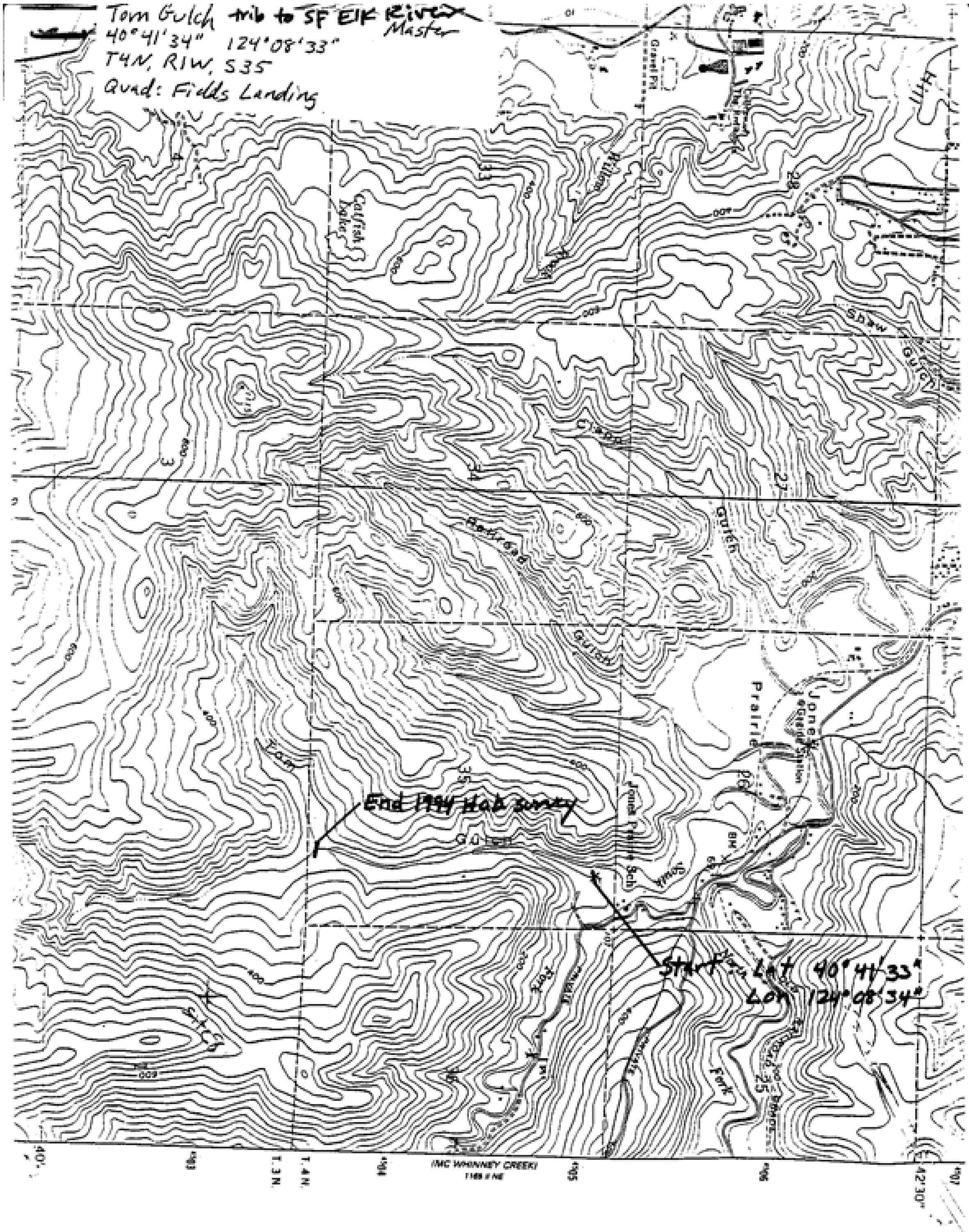
Tom Gulch trib to SF Elk River
Master
40°41'34" 124°08'33"
T4N, R1W, S35
Quad: Fields Landing
End 1994 Hab survey
Start: Lat 40°41'33"
Lon 124°08'34"
Tom
Gulch
Shaw
Gulch
Clapp
Gulch
Railroad
Gulch
Prairie
Jones
Fork
South
IMC WHINNEY CREEK)