91(HP-7)

Annual Report
For Interagency Agreement 14-16-0001-91522

UPPER SOUTH FORK OF THE SALMON RIVER RIPARIAN STUDY

U. S. FOREST SERVICE
KLAMATH NATIONAL FOREST
SALMON RIVER RANGER DISTRICT

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JANUARY 1992

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ABSTRACT

During the summer of 1991, a Watershed Improvement Needs Inventory was conducted on the Upper South Fork of the Salmon River, an 80 square mile watershed which forms the headwaters of the South Fork of the Salmon River above the confluence with the East Fork. Both anadromous and resident fish species inhabit this section of the river. The anadromous species include spring and fall run chinook salmon (*oncorhynchus tshawytscha*), summer and winter run steelhead (*O. mykiss*), Coho salmon (*O. kisutch*), and sea run Pacific lamprey (*lampreta tridentata*). The inventory included stream stability ratings, channel classification, upslope watershed inventories, and instream fish habitat surveys. The objectives of the inventory were to identify streams and riparian areas, describe their condition, and prescribe restoration projects where appropriate. The Upper South Fork ranges in elevation from 2400 to 8880 feet, and receives from 30-70 inches of precipitation, with snow predominating over 5,000 feet in elevation. Terrain is typically steep and rugged, but a broad gentle glacial valley occurs upstream from Big Flat. From Rush Creek down to the intersection with the East Fork of the Salmon River, the main stem flows through a wide, slightly eroded valley floor with flights of abandoned river terraces on the margins. These terraces were mined for gold at the turn of the century, greatly modifying the river channel and adjacent land. Bedrock in the project area consists mostly of metamorphic and granitic rock, along with a minor amount of ultramafic rock. The granitic rock is deeply weathered and dissected below 4000 feet in elevation, making it prone to shallow debris landslides. Soils developed from the metamorphic and ultramafic rock exhibit a high erosion hazard, while the hazard on those developed from granitic rock is very high. Floods of 1955 and 1964 severely damaged many of the channels. The inventory revealed 123 riparian miles along stream courses in the watershed, an increase of 50% over pre-existing surveys. Of these, 92 miles are perennial, 6 miles intermittent, and 25 miles ephemeral. The condition of riparian areas in the perennial section was rated as follows: 10 miles excellent, 59 miles good, 20 miles fair, and 3 miles poor. The inventory revealed significant fish habitat problems related to channel structure, sedimentation, riparian cover, and to some extent, channel stability. Channel stability is a serious problem from Petersburg up to Josephine Lodge. Sedimentation from near-channel debris slides is severe from Rush Creek up to Josephine Lodge. The structure of the river (distribution of pools and riffles) is a problem in many areas. This is due in large part to the lack of deep pools. Riparian cover is severely lacking in the Petersburg area and upstream from Big Flat. This lack of cover is due to mining activity and historic flooding. Restoration projects are offered which address the primary fish habitat problems. Potential projects are prioritized, and initial cost estimates developed.

INTRODUCTION

Klamath River Basin Fishery Resources Restoration Act-

In 1986, the Klamath River Basin Fishery Resources Restoration Act, P.L. 99-552 (hereinafter referred to as "the Klamath Act"), became law. The Klamath Act established the Klamath River Basin Conservation Area Restoration Program, a twenty-year fishery restoration program in the Klamath River basin. An advisory committee, the Klamath River Basin Fisheries Task Force, was established by the Klamath Act to provide guidance in planning and implementing the Restoration Program. The Task Force formulated a restoration program work plan for Fiscal Year 1991, consisting of projects recommended for funding by the U.S. Fish and Wildlife Service.

Project History-

The Klamath National Forest (Salmon River District) proposed a Watershed Improvement Needs Inventory (WINI) to determine the conditions of watersheds tributary to the upper South Fork of the Salmon River. The primary objective of this project was to identify streams and riparian areas, describe their conditions, and develop a prioritized list of restoration projects with estimated costs. Approximately 12,000 acres were inventoried in detail, and an additional 39,000 wilderness acres in a cursory fashion. The inventory includes stream stability ratings and channel classification, upslope watershed inventories and in-stream fish habitat surveys.

Riparian areas of the upper South Fork of the Salmon River are critical to the health of the river system, and disturbance can adversely affect them, as well as have effects for long distances downstream. Anadromous fisheries habitat is the most significant beneficial use of riparian habitat, with spring-run Chinook salmon habitats the most sensitive to disturbance.

Report-

This report summarizes the eight month study and inventory of the upper South Fork of the Salmon River. Addressed are history, assessment of current condition, identification of potential opportunities, and possible solutions for restoration or enhancement of high value beneficial uses.

A description of the project area is contained in the Study Area and Background section; study techniques are described in the Methods section, and findings are presented in the Results and Discussion section. Conclusions and Recommendations, including a prioritized list of restoration projects, are also presented. Appendix A contains a geologic map and explanation. Appendix B reflects a field note summary and ratings for each riparian area. Appendix C is a copy of the Fisheries Habitat Study of the Upper South Fork of the Salmon River. Appendix D contains the individual recommended R-5 Watershed Improvement Needs (WIN) projects. Appendix E contains the data sheets for each landslide found and

documented in the course of the inventory. Appendix F contains the photo index for all photos taken during the inventory process. Appendix G contains a large scale (1:15, 840; 4" = 1 mile) topographic map with clear overlays displaying: (1) Fire activity and timber sale harvest units, (2) roads, trails, landslides, and WIN projects, and (3) streams (with ratings). A topographic map displaying watershed boundaries is also included in this Appendix.

STUDY AREA and BACKGROUND

A. *Location and Description-*

The Upper South Fork of the Salmon River, upstream from the confluence of the East Fork of the Salmon River, drains approximately 51,000 acres (80 square miles) which includes 39,000 acres of the Trinity Alps Wilderness Area **(Figures 1 and 2)**. Elevations range from 8880 ft. near Thompson Peak to 2400 ft. at the confluence with the East Fork of the Salmon River. The stream flows north and northwest from the headwaters of Salmon Lake at 7150 ft. elevation. The drainage is bounded on the south and southwest by the divide separating the Klamath and Trinity River Watersheds. This divide includes Tri-Forest Peak, Thompson Peak, Grizzly Butte, China Springs, and Cold Springs. The common boundary shared by the Salmon River Ranger District and Shasta-Trinity National Forest forms the Eastern Boundary of the watershed, which includes Black Mountain, Red Rock Mountain, Preachers Peak, Big Flat, Packers Peak, and the Rush Creek Lake area. The West boundary is on a line from Cecil Point to Cecilville, and the North boundary is the South Taylor watershed ridge line which includes Onion and Haypress Meadows. **Figures 2 and 3** show the main streams and watershed divides.

B. *Geology/Geomophology-*

The study area is located within the Klamath Mountains Geomorphic Province. The Klamath Mountains are composed of an accumulation of slices of rock that were swept against the western margin of North America by plate tectonic processes of sea floor spreading and subduction zone convergence. The slices of ancient crust range in age from early Paleozoic to late Mesozoic (about 500 - 150 million years old) and are structurally arranged in arcuate fault-bounded belts that become progressively younger to the west (Irwin, 1966).

The South Fork of the Salmon River basin contains rocks of the Eastern Klamath Belt, Central Metamorphic Belt, Stuart Fork Formation and North Fork Terrane (Appendix A). These units are arranged in a complex stack of of eastward dipping wedges of rock separated by faults. Rocks of the Trinity Peridotite are structurally highest and easternmost. Going westward, rocks of the Central Metamorphic Belt, Stuart Fork Formation, and North Fork Terrane are stacked in successively lower structural positions (Wagner and Saucedo, 1987). The units range in age from Ordovician to Triassic. The rock units were deformed and metamorposed at various times prior to and during their accretion to the continent. Diorite and granite intruded through the older eastern-dipping rock slices in mid-Jurassic time.

Rock units represented in the South Fork of the Salmon River basin include the following (in order of decreasing age): Trinity peridotite; Stuart Fork Formation phyllitic schist and blueschist; ultramafic, metasedimentary and metavolcanic rocks of the North Fork Terrane; diorite and granite of Mesozoic plutons; and glacial deposits of Quaternary age (Appendix A). Of these rocks, the Salmon Hornblende Schist and plutonic (diorite and granite) rocks predominate in terms of areal extent. The granitic rock occupies 43% of the watershed, ultramafic rock about 1%, and the remaining 56% is metamorphic rock **(Figure 3)**.

Figure 1. Index Map of the Klamath National Forest.

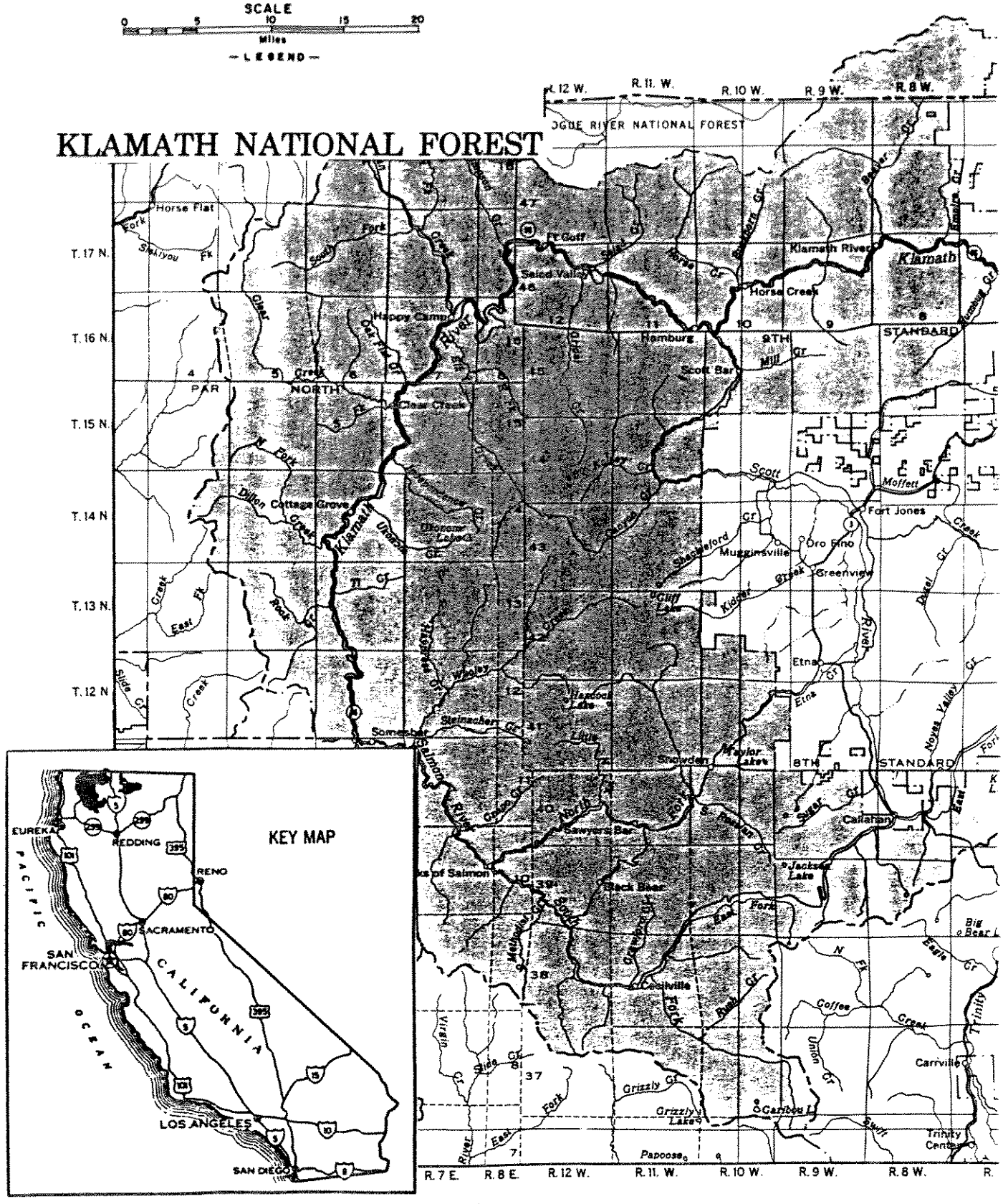


Figure 2. Study Area of the Upper South Fork of the Salmon River.

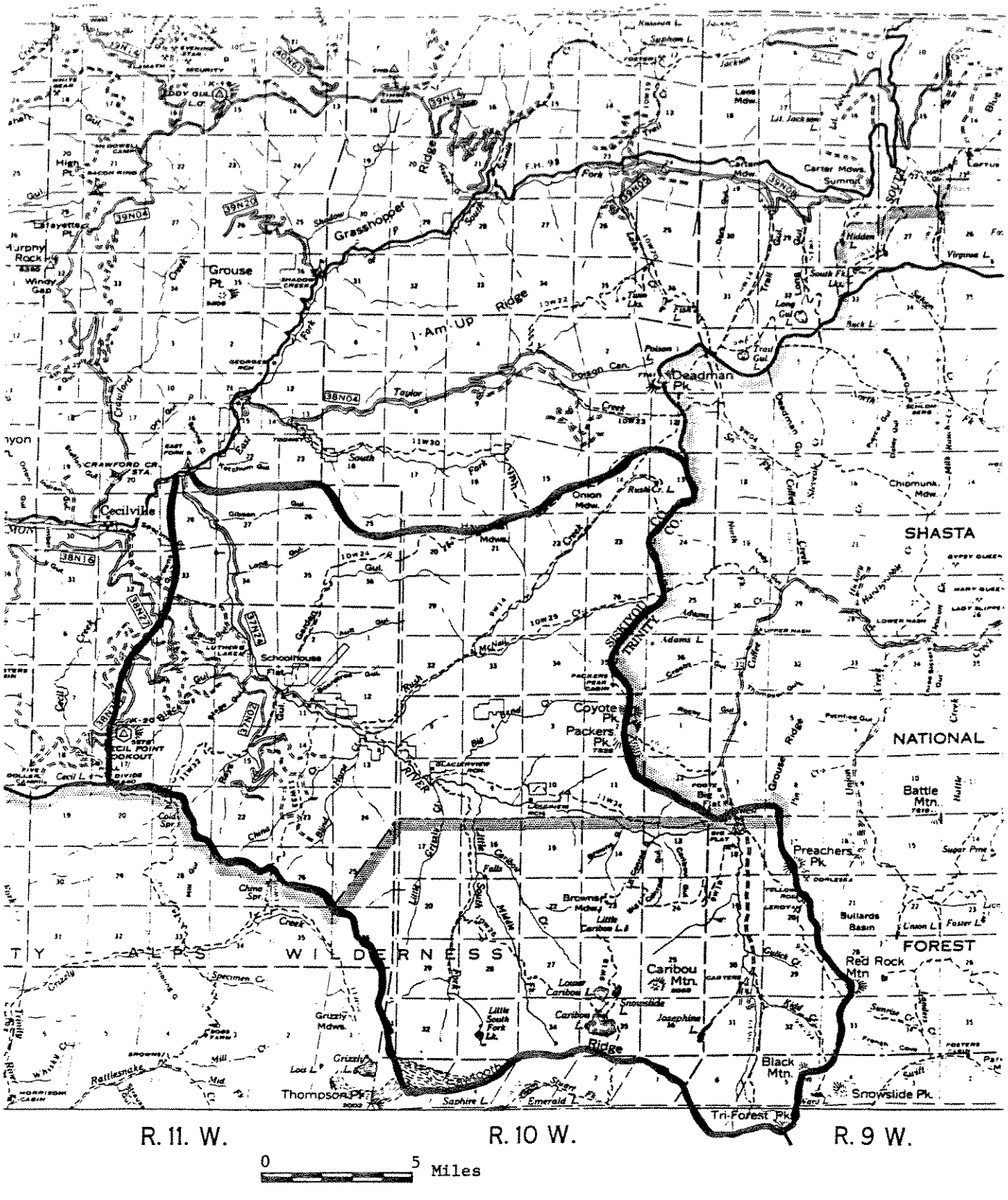
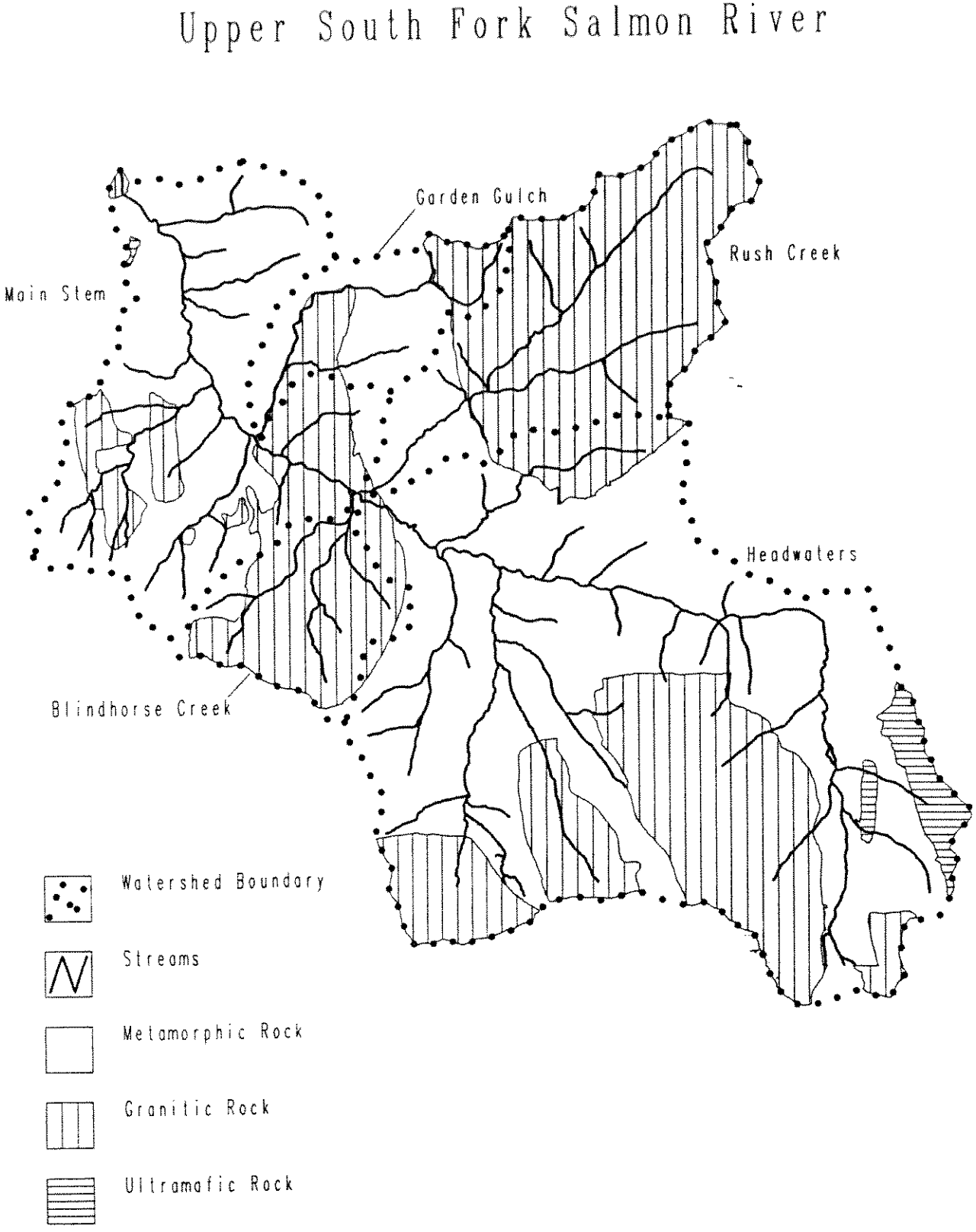


Figure 3. Map of Bedrock, Major Streams, and Watershed Boundaries



The upper reaches of the watershed, above 5,000 feet, have been carved by alpine glaciers. Glacial geomorphic features include U-shaped valleys, hanging valleys, moraines, cirques, bedrock basins, marshes and meadows. Glacial deposits occur in upper headwater areas of tributary streams. These deposits (combined with stream terraces) occupy 11% of the watershed. The South Fork of the Salmon River takes an abrupt westward bend near Big Flat. The abrupt change in direction of flow of the river is the result of stream capture (Hershey, 1902). During the southerly retreat of a large glacier in the Coffee Creek Valley, a large terminal moraine was left behind. This condition then allowed Coffee Creek to flow over the low drainage divide to the west and into the South Fork of the Salmon River.

C. *Soils-*

The soils in this area have been identified in the Order 3 Soil Resource Inventory of the Klamath National Forest. There are two general groupings of the soils. The first are those residual soils formed from metamorphic and ultramafic rocks. The predominant families are the Clallam and Holland soils. These soils are moderately deep or deep, and have gravelly loam surface textures over loam or clay loam subsoils. Erosion hazard ratings are typically high. The second group of soils are residual soils formed from granite and quartz diorite. These are predominately soils of the Gilligan family. Surface textures are sandy loam over sandy loam subsoils. Erosion hazard ratings are generally very high. **Figure 3** shows the distribution of granitic, metamorphic, and ultramafic parent material in the basin.

D. *Climate-*

The climate of the Upper South Fork drainage is seasonal, with the largest amount of precipitation occurring between November and March. Average annual precipitation varies from 30-70 inches in the basin (Rantz, 1967). There is a glacier at the head of the Little South Fork tributary which maintains a snowpack year around. Snow accumulation can exceed twenty feet in the upper elevations and one to two feet in the lower basin. The snowpack in protected areas has been observed in June and July. During the drought cycle of the past six years, the glacier area has been shrinking and the heavy long lasting snow packs have not occurred. Late summer thunderstorms occur with a frequency and severity that have resulted in significant damage to the riparian resources by creating heavy stream turbidity, debris flows. Major flood events occurring in 1955 and 1964 caused severe damage to the tributary stream courses and their riparian areas. There are still many miles of tributary that have not fully recovered from these two major events.

E. *Hydrology-*

Since 52% of the watershed is over 5000 feet in elevation, snowmelt plays a dominant role in stream hydrology. Prominent lakes and streams in the project area include Salmon Lake, Josephine Lake, Caribou Lakes, Snowslide Lake, Little South Fork Lake, and Rush Creek Lake. The main tributaries feeding the drainage are the Caribou Basin, Little South Fork, Grizzly Creek, Blind Horse, Rays Gulch, Blacks Gulch, and Rush Creek.

The Upper South Fork of the Salmon River originates at the head of the long glaciated valley above Big Flat. The headwater origin at Salmon Lake (elevation 7150 ft.) is surrounded by numerous springs and marshy areas set at the head of a deeply incised bedrock channel. The other major water sources for the balance of the drainage include springs, lakes, glacier and snowpack melt. The major water sources for the drainage are within the Trinity Alps Wilderness Area. **Figures 2 and 3** display major streams and watershed boundaries, respectively.

F. *Fisheries-*

The endemic fish community of the Upper South Fork of the Salmon River is composed of anadromous and resident species. The anadromous species include spring and fall run chinook salmon (*oncorhynchus tshawytscha*), summer and winter run steelhead (*O. mykiss*), coho salmon (*O. Kisutch*), and sea-run Pacific lamprey (*lampetra tridentata*). Use of the Upper South Fork of the Salmon River is predominantly by spring chinook; fall chinook may not be able to access this area during periods of base flow. Coho salmon may not use the habitat annually, and their use is probably related to the total coho escapement into the Salmon River basin. Non-anadromous species include Klamath speckled dace (*Rhinichthys osculus Klamathensis*), Klamath small scale sucker (*Catostomus rimiculus*), and Marbled sculpins (*Cottus Klamathensis*). Threespine sticklebacks (*Gasterosteus aculeatus*) may be present in the habitat, but their use of the habitat is unconfirmed.

G. *Vegetation-*

The Upper South Fork of the Salmon River Watershed supports diverse riparian areas ranging in elevation from 8880 ft. to 2400 ft. These zones contain old growth fir, mixed conifer forest, lakes, springs, meadows, alder, snow brush, and deciduous trees. The conifer component ranges from white and Douglas fir through ponderosa pine, sugar pine, and incense cedar. Alder, cottonwood, big leaf maple, live oak, and white oak, comprise the majority of deciduous trees. Yew and Madrone trees are found especially in the lower and middle reaches of Black Gulch, Stage Gulch, Rays Gulch, China and Blindhorse tributaries. The stream banks support a wide variety of annual and perennial plants and forbs.

H. *Wildlife-*

Currently there are four spotted owl conservation areas established in the Upper South Fork drainage. Many diverse populations of wildlife co-exist in the drainage. An elk population historically roamed the upper reaches of the drainage and an introduced elk herd (1990) is expected to re-populate the available habitat. Sightings of raptors, fur bearers, mountain lions, and bear have been recorded and numerous sightings and evidence were noted during this inventory. The Blindhorse sub-basin bordering the wilderness contains one of the largest contiguous blocks of old growth conifer forest on the Salmon River District. It is currently designated as a Spotted Owl habitat conservation area, and contains granitic soils, springs, and sensitive riparian areas. The elk that were re-introduced in 1990 seem to be effectively utilizing the Black Gulch, Rays Gulch, and China Creek habitats.

I. *Fire-*

The major wildfire areas which burned prior to 1925 throughout the drainage appear to be well recovered. Since 1925, the fires in the drainage have been limited to small acreage lightning caused fires. The 100% fire suppression policy, the current drought, and the introduction of additional fuels from logging and environmental manipulation indicate that the risk of an intense wildfire is high.

There have been many small lightning fires recorded during the last forty-five years throughout the Upper South Fork drainage (Appendix G). In 1917 there were two major fires in the drainage. One in the lower half of the Little South Fork burned approximately 2000 acres. The other was near the mouth of the drainage and burned 160 acres. In 1923 nearly 800 acres burned near the mouth of Rush Creek. There was also a 600 acre fire in 1924 on the west side of Packers Peak. The most recent large fire was 1971 in the Glacierview Ranch area and burned over 600 acres.

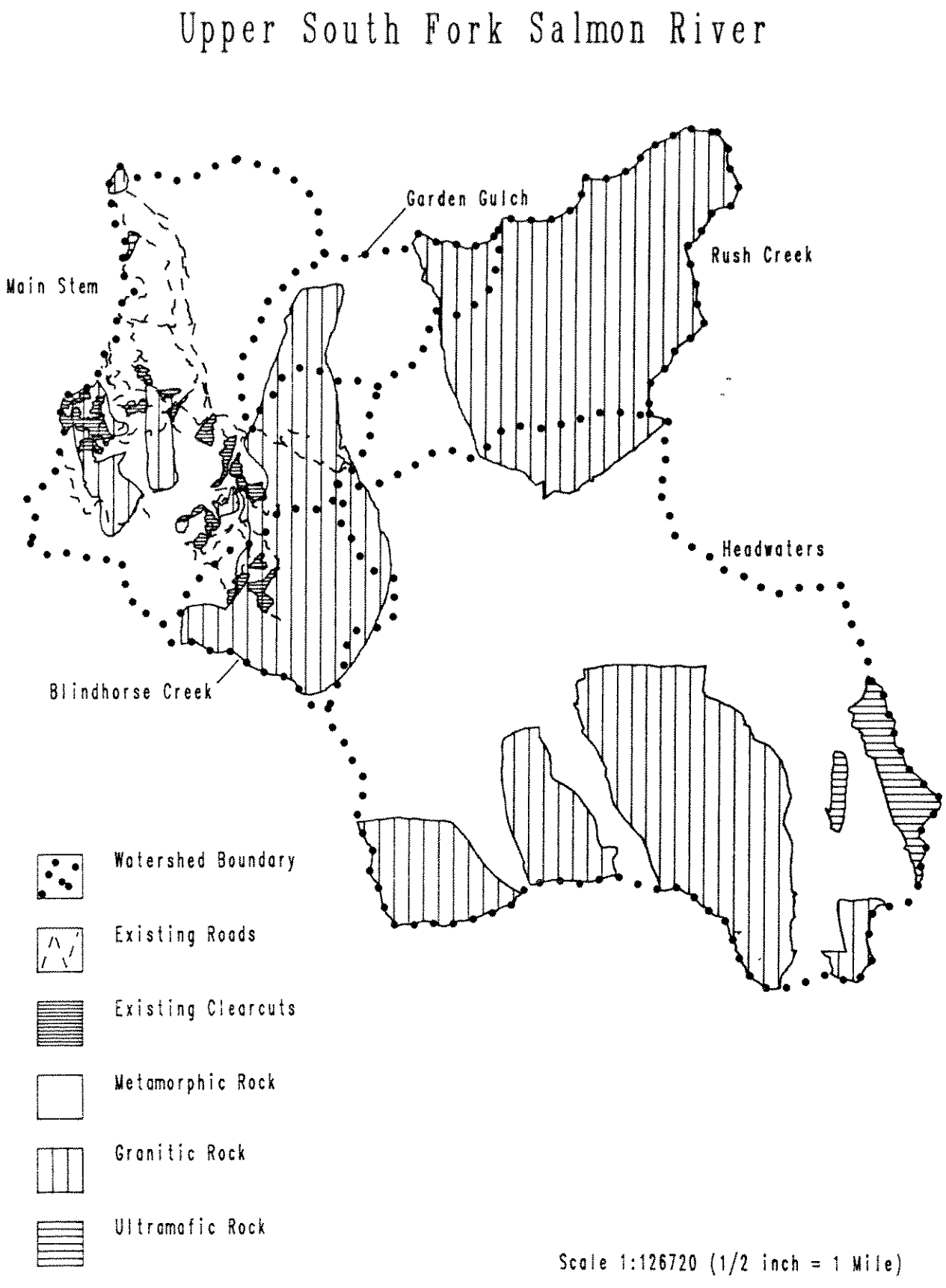
J. *Development History and Current Land Use-*

Early entry into this Upper South Fork drainage was primarily a trail from Cecilville up through the Petersburg area to the early mining and ranching settlement of Summerville. This area was settled in the late 1800's and grew to be a population center of about 3000 inhabitants. The area was dominated by heavy hydraulic mining from the confluence with the East Fork of the Salmon River up to the confluence of the Little South Fork tributary. This ten mile reach of the watershed contains numerous old water diversion ditches stemming from almost every tributary. One major water diversion ditch originated one half mile up the Little South Fork tributary and flowed through a series of syphons, flumes, piping, and hand dug ditches downstream to a point just above Long Gulch on the East side of the drainage. The portion of the ditch from Big Bend Creek down to one-half mile below Rush Creek has been washed and eroded away. Heavy mining dominated the area through the early 1940's. The last hydraulic mining operation existed until the early 1960's.

The first County road into the area was established in 1949, from Cecilville across the river to four corners and down to Petersburg. In 1967, a road was built from the confluence of the East Fork of the Salmon River and the Upper South Fork up the East side of the tributary to the Petersburg area and tied in with the original county road. This road continued to the termination point at the Rush Creek trail head. **Figures 2 and 4** display major permanent roads in the basin.

Cattle were raised in the area as early as 1880. The first sheep were grazed in the head of Rush Creek in the early 1890's. They were brought in from the Sacramento Valley, up Deer Creek on the Trinity, down the Upper South Fork to Big Flat, and up to Rush Creek via Coffee and Adams Creeks. In the early 1890's the majority of the cattle were raised in Cecilville, and on the Jordan and Lor-O Ranch. These three locations supported a total of about 300 head of cattle. The first summer season grazing allotments for ranchers in Scott Valley were granted in 1911. From 1911 to 1931 there were as many as fourteen grazing permittees utilizing

Figure 4. Map of Major Roads, Timber Harvest Units, Watershed Boundaries and Bedrock



the Rush Creek and Big Flat area with approximately 500 head of cattle. Presently there are three permittees utilizing the Garden Gulch, Upper Rush Creek, and the Big Flat areas, with total allotments of 27 horses and 125 head of cattle.

Section 31, upstream from Big Flat, is privately owned. There is road access crossing National Forest Land from Coffee Creek and Big Flat. The three miles of road are authorized by a special use permit issued in 1962. The permit was issued to allow access to the private land and Carter's Lodge. The road was originally constructed in the late 1930's by pick and shovel. The road and access is currently through Wilderness area. Access is limited to private land owners and guests of the lodge. The recreation lodge is now called Josephine Lodge and is located at the trailhead for Josephine Lake. The road is gated half a mile upstream from Big Flat campground and is closed to all public traffic except quests of Josephine Lodge. Currently, several structures exist on this private land: the main lodge complex, six summer cabins, and a logging equipment shop. The special use road was also used for hauling logs from the initial harvest of the private land (from East one-half Section 31) in the early 1960's.

Recreation has been quite extensive in the Upper South Fork drainage. The primary recreation use has been hunting, fishing, and hiking. The Rush Creek trailhead, accessed via the Salmon River Ranger District side, has had limited use. The majority of use from this trailhead has been by the private land owners of Glacerview and Lakeview Ranches. Historically, the heaviest use has been in the Big Flat area which is accessible from the Trinity side via Coffee Creek. Big Flat (a designated campground) is the major trailhead for the Caribou Lakes and the headwaters of the Upper South Fork of the Salmon River. The Big Flat campground is administered by the Shasta-Trinity National Forest.

The majority of recreation use is concentrated in the Big Flat area and the Caribou Basin. Big Flat campground and the adjacent Caribou Lake trailhead receives heavy use. The heavily used campground area has a potentially high impact on the Upper South Fork because it is located adjacent to the stream and nearly the entire upper stream bank is an active landslide. Josephine Lodge and its private access road is heavily used during the summer season. China Creek trailhead which leads to the Grizzly Lake area is also heavily used. The Rush Creek trailhead receives a moderate amount of recreational traffic; however, the majority of this use is from private land owners of Glacierview and Lakeview Ranches. Glacierview Ranch utilizes "all terrain vehicles" on the first 1.5 miles of this Wilderness Trail to carry supplies to and from the Ranch.

The original trail through Petersburg is still visible at points along the lower reaches of the river. The majority of the maintained trails are in good condition. The old Rays Gulch trail is seldom used and is mostly overgrown. The trail shown approximately two miles up the Little South Fork which crosses the Creek and heads east toward the Caribou Basin is completely overgrown with brush at about the 5200 ft. elevation. A portion of the trail from Rush Creek Lake to the head of McNeil Creek is improperly located on the maps. At the top of the ridge the trail heads east down the ridge through Section 24 for approximately three quarters of a mile and then angles west to the head of McNeil Creek. The maps show the trail going

straight along the boundary between the Salmon River Ranger District and the Shasta-Trinity National Forest.

Other than the original County road, the majority of the roads are a result of timber management activities. Several small roads that were a result of mining activities and are old, in poor condition, and are not maintained for use.

K. *Archaeology-*

Because of the historic activities in the area there are numerous archaeological sites throughout the drainage, including old can dumps, cabin sites, mining millsites, and numerous diversion ditch and hydraulic complexes.

METHODS

The Upper South Fork of the Salmon River was divided into sub-watersheds for mapping purposes using an alpha-numeric designation. Divisions were based on topographical features and known perennial and intermittent tributaries. Each perennial tributary was given a sub-watershed area using the following:

WATERSHED DESIGNATION CODE

COMPARTMENT NO. - SUB-WATERSHED NO. - STREAM NO. - TRIBUTARY LETTER/ STATION NO.

Example: 442-A-1-A 442-A-1-2

Compartment Number: Standard Forest Service compartment number for overall watershed area.

Sub-watershed Number: Defined by descending ridges within the compartment and usually contain only one Order Three watershed. Designated by letter and provide smaller area for completing riparian field observations and reporting area.

Stream Number: Used to designate each stream within a sub-watershed area. Numbers start at most downstream end and increase upstream.

Tributary Letter/Station Number: Letters indicate smaller Order One/Two tributaries with alphabetical order beginning at confluence of sub-watershed and main watershed and proceeding upstream or in a clockwise manner.

Specific tributary names are used with each watershed designation code where available.

Station numbers were established along sub-watersheds in same order as field observations usually every one quarter mile or where significant changes or features are noted. Pfankuch Stream Reach Inventory and Channel Stability Evaluations were completed between stations. Rosgen Channel Typing Classification was also determined on each reach.

Riparian areas were surveyed up to 250 ft. on both banks of all tributaries unless conditions existed which necessitated further investigation.

References made to "right" or "left" bank are oriented looking upstream.

Areas in the wilderness were surveyed in a cursory manner and detailed woody debris and snag information was not collected.

An overall review of each compartment was performed using existing information from aerial photos, fire atlas records, timber stand record cards, old harvest contracts, resource atlas, old and current transportation maps, and fisheries habitat surveys. Additional information was gathered from Fisheries, Wildlife, Archaeology, and Recreation personnel, plus interviews with the public regarding some historical facts about the area.

A scoping letter was developed and sent to the study area residents or private land owners. The scoping letter was also sent to interest groups and agencies who may have an interest in the area.

Subjective considerations were made regarding time of year (season) and the abnormal flows experienced after 5 years of severe drought. It was important to consider stream size relative to plant growth when observations were made. As indicated by Pfankuch, "Very small unbranched, first order segments will require a scaling down of sizes...". Smaller order one through three watersheds necessitated a reduction of relative values in rating the stream using the Pfankuch technique.

Data interpretation helped us identify and locate specific areas which need watershed restoration or improvement. Potential project sites were identified and catalogued using the USDA-Forest Service R-5 WIN report format (See Appendix D).

The inventory process included rating of stream channel stability, riparian area size, condition, and ecological status (**Figure 5**), and the location and extent of areas needing restoration or improvement. Map overlays were developed which displays tributaries and their channel stability ratings, roads, trails, diversion ditches, lakes, springs, archaeological sites, proposed restoration project sites, fire history, landslide locations, and location of timber management activities.

The WIN assessment utilized an interdisciplinary team approach to develop an integrated watershed improvement plan, following the guidelines set forth in the Forest Service Handbook (FSH 2509.15).

Implementation of specific projects will be based on funding availability. Project prioritization will be based on the needs of the entire Salmon River Watershed, which will be accomplished by combining the findings of this study with those of other available studies, for example, the Salmon River Sub-basin Sediment Analysis, in preparation.

Figure 5. Riparian Inventory Field Data Form

RIPARIAN INVENTORY FIELD OBSERVATIONS

Date:_____
Compartment:_____
Subwatershed:_____
Riparian Zone:_____
Weather:_____
Elev.:_____
Gradient:_____
Water Temp:_____
Pfankuch Sampling Yes_____ No_____
Location/Station #_____ Photo#_____
Perennial_____ Intermittent_____ Ephemeral_____
Rosgen Sampling Yes_____ No_____
Location/Station #_____ Photo#_____
Classification_____
Woody Debris: (cubic feet)
Location:_____ Quantity:_____
Predominant Ground Cover:_____
Predominant Tree Species:_____
Predominant Water Habitat Species:_____
Predominant Wildlife:_____
Travel Corridors:_____
Habitats:_____
Snag Inventory:_____

Notes/Mapping: (Land disturbances, document springs, trails, roads, fuel loading,etc.)

Individual Making Obervations:_____

RESULTS AND DISCUSSION

Completion of field inventories revealed the following:

Vegetative Shading-

The entire main stem of the Upper South Fork Salmon River lacks adequate vegetative shading. Marginal summer water temperature conditions (72°F) result from the broad, unvegetated floodplain found throughout the main drainage, especially in the Petersburg and Big Flat areas. Poor riparian area condition is also detrimental to the quality rearing habitat of salmon and steelhead. In addition, there is a scarcity of deep pools which influence fish rearing conditions. The lack of deep pools is probably a result of streambed mobility. Numerous landslides, flood plains, and exposed areas created by past mining activities serve as constant sediment sources which further reduces fish rearing habitat quality.

Stream Channels-

The stream channels exhibit little recent damage from major events but many reaches show signs of older major events, probably the floods of 1955 and 1964. Damage caused during the 1972 and 1974 flood events does not appear to have had a significant effect. These events did, however, slow the recovery process of the 1964 event. The streambed substrate ranges from bedrock to boulders, cobbles, and fines. The movement of granitic sands is found throughout the majority of the drainage. The main stem from Petersburg to Big Flat contains significant landslide sites which are point source sediment contributors during heavy rainfall and high water periods.

Stream and Road Inventory Results-

The inventory confirmed the location and condition of roads, streams, plantations, and lakes. There were originally 82 miles of riparian area shown on maps. Results revealed 123.2 riparian miles, and increase of 50.2%. The resulting 123.2 riparian stream miles were classed as follows: 92.5 miles perennial, 6 miles intermittent, and 24.7 miles ephemeral. The 92.5 miles of perennial were rated as follows: 3.0 miles of Poor, 20.5 miles of Fair, 59.0 miles of Good, and 10.0 miles of Excellent.

Results of Past Fish Habitat Improvement-

Extensive work has been performed by Fisheries Biologists over the past ten years from the confluence of the East Fork of the Salmon River up to the confluence with the Little South Fork. The primary focus of fisheries work on this portion of the Upper South Fork of the Salmon River was habitat condition inventory and the introduction of instream structures. The most recent habitat condition inventory was performed in 1988 and 1989 (see Appendix C). The data collected in the fisheries habitat inventory are still valid. The observations made during this riparian inventory reflect little change since that 1989 habitat inventory. In addition, PSW Forest & Range Experiment Station, in conjunction with the Salmon River Ranger

District Fisheries Department, is conducting a pool sediment study of the Upper South Fork from its confluence with the East Fork to the confluence with the Little South Fork.

Stream Turbidity and Landslides-

Stream turbidity is evident during high intensity precipitation, rainfall after an extended dry period, and during periods of spring snow melt run off. The extensive landslides and bare banks add to this turbidity. The main stem of the Upper South Fork Salmon from the Rush Creek trailhead to Big Flat (in the Trinity Alps Wilderness) contains several major active landslides which are point source sediment contributors to the stream. Sediment routing studies and long-term monitoring could provide information to evaluate the impact these landslides may have on downstream beneficial uses.

Large Woody Debris-

There is an extensive amount of large woody debris in most of the tributaries and a fairly large inventory of snags. The main stem of the Upper South Fork from the headwaters to the confluence with the East Fork lacks any significant amount of large woody debris and snags are absent from the riparian area.

Current Watershed Conditions-

Channel stability ratings in most of the Upper South Fork are primarily good to excellent (75%). Only 3% were rated as poor. From all information available, it appears that reaches which received Excellent ratings have suffered little impact from either natural catastrophes or human activities. These areas are found in topography associated with Pleistocene glacial events. The remainder of the watershed has undergone some amount of environmental modification or manipulation which has resulted in a reduction of stream channel stability and riparian zone integrity to their present conditions.

Effects of Floods, Mining, Recreation and Timber Harvest-

Natural events which affected the watershed conditions appear to have developed since the last glacial episode scoured the cirques in the headwaters of the drainage. Historic records and photos reveal that the Upper South Fork of the Salmon River has been subjected to two catastrophic floods in this century. The area has been heavily impacted by hydraulic mining since the late 1800's. The extensive hydraulic mining which occurred historically in this drainage has been detrimental to the riparian areas and fisheries habitat. There are vast tailing piles in a majority of the riparian zones and minimal topsoil left in most of these areas. Vegetative recovery of these areas has been slow to non-existent and poor soil conditions inhibit some potential rehabilitation projects. The same held true with the early construction of roads and initial timber management activities. The 1955 and 1964 floods severely impacted many sites and degraded approximately 100 miles of riparian habitat. The effects of these floods were made worse by earlier mining, road construction and timber harvest. The use of all terrain vehicles from the Rush Creek trailhead appears to be beyond what is authorized

for Glacierview Ranch and is impacting the surrounding area. Stream channel and riparian areas, especially along the main stem, are still recovering from the impacts of the floods as well as the historic impacts of hydraulic mining. This is apparent from the variable ages of riparian vegetation, the vast old tailing piles, and lack of topsoil. More recent timber management activities (timber sales since mid-70's) have followed management guidelines for the protection of riparian resources; however, some site specific problem areas were identified. **Figure 4** displays timber harvest areas and primary roads in the project area.

CONCLUSIONS

Channel stability for perennial segments is rated as 3% poor, 22% fair, and 75% good and excellent. However, when channel structure, sedimentation, and riparian cover are considered, the overall condition of the fish habitat is poor for the watershed.

Many areas of the main channel are very unstable. The area of highest risk of channel bank failure is from Petersburg Station upstream to Josephine Lodge. Stability could be improved by stream training, natural stabilization structures, and riparian planting, but to be effective it would be costly especially since about half of the high risk area is not easily accessible.

Sediment contribution to the river and tributaries is a major problem. The principal point sources of sediment are surface erosion sites and numerous raw landslides. The highest concentration of point sources is located on the river from one mile south of the Rush Creek trailhead up to Josephine Lodge. The majority of this area is within the wilderness, but is in most cases, affected by human activities. These conditions could be corrected by some stream training and extensive landslide stabilization.

River channel structure and complexity is another major problem. The lack of deep pools influences fish rearing and adult holding conditions. This problem is a result of river bed mobility which was the aftermath of the 1964 flood and years of hydraulic mining and human activity. This problem could be addressed by using natural structures and stream training to reduce sedimentation.

One of the most severe problems in the project area is the lack of riparian vegetation and resultant poor thermal conditions. The marginal summer water temperature conditions are a result of the broad, unvegetated floodplain evidenced throughout the drainage, especially in the Petersburg area and upstream from Big Flat. This resulted from the 1964 flood and extensive amount of human manipulation in the early 1900's. An extensive riparian planting and revegetation project would resolve this problem.

Conditions identified by this project have resulted in development of a diversity of opportunities critical to fisheries habitat and other beneficial uses. This watershed is diverse and has experienced a great deal of manipulation. Its size and diversity has a significant impact on the overall health and productivity of downstream habitats.

RECOMMENDATIONS

Problem areas and opportunities related to fish habitat, recreation, wildlife and timber management were identified through the WINI process. Thirty-four potential WIN projects have been identified.

Initial restoration actions should include: revegetating riparian and flood plain areas with native species, restoring suitable accumulations of woody cover, reducing sedimentation to prevent further pool filling, and controlling fish poaching during seasonal runs.

General Recommendations-

The potential impact of the active landslide on the upper bank of the stream, adjacent to Big Flat Campground should be given high priority. Similarly, the opportunity to monitor the movement of sediment should be evaluated.

The China Spring trailhead, which has become the major access to Grizzly Lake, should be further developed by providing parking, information, waste disposal, and livestock facilities.

Enforcement of restrictions on all terrain vehicle use in the Glacierview Ranch area is needed. Appropriate signing on the wilderness trail clarifying this all terrain vehicle use would be beneficial to the recreational users of the trail.

The Salmon River Ranger District and Klamath National Forest should participate with the Shasta-Trinity National Forest in the development of the Trinity Alps Wilderness Management Plan. About 75% of the upper South Fork is in the Wilderness area.

Implementation of Identified WIN Projects-

WIN projects are listed and prioritized in Tables 1 - 5 on pages 24 to 32 at the end of this section. These tables include the following:

Table 1.	Salmon River District Priority Considering all Factors	10 Projects
Table 2.	Erosion/Sedimentation Control	31 Projects
Table 3.	Fish Habitat Enhancement	9 Projects
Table 4.	Recreation Enhancement	4 Projects
Table 5.	Wildlife Enhancement	3 Projects

There are a total of 34 separate projects, some of which are repeated in several tables, since they address more than one issue. Salmon River District priority projects include the 10 highest priority projects as selected by the Watershed Improvement Needs Inventory team, and are part of the total (34 projects). The project cost figures mentioned are rough estimates and will be finalized only after interdisciplinary input on a more site specific basis. Geologic investigations will be needed on the landslide stabilization projects.

A brief description of some of the restoration proposals is presented below:

Revegetation Projects-

Proposed WIN project #34 identifies the need to revegetate riparian and flood plain areas with native species. The long-term objective is to provide adequate stream shading to moderate seasonal water temperature fluctuations and improve the quality of spawning and rearing habitat conditions. There are approximately 250 acres of riparian area in need of planting.

Additional planting areas not in the immediate riparian zone would benefit soil stability. Proposed WIN project #25 addresses the need for additional planting in the area across the river from Petersburg where road 38N01 intersects the flat area of open ground bisected by ephemeral channels. There are approximately 30 acres of this type in need of additional planting.

Stream Bank and Landslide Stabilization Projects-

Proposed WIN projects #3,8,9,11,12,13,14,15,16,17,18,19,20,21,22,23,24, and 26, address sedimentation in the watershed. There were thirty-seven landslide areas identified and documented during the inventory. Thirty of these areas are direct point source contributors of sediment into a tributary. The majority of the worst point sources are located in the wilderness area (Project #20,21,22,23,and 24) and are a result of the 1964 flood and/or previous mining activity. Most of these areas occur along lengthy reaches and are characterized by steep, raw, lower and upper stream banks that are unstable. 59 acres of actual landslide surface area were identified in the watershed and influence approximately 242 acres of riparian zone. The most critical areas are reflected in proposed Projects #17,20 and 22, two of which are located in the wilderness area. Project #17, located just outside the wilderness area encompasses the entire reach between Station 18 and 19 (one quarter mile). The area is characterized by mass wasting and landslides on both sides of the river within the flood plain. Project #20 is located in the wilderness area at the confluence with Grizzly Creek. This 10-acre area of severe landslides influences about 50 acres of riparian area and associated flood plain. This appears to be one of the main point sources of sediment input and stream turbidity in the watershed. Project #22 is a landslide located at and directly influenced by Big Flat campground. The landslide area needs to be isolated from foot traffic, stabilized with structures and planting and the drainage from the campground needs to be re-directed away from the landslide area.

Mining Excavation Stabilization Projects-

Proposed Projects #1,2,4,6 and 10, address problems from old mining leads and channels created by the extensive hydraulic mining activity in the lower reaches of the watershed. These leads serve as unrestricted water and sediment flow channels from riparian areas directly into the main river during periods of high overland flow. It would be beneficial, using available natural materials (rock and woody debris), to place erosion control structures

across the mining leads to re-direct and disperse water flow. This could be supported by planting in areas where top soil is available.

Road Stabilization Projects-

Proposed WIN projects #27,28,30,31,32 and 33, involve the road systems in the Upper South Fork drainage. There are several roads not in use which are catalysts for some surface erosion in the drainage. Approximately five miles of road could be obliterated, blocked, or re-structured to alleviate erosion, maintenance, and safety hazards.

Wetlands Development Projects-

Proposed Project #5 is an opportunity to create a wetlands complex to benefit a diversity of species and enhance fisheries habitat, wildlife, scenic values, and recreation. The site is a two mile reach of the Upper South Fork centered around the Petersburg area. At present, the area is a "biological desert", with the exception of several small seeps and ponds. This particular location was heavily impacted by early hydraulic mining and the 1964 flood. Most of the site was hydraulic mined down to bedrock and the top soil was lost. The River which bisects this area, and the surrounding riparian areas are in very poor condition. Restoration of fisheries habitat coupled with a wetlands project could result in an increase in biological productivity and diversity. In addition to the potential recreation benefits, the filtering and cleansing effects of a marsh could increase the number of nesting waterfowl, provide elk wintering habitat, fish rearing habitat, and improved water retention capacity.

Abandoned Dump Cleanup Projects-

Project #7 includes cleanup of an old can dump near the Petersburg Fire Station.

Table 1. DISTRICT TOP TEN RANKING FOR WINI PROJECTS

RANKING	PRIORITY	PROJECT #	EST. COST*	PROBLEM	BENEFIT	TREATMENT
1	high	5	$200,000	poor fish habitat	enhancement of fish habitat	erosion control structures, riparian planting, pooling
2	high	34	$30,000	no riparian cover	improved fish habitat	riparian planting
3	high	22	$10,000	erosion	preserve campground, decrease sediment	erosion controls
4	high	33	$15,000	no established trailhead facility	improved recreation	effectively manage resources for trailhead
5	high	7	$10,000	biologically significant hazard	visual and safety improvement	clean up
6	high	17	$10,000	poor fish habitat, mass wasting, erosion	enhancement of fish habitat	erosion control, planting
7	high	20	$10,000	poor fish habitat	enhancement of fish habitat	erosion control, channel training, planting
8	high	31	$15,000	erosion and compaction	soil stabilization and productivity	rehab landing, divert water, revegetate, subsoiling
9	high	32	$15,000	soil erosion and compaction	soil stabilization and productivity	divert water, revegetate, subsoiling

Table 1. DISTRICT TOP TEN RANKING FOR WINI PROJECTS (continued)

RANKING	PRIORITY	PROJECT #	EST. COST*	PROBLEM	BENEFIT	TREATMENT
10	high	30	$15,000	soil erosion	soil stabilization	road obliteration, erosion control, revegetation

Table 2. RANKING TABLE FOR EROSION/SEDIMENTATION CONTROL

RANKING	PRIORITY	PROJECT #	EST. COST*	PROBLEM	BENEFIT	TREATMENT
1	high	17	$10,000	sediment; mining, roads	fish habitat and water quality	erosion control, revegetation
2	high	20	$10,000	sediment: mining, roads	fish habitat and water quality	erosion control, channel training, bank stabilization, planting
3	high	21	$5,000	sediment; erosion, bank stabilization	fish habitat and water quality	erosion control, relocate trail, planting
4	high	8	$5,000	sediment; slides, mining	fish habitat and water quality	erosion control, stabilization, planting
5	high	9	$5,000	sediment; slides, mining	fish habitat and water quality	stabilization and revegetation
6	high	11	$5,000	sediment; mining, slides	fish habitat and water quality	erosion control and revegetation
7	high	13	$2500	sediment; mining, mass wasting	fish habitat and water quality	stabilization and revegetation
8	high	14	$2500	sediment; mass wasting	fish habitat and water quality	stabilization and revegetation
9	high	15	$1000	sediment; mass wasting,	fish habitat and water quality	stabilization and revegetation
10	high	16	$2500	sediment; erosion, mining	fish habitat and water quality	stabilization and revegetation

Table 2. RANKING TABLE FOR EROSION/SEDIMENTATION CONTROL (continued)

RANKING	PRIORITY	PROJECT #	EST. COST*	PROBLEM	BENEFIT	TREATMENT
11	high	17	$10,000	sediment; mining, mass wasting	fish habitat and water quality	erosion control, stabilization, revegetation
12	high	18	$2500	sediment; mining	fish habitat and water quality	erosion control and revegetation
13	high	19	$1500	sediment; erosion, mass wasting	fish habitat and water quality	stabilization and revegetation
14	high	22	$10,000	sediment; slides, erosion	fish habitat and water quality	erosion control, stabilization, revegetation
15	high	23	$10,000	sediment; slides	fish habitat and water quality	stabilization, erosion control, revegetation, channel training
16	high	24	$2500	sediment; slides	fish habitat and water quality	stabilization and revegetation
17	high	3	$10,000	sediment; erosion, roads	fish habitat and water quality	road obliteration, stabilization, revegetation
18	moderate	26	$3,000	sediment; slides	fish habitat and water quality	erosion control and revegetation
19	moderate	27	$10,000	sediment; erosion, mining, roads	fish habitat and water quality	erosion control, road obliteration, revegetation
20	high	28	$5,000	road failure	soil stabilization	erosion control and stabilization

Table 2. RANKING TABLE FOR EROSION/SEDIMENTATION CONTROL (continued)

RANKING	PRIORITY	PROJECT #	EST. COST*	PROBLEM	BENEFIT	TREATMENT
21	high	29	$750	sediment; erosion gully through cut block	soil stabilization	natural structures and planting
22	high	30	$15,000	soil erosion	soil stabilization	road obliteration, erosion control, revegetation
23	high	31	$15,000	erosion and compaction	soil stabilization and productivity	rehab landing, divert water, and revegetate, subsoilling
24	high	32	$15,000	soil erosion and compaction	soil stabilization and productivity	diverting water, revegetation and subsoilling
25	high	12	$5,000	sediment; slide and erosion	fish habitat and water qualtiy	erosion control and revegetation
26	high	25	$2500	erosion	fish habitat and water qualtiy	erosion control and revegetation
27	low	1	$300	sediment; mining	fish habitat and water quality	natural erosion structures
28	low	2	$300	sediment; mining	fish habitat and water quality	natural erosion structures
29	low	4	$300	sediment; mining	fish habitat and water quality	natural erosion structures
30	high	6	$3,000	sediment; mining	fish habitat and water quality	stabilization, erosion control, revegetation

Table 2. RANKING TABLE FOR EROSION/SEDIMENTATION CONTROL (continued)

RANKING	PRIORITY	PROJECT #	EST. COST*	PROBLEM	BENEFIT	TREATMENT
31	moderate	10	$500	sediment; erosion, mining	fish habitat and water quality	natural material erosion control and revegetation

Table 3. RANKING TABLE FOR FISH HABITAT ENHANCEMENT

RANKING	PRIORITY	PROJECT #	EST. COST*	PROBLEM	BENEFIT	TREATMENT
1	high	34	$30,000	no riparian cover	improved fish habitat	riparian planting
2	high	5	$200,000	poor fish habitat	enhancement of fish habitat	erosion control structures, riparian planting, pooling
3	high	17	$10,000	poor fish habitat, mass wasting, erosion	enhancement of fish habitat	erosion control, planting
4	high	20	$10,000	poor fish habitat	enhancement of fish habitat	erosion control, channel training, planting
5	high	21	$5,000	sediment; erosion, bank stabilization	fish habitat and water quality	erosion control, relocate trail, planting
6	high	8	$5,000	sediment; slides, mining	fish habitat and water quality	erosion control, stabilization, planting
7	high	9	$5,000	sediment; slides, mining	fish habitat and water quality	stabilization and revegetation
8	high	11	$5,000	sediment; mining, slides	fish habitat and water quality	erosion control and revegetation
9	high	13	$2500	sediment; mining, mass wasting	fish habitat and water quality	stabilization and revegetation

Table 4. RANKING TABLE FOR RECREATION ENHANCEMENT

RANKING	PRIORITY	PROJECT #	EST. COST*	PROBLEM	BENEFIT	TREATMENT
1	high	22	$10,000	erosion	preserve campground, decrease sediment	erosion controls
2	high	5	$200,000	poor system quality	improved rec. access and quality of system	extensive rehabilitation
3	high	33	$15,000	no established trailhead facility	improved recreation	effectively manage resources for trailhead
4	high	7	$10,000	biologically significant hazard	visual and safety improvement	clean up

Table 5. RANKING TABLE FOR WILDLIFE ENHANCEMENT

RANKING	PRIORITY	PROJECT #	EST. COST*	PROBLEM	BENEFIT	TREATMENT
1	high	5	$200,000	poor riparian quality	riparian rehabilitation	extensive rehabilitation of riparian area
2	high	34	$30,000	poor riparian cover	improved riparian condition	riparian planting
3	high	7	$10,000	biologically significant hazard	visual and safety improvement	clean up

SUMMARY OF EXPENDITURES

COOPERATIVE AGREEMENT 14-16-0001-91522
PROJECT 91-HP-7
11333-1331-1045
SOUTH FORK OF THE SALMON RIVER WATERSHED IMPROVEMENT NEEDS INVENTORY

	USFS	*USF&WS*
Salaries (including Benefits)	$500	$18,500
Travel and Transportation	$400	0
Non-expendable Equipment and Material (Supplies)	$1,000	0
Expendable Equipment	$2,000	0
Operation and Maintenance	$2,600	0
General Administrative Expenses (Overhead)	$3,500	0
Subtotal	$10,000	$18,500

Total Project Cost $28,500

ACKNOWLEDGEMENTS

Work reported in this paper was conducted under a cooperative agreement between the U.S. Forest Service and the U.S. Fish and Wildlife Service under Interagency Agreement 14-16-0001-91522, Project 91-HP-7,11333-1331-1045.

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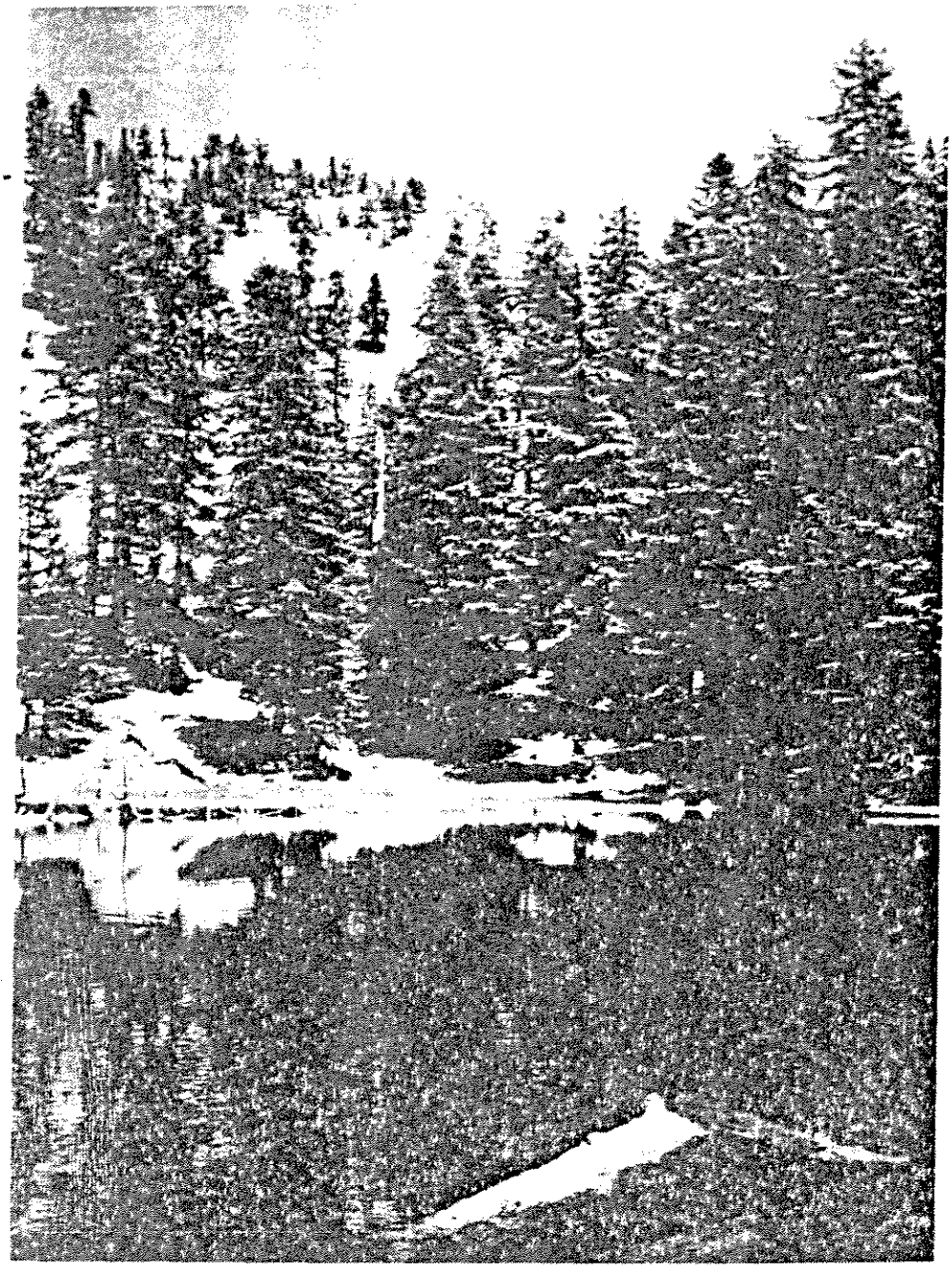
UPPER SOUTH FORK OF THE SALMON RIVER RIPARIAN STUDY



KLAMATH NATIONAL FOREST
SALMON RIVER RANGER DISTRICT