

INSTREAM FLOW REPORT SERIES

RELATIONSHIPS REPORT
1A- AQUATIC HABITAT
FLOW RELATIONS
1B- OTHER INSTREAM
RELATIONSHIPS AND
1C- MITIGATION OPPOR

ECONOMIC FLOW
RELATIONSHIPS REPORT
(POWER REPORT)

*July 10, Hancock Materials -
Sutcliffe Agency Workshops 1,
Jonestown Plan Studies
February 15, 1984*

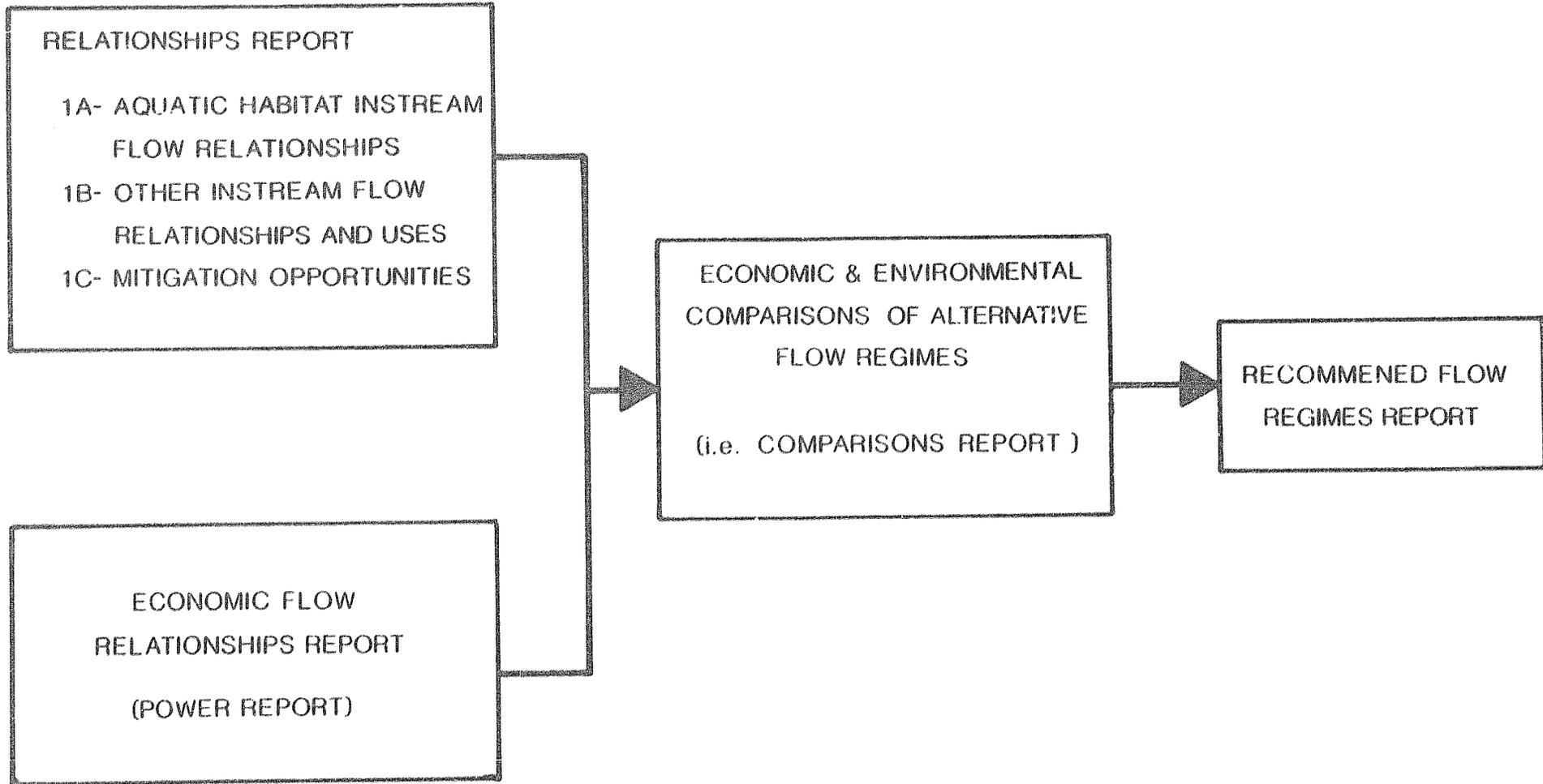
ENVIRONMENTAL
OF ALTERNATIVE
REGIMES
(ENVIRONMENTAL IMPACT
STATEMENTS REPORT)



RECOMMENDED FLOW
REGIMES REPORT

*E. Manderson
T. Arminski*

INSTREAM FLOW REPORT SERIES



*E. Mardikian,
T. Arminski*

SCHEDULE OF UPCOMING AQUATIC WORKSHOPS

WORKSHOP 2

MARCH 29, 1984

TOPIC: AQUATIC STUDIES WORKSCOPE FY84, FY85

REPORTS AVAILABLE: LOWER RIVER PLAN OF STUDY
NAVIGATION PLAN OF STUDY

WORKSHOP 3

APRIL 27, 1984

TOPIC: FISHERIES HABITAT RESPONSE TO ALTERATION OF INSTREAM
TEMPERATURE AND ICE CONDITIONS

REPORTS AVAILABLE: FINAL AEIDC MONTHLY TEMPERATURE SIMULATION
FINAL USFWS INCUBATION REPORT
DRAFT RESERVOIR TEMPERATURE CALIBRATION
REPORT
DRAFT ICE MODEL CALIBRATION REPORT
AEIDC WEEKLY TEMPERATURE SIMULATION REPORT
(NOT COMPLETE BUT INFORMATION AVAILABLE)

WORKSHOP 4

MAY 29. 1984

TOPIC: WATERSHED PROCESSES/SEDIMENTATION/TURBIDITY/ACCESS

REPORTS AVAILABLE: FINAL RIVER RESERVOIR SEDIMENT STUDY
FINAL GROUNDWATER REPORT
DRAFT WATER QUALITY REPORT
DRAFT AQUATIC HABITAT AND INSTREAM FLOW
REPORT

WORKSHOP 5

JUNE 29. 1984

TOPIC: CORRELATION BETWEEN SPECIES SPECIFIC HABITAT AND RIVER
HYDRAULICS

REPORTS AVAILABLE: DRAFT AQUATIC HABITAT AND INSTREAM FLOW
REPORT
DRAFT RESIDENT AND JUVENILE ANADROMOUS
REPORT
HABITAT RELATIONSHIPS REPORT (NOT COMPLETE
BUT INFORMATION AVAILABLE)

WORKSHOP 6

JULY 29, 1984

TOPICS: FORECAST OF PROJECT INDUCED WATER QUALITY CHANGES AND
THEIR EFFECT ON FISH

PARTIAL NAVIGATION AND RECREATION ANALYSES

REPORTS AVAILABLE: DRAFT WATER QUALITY REPORT
NAVIGATION AND RIVERINE RECREATION REPORTS
(MAY NOT BE COMPLETE BUT INFORMATION
AVAILABLE)

WORKSHOP 7

AUGUST 29, 1984

TOPIC: FINDINGS OF THE HABITAT RELATIONSHIPS REPORT

REPORTS AVAILABLE: DRAFT HABITAT RELATIONSHIPS REPORT
FINAL RESERVOIR TEMPERATURE/ICE REPORT
FINAL INSTREAM TEMPERATURE REPORT
FINAL INSTREAM ICE REPORT

WORKSHOP 8

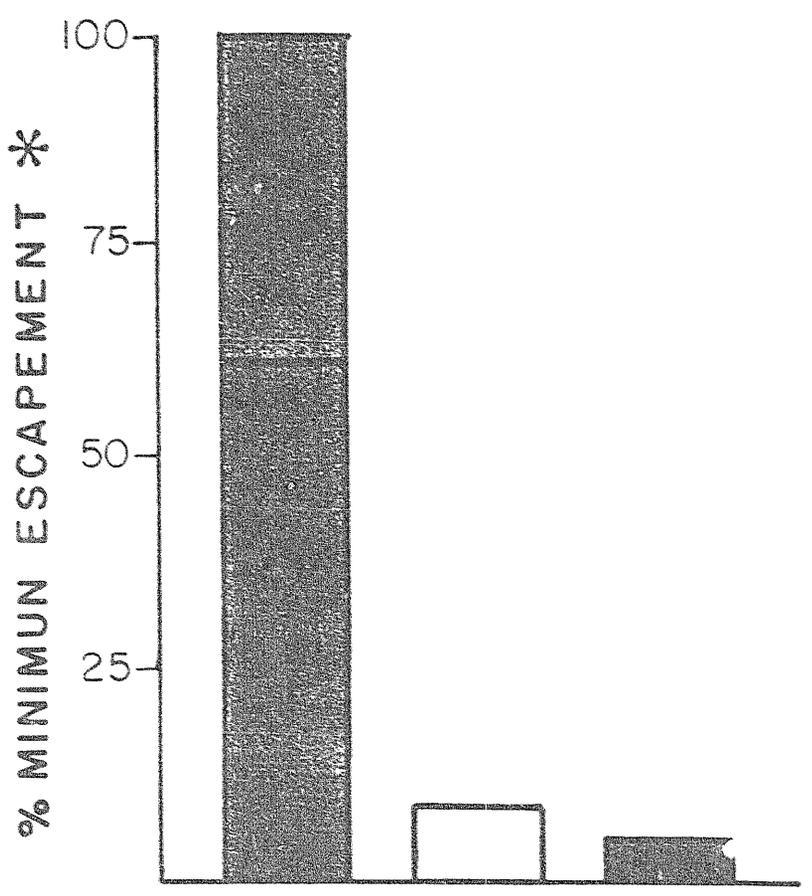
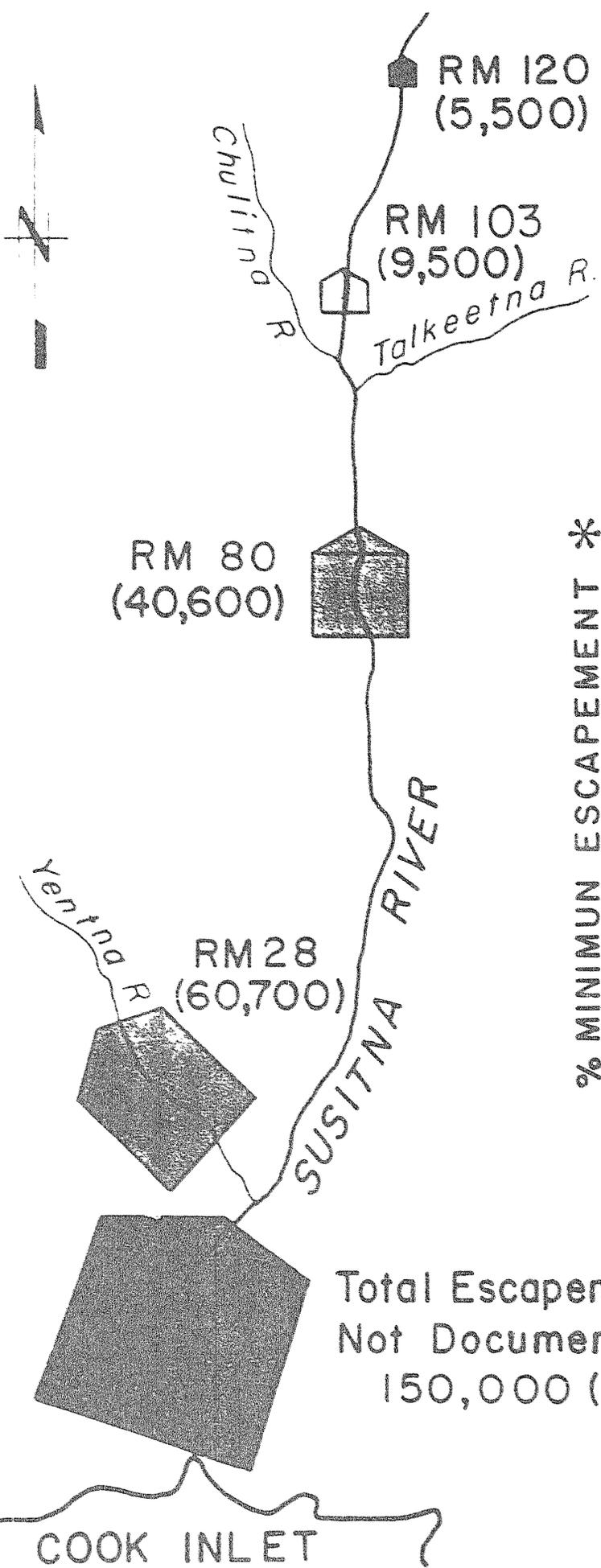
SEPTEMBER 15, 1984

TOPIC: PROJECT MITIGATION OPPORTUNITIES

REPORTS AVAILABLE: DRAFT MITIGATION OPPORTUNITIES REPORT

E. Barrett

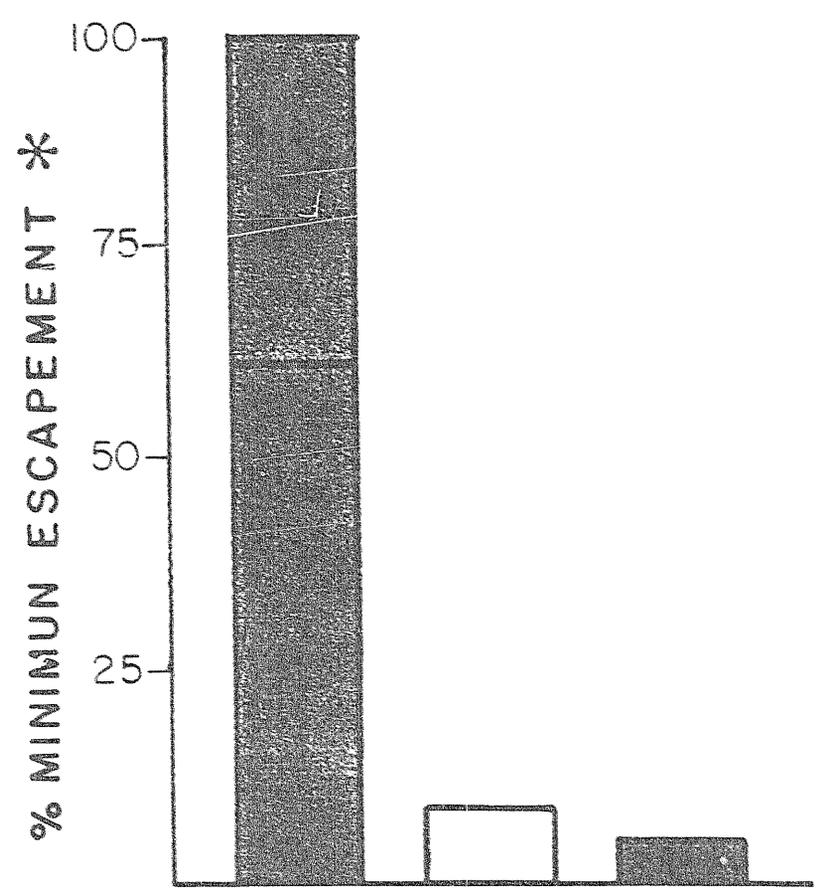
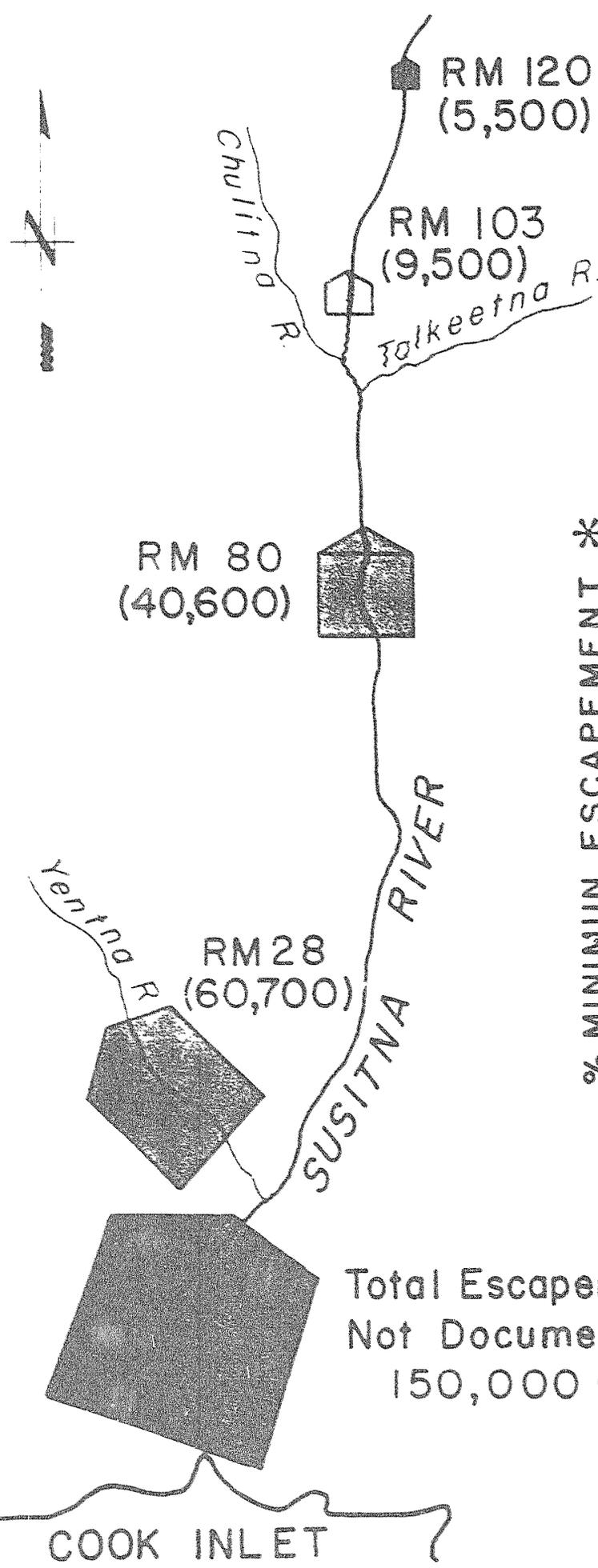
SUSITNA 1983 PINK ESCAPEMENT



* Min. Escapement = Yentna River Plus Above RM 80

B. BOVETT

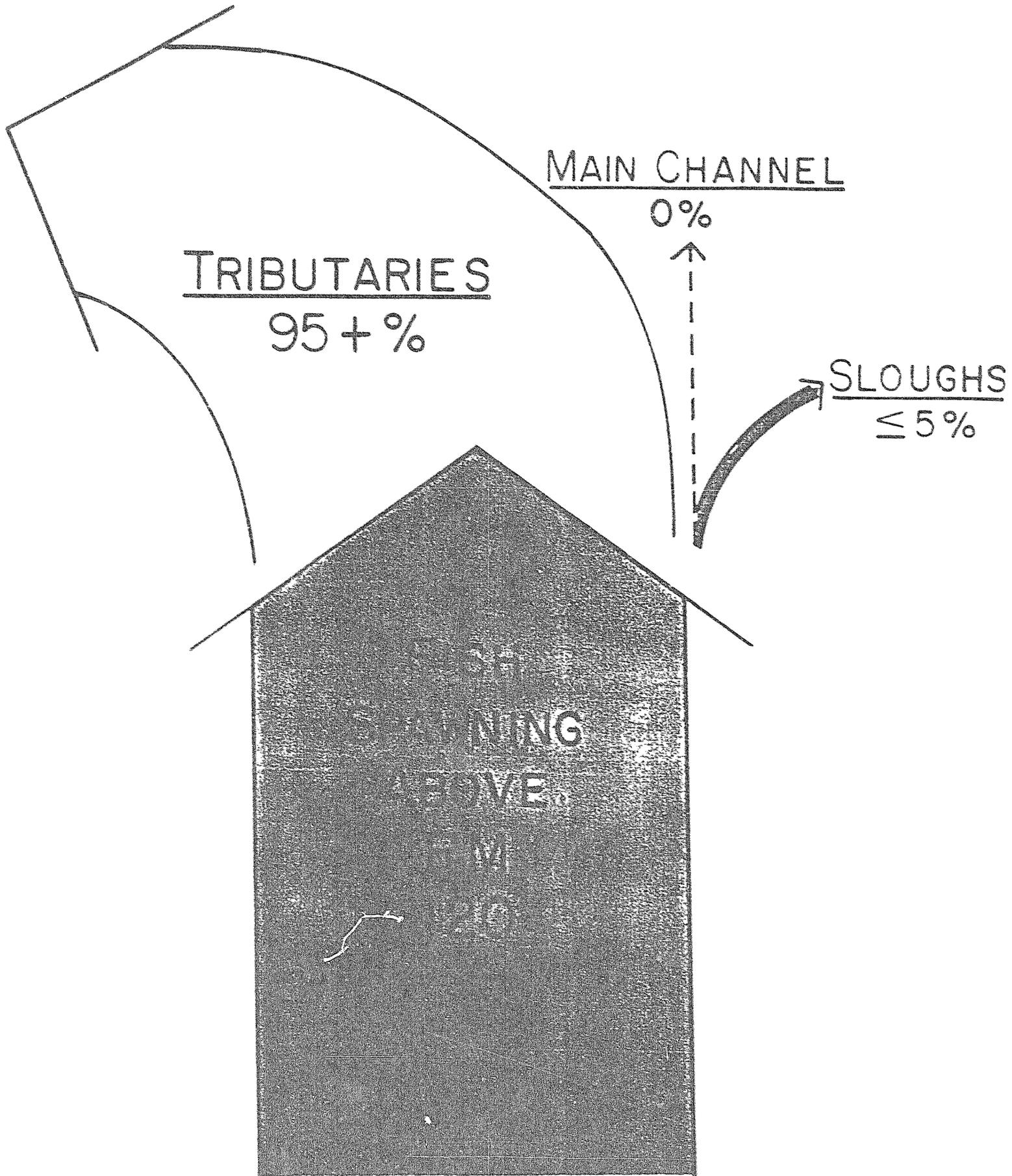
SUSITNA 1983 PINK ESCAPEMENT



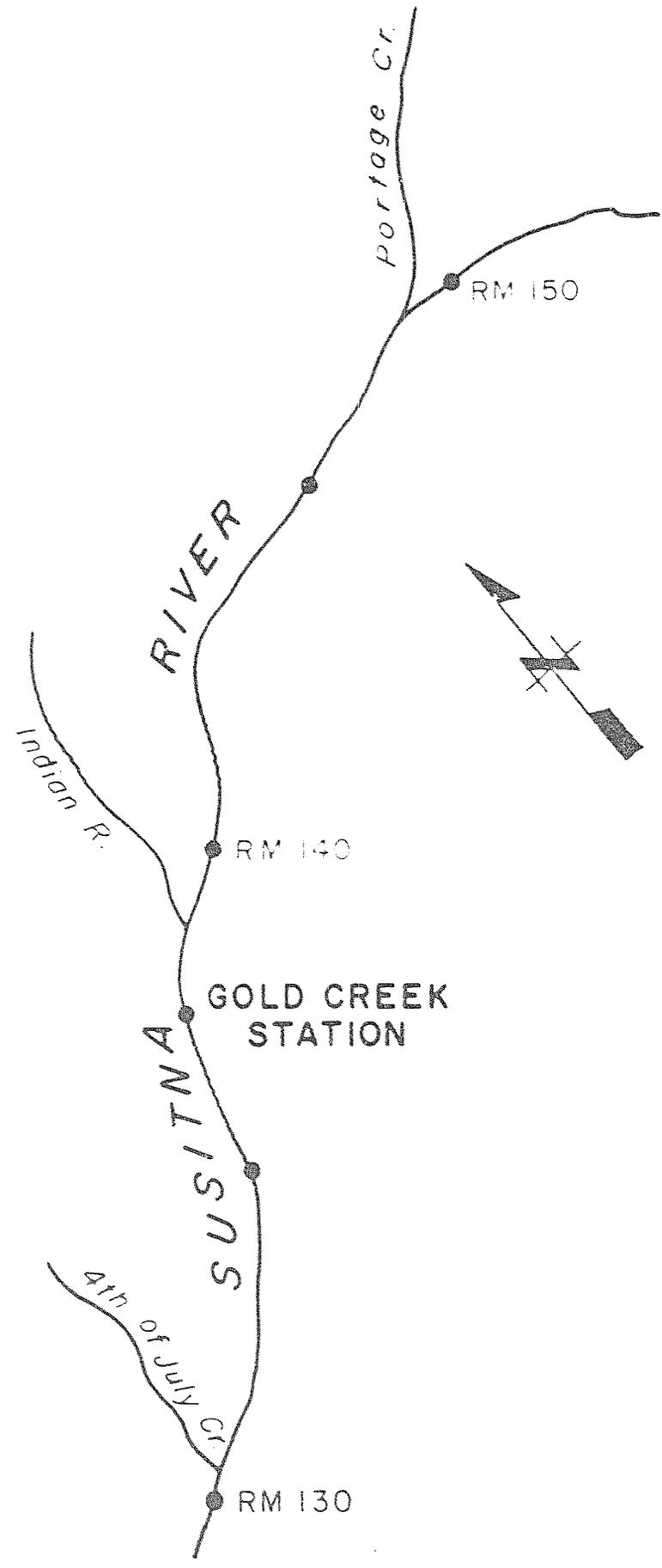
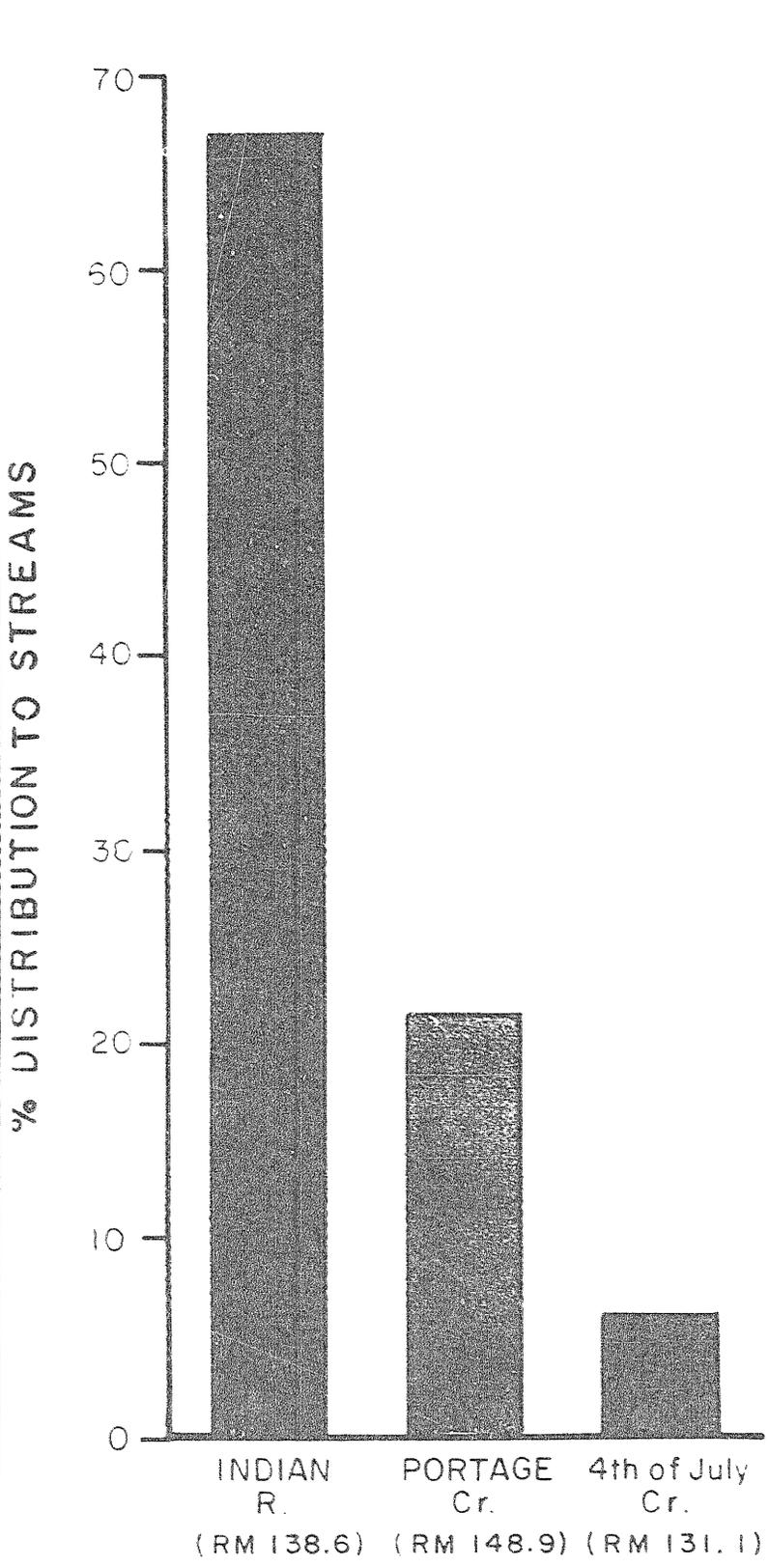
* Min. Escapement = Yentna River Plus Above RM 80

Total Escapement
Not Documented
150,000 (?)

1983 PINK SPAWNING AREAS



1983 MAJOR PINK SALMON SPAWNING STREAMS ABOVE RM 98.6



CONTRIBUTION
OF SUSITNA RIVER TO
UPPER COOK INLET

COMMERCIAL CHUM SALMON CATCH :

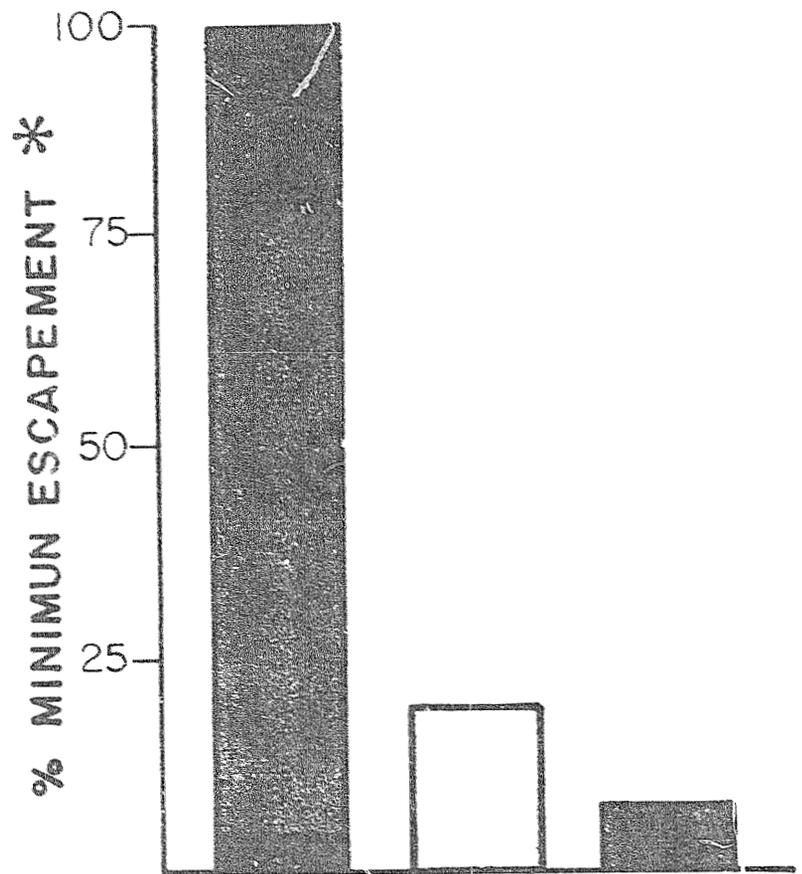
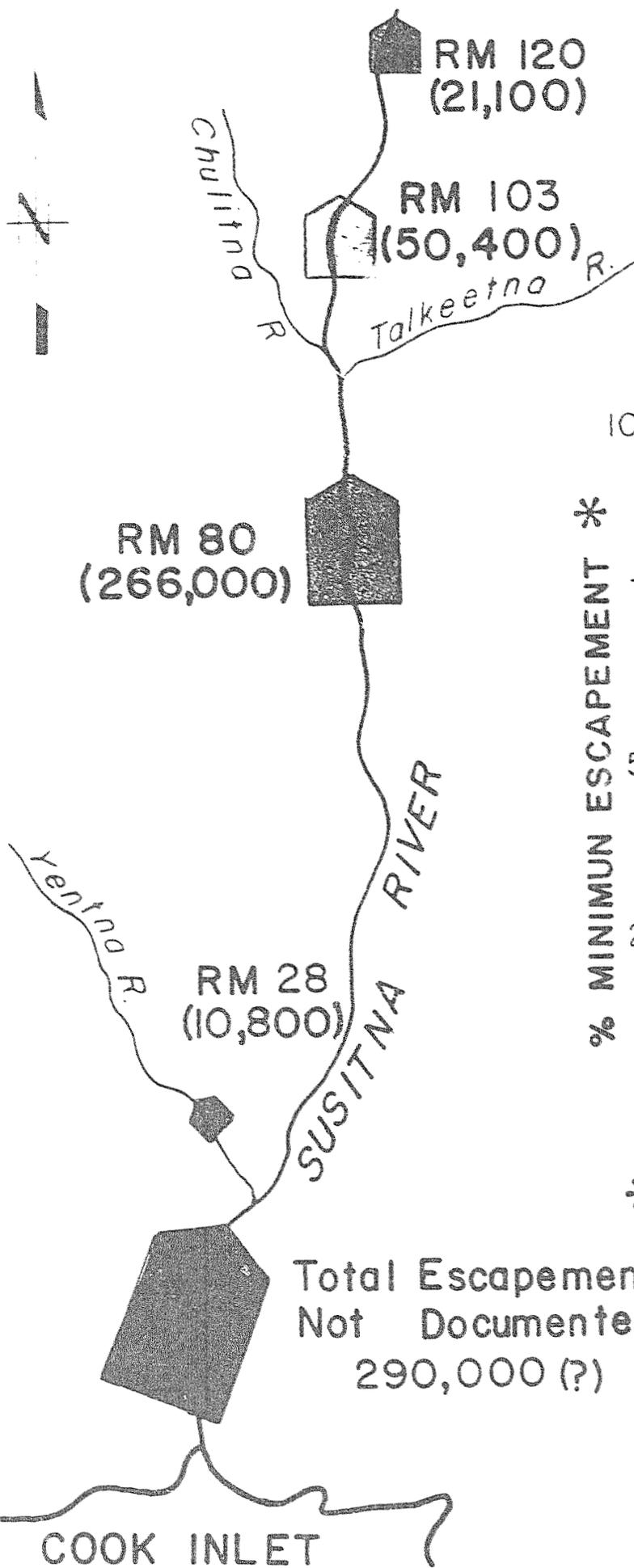
≈ 80-90%[↓]

1983 HARVEST (PRE.) ≈ 1.1 MILLION

10 YEAR AVERAGE (74-83) ≈ 0.8 MILLION

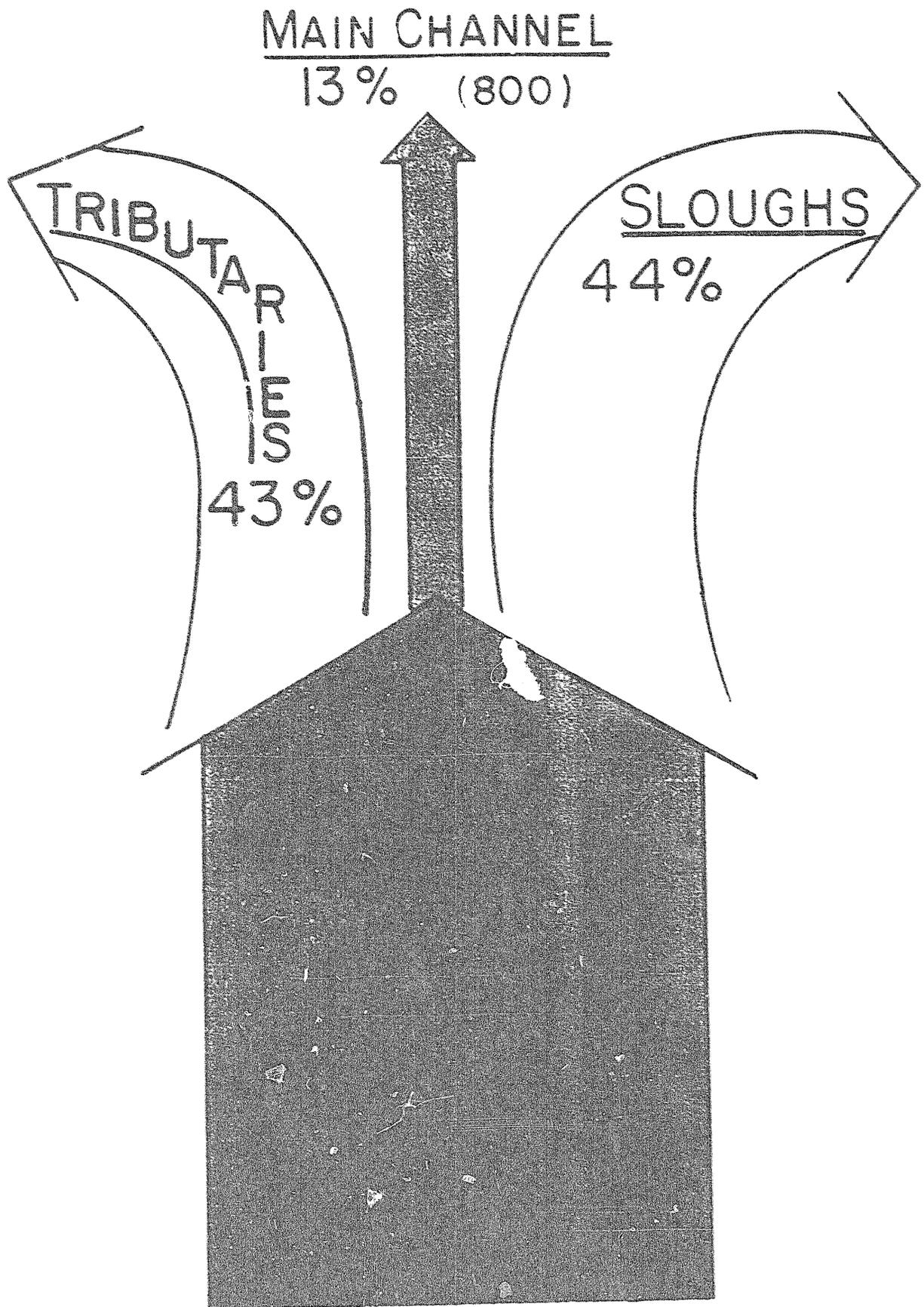
[↓]
BASED ON PROFESSIONAL JUDGEMENT

SUSITNA 1983 CHUM ESCAPEMENT

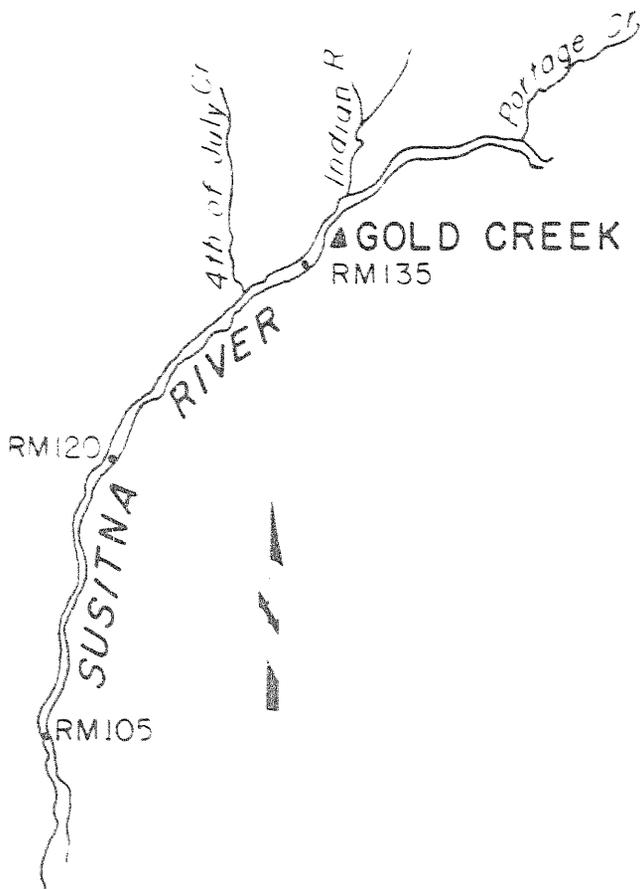
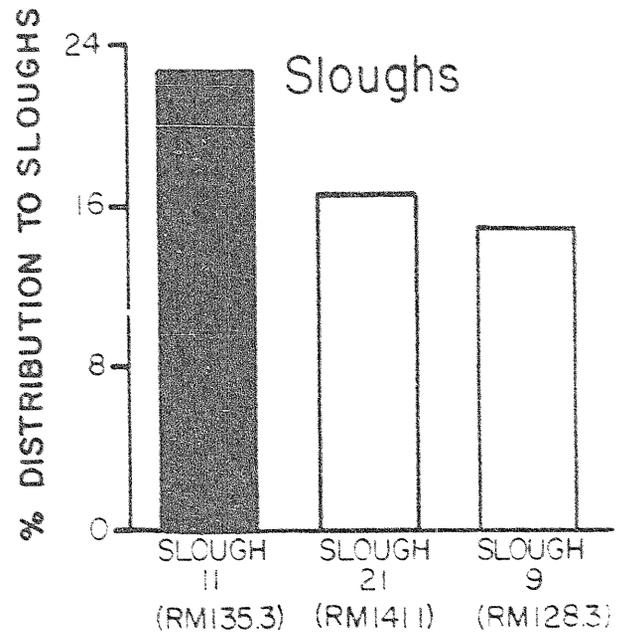
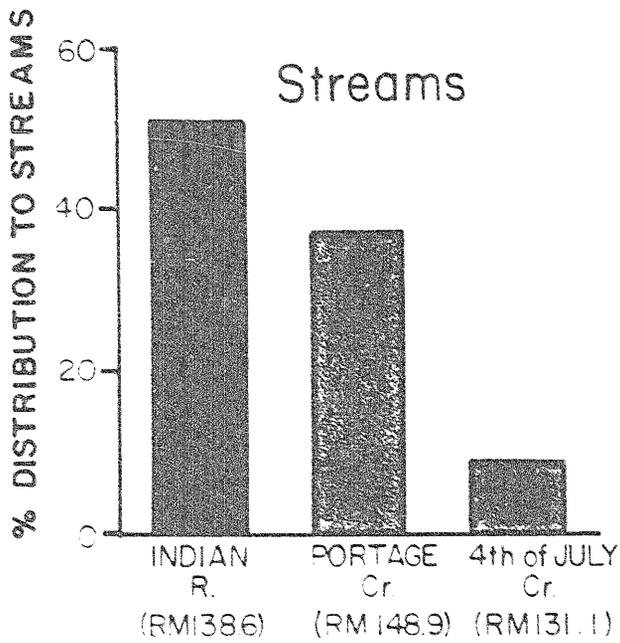


* Min. Escapement = Yentna River Plus Above RM 80

1983 CHUM SPAWNING AREAS



1983 MAJOR CHUM SALMON SPAWNING AREAS ABOVE RM 98.6



CONTRIBUTION
OF SUSITNA RIVER TO
UPPER COOK INLET

COMMERCIAL COHO SALMON CATCH :

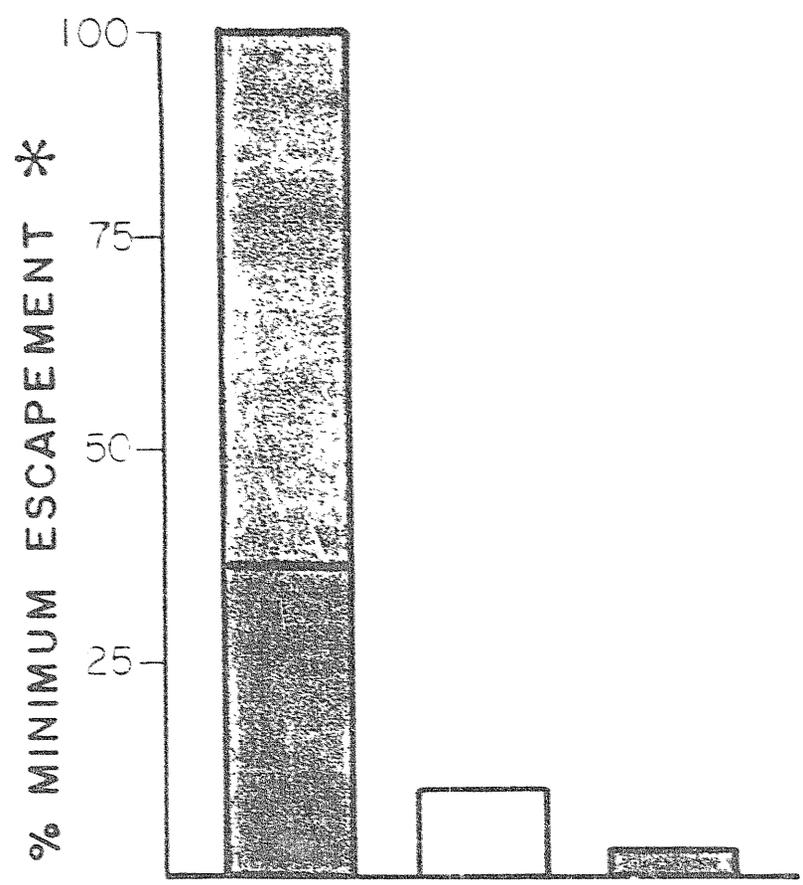
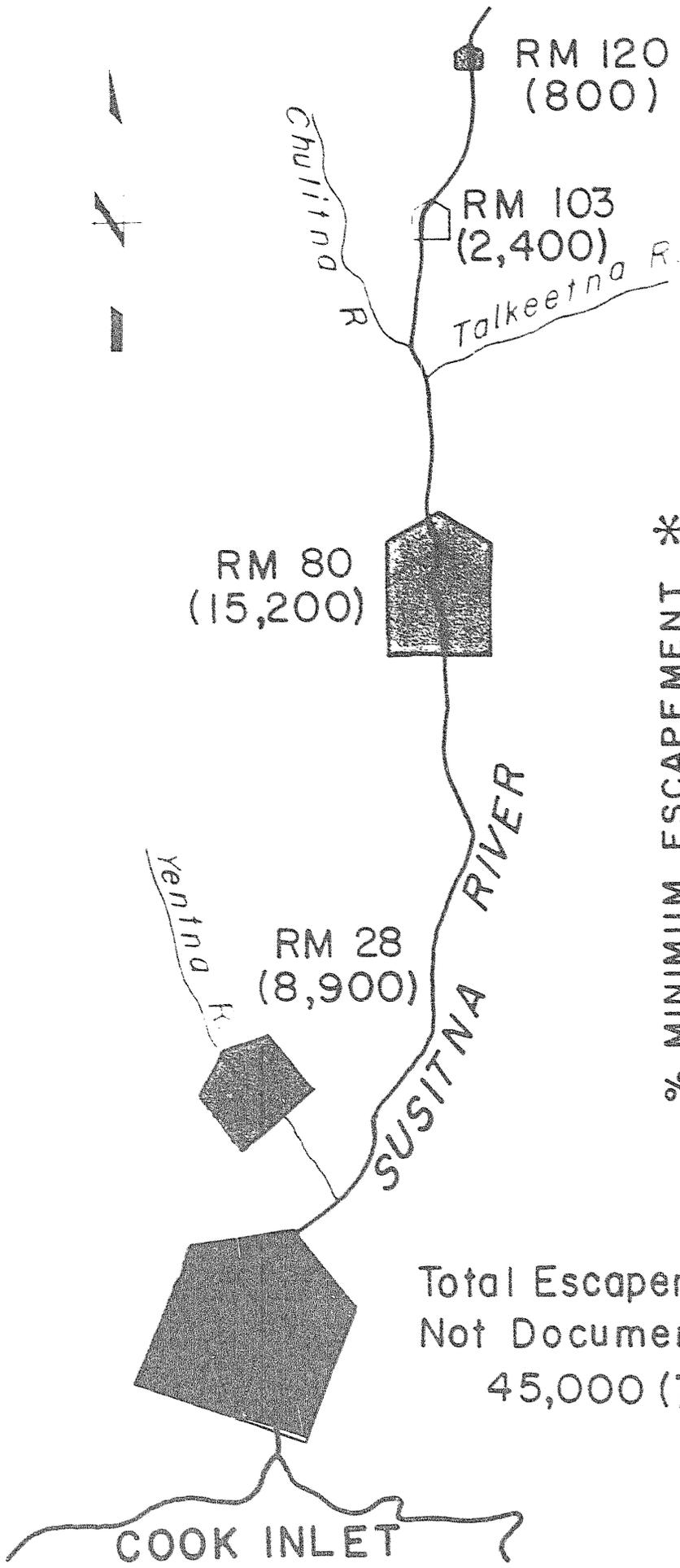
$\approx 50\%$ ✓

1983 HARVEST (PRE.) \approx 500 THOUSAND

10 YEAR AVERAGE (74 - 83) \approx 340 THOUSAND

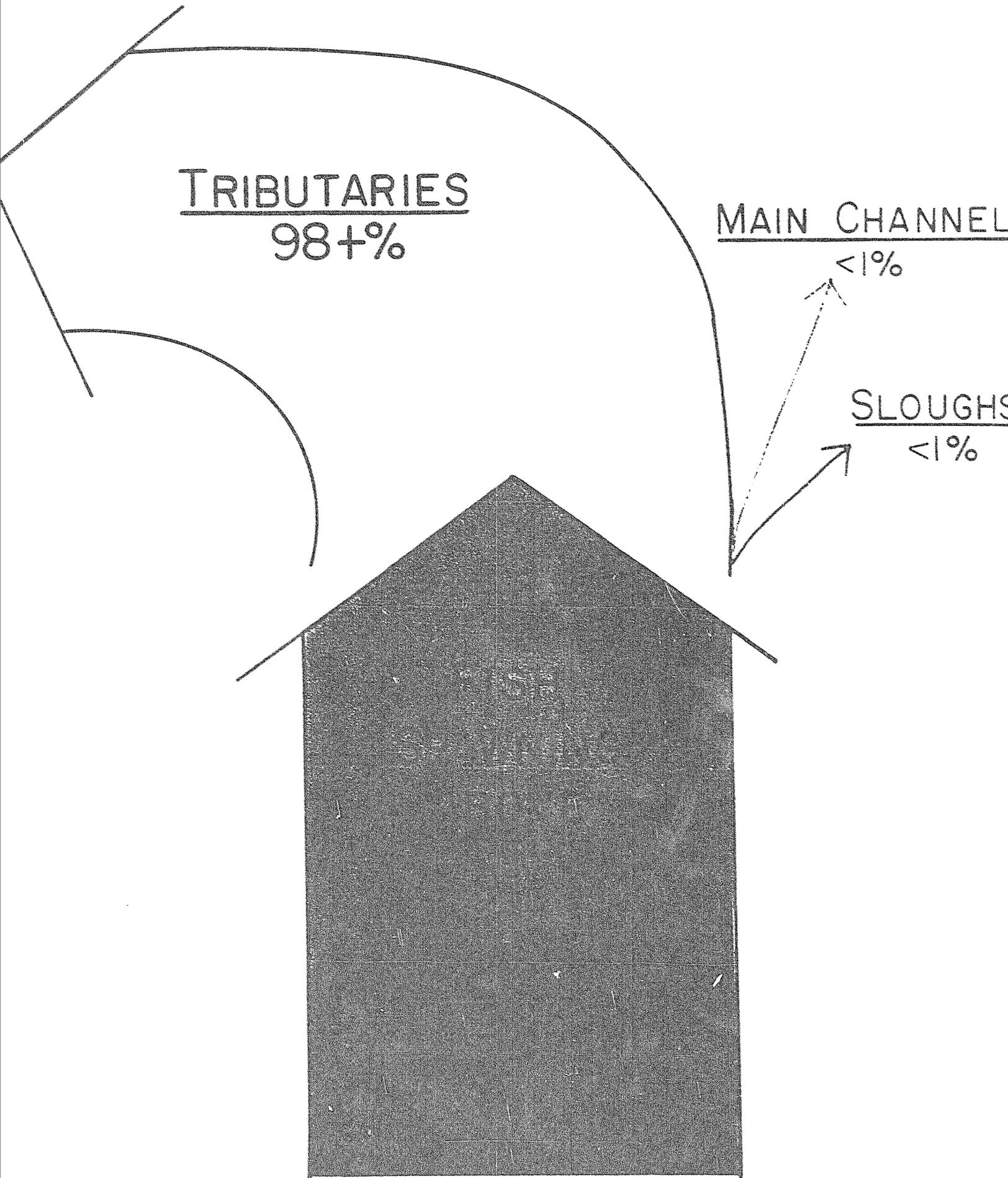
✓
BASED ON PROFESSIONAL JUDGEMENT

SUSITNA 1983 COHO ESCAPEMENT

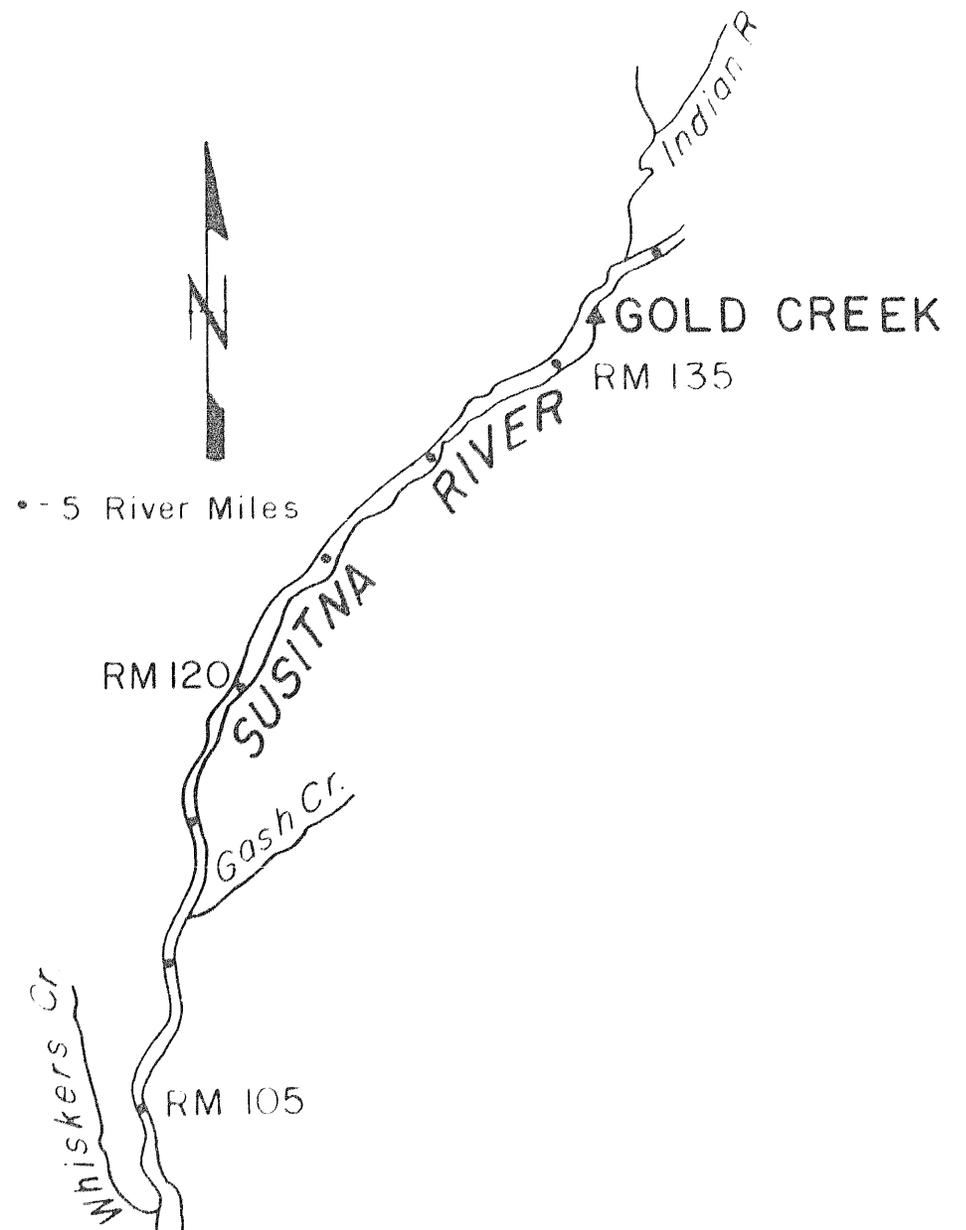
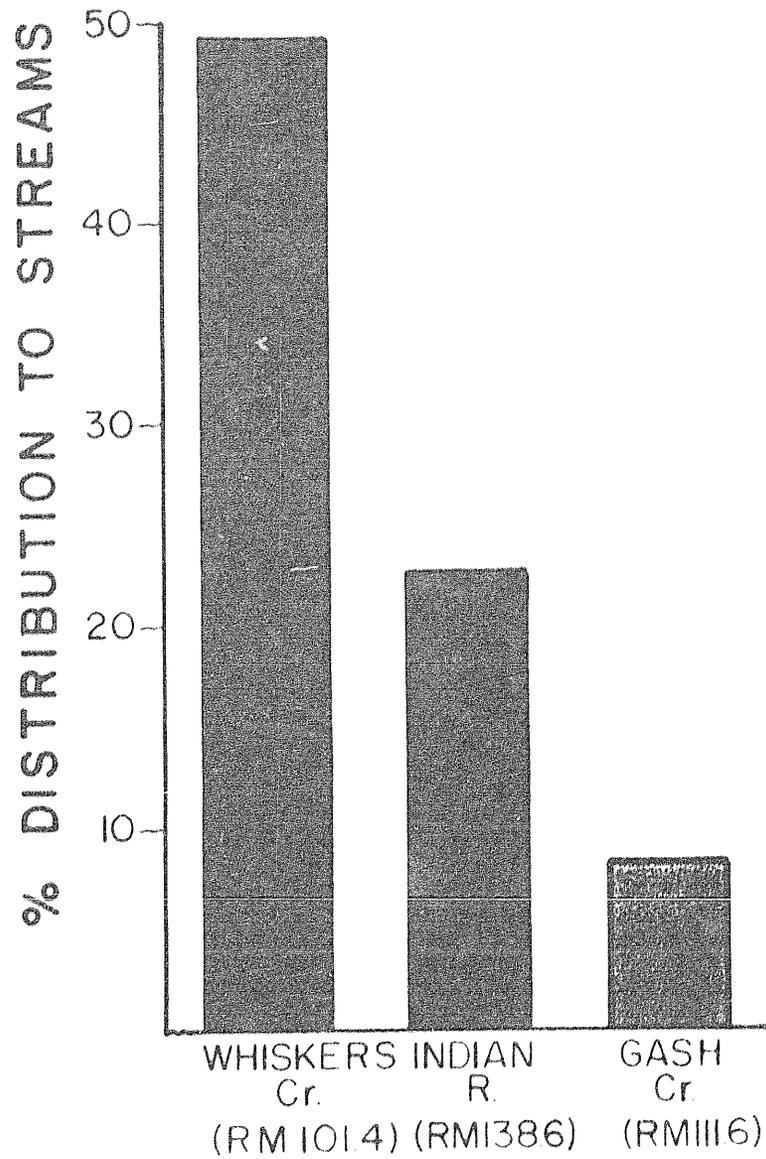


* Min. Escapement = Yentna River Plus Above RM 80

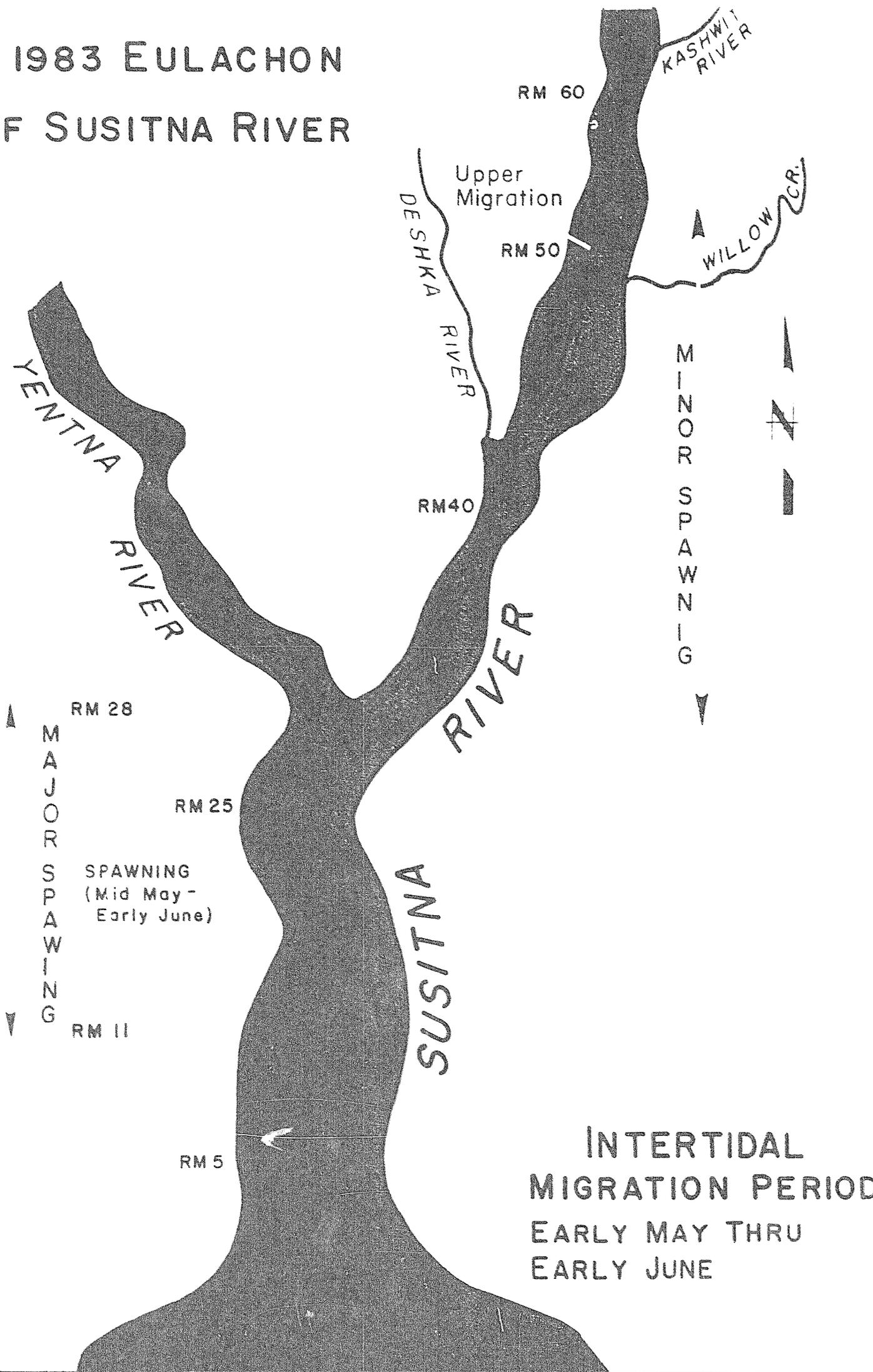
1983 COHO SPAWNING AREAS



1983 MAJOR COHO SALMON SPAWNING STREAMS ABOVE RM 98.6



1982 & 1983 EULACHON USE OF SUSITNA RIVER



CONTRIBUTION
OF SUSITNA RIVER TO
UPPER COOK INLET

COMMERCIAL CHINOOK SALMON CATCH :

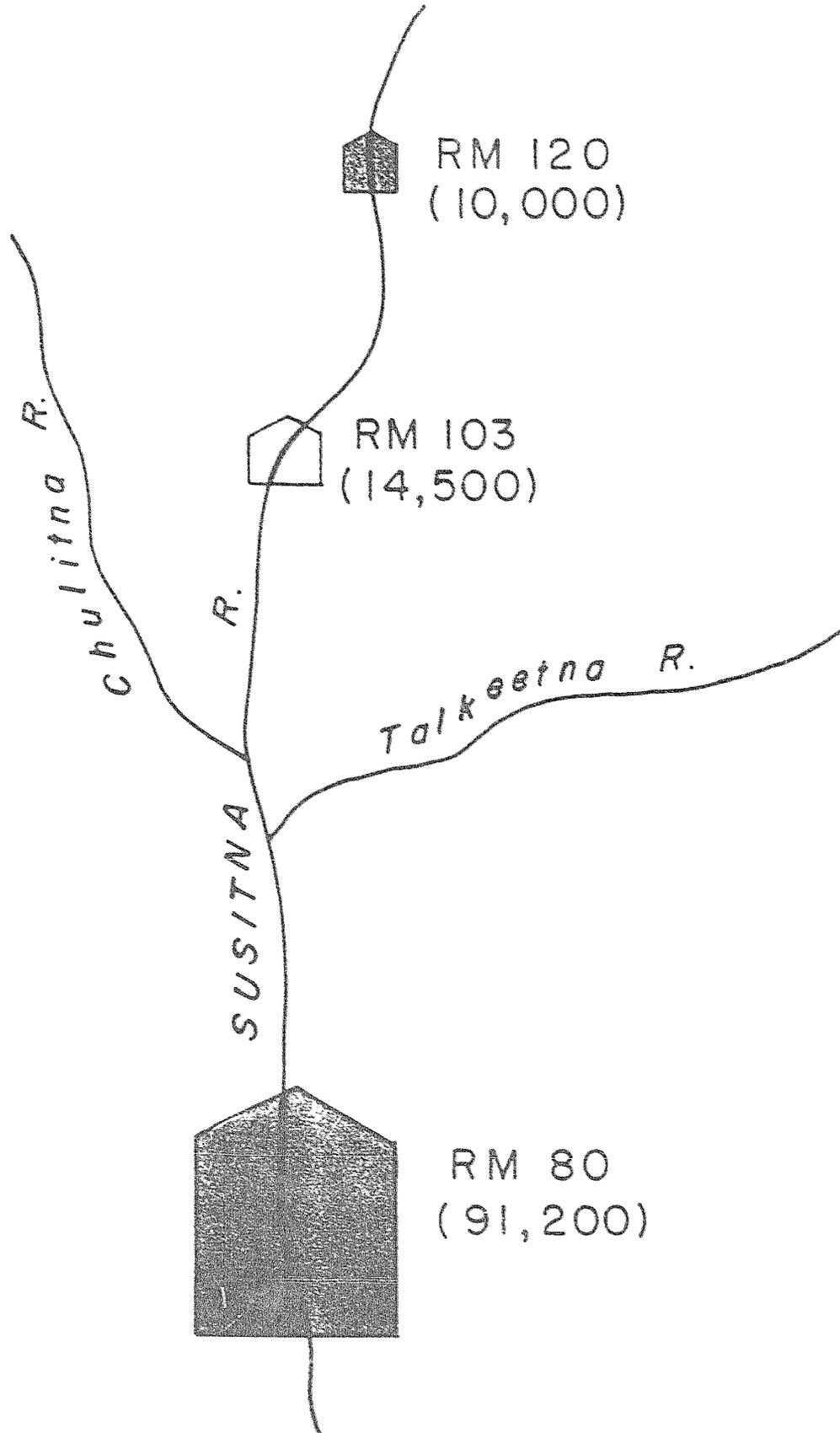
≈ 10% [∟]

1983 HARVEST (PRE.) ≈ 19 THOUSAND

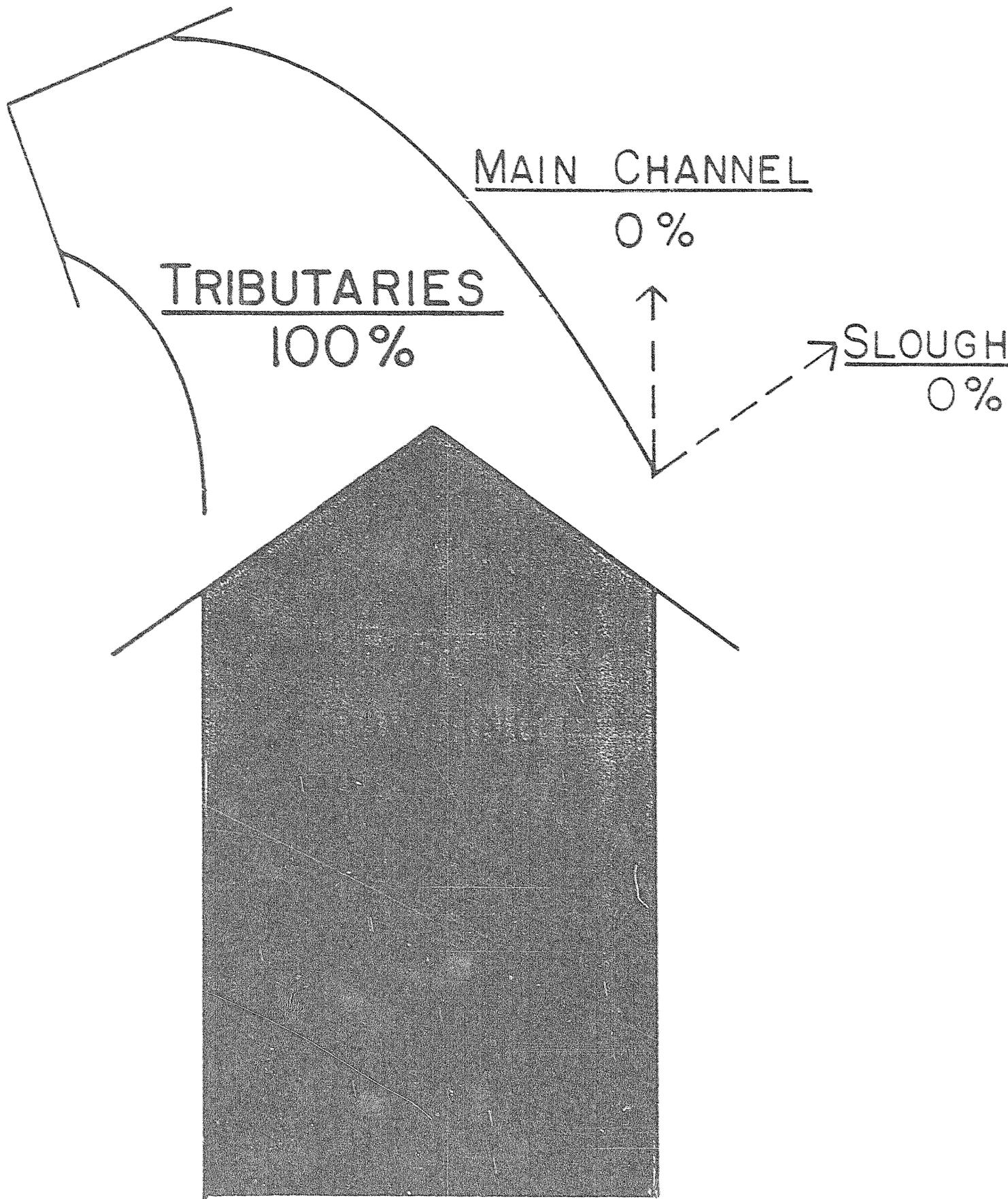
10 YEAR AVERAGE (74-83) ≈ 13 THOUSAND

[∟] BASED ON PROFESSIONAL JUDGEMENT

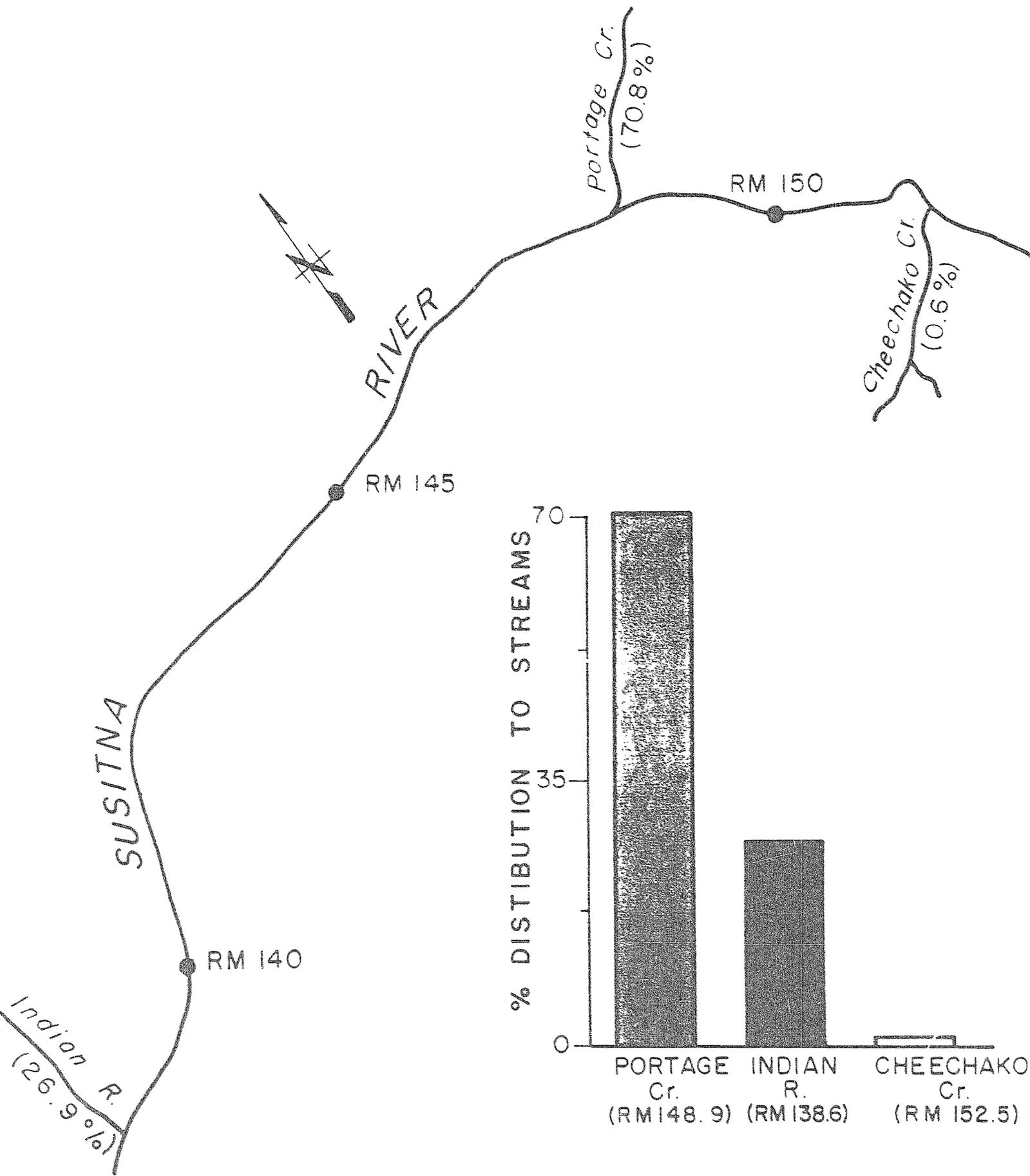
SUSITNA 1983 CHINOOK ESCAPEMENT



1983 CHINOOK SPAWNING AREAS



1983 MAJOR CHINOOK SALMON SPAWNING STREAMS ABOVE RM 98.6



CONTRIBUTION
OF SUSITNA RIVER TO
UPPER COOK INLET

COMMERCIAL SOCKEYE SALMON CATCH:

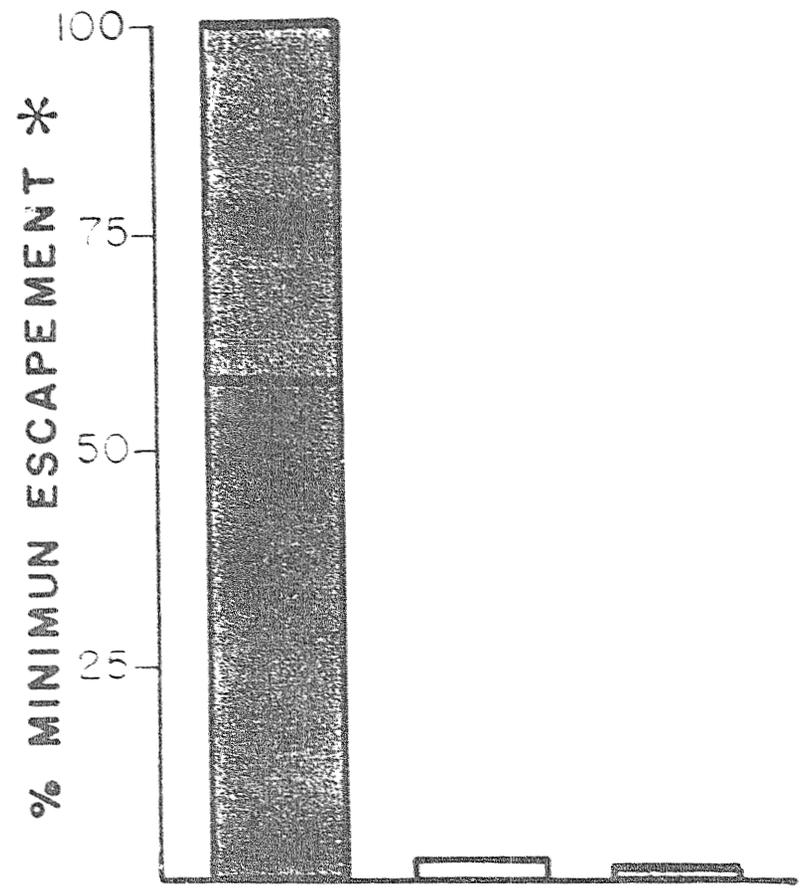
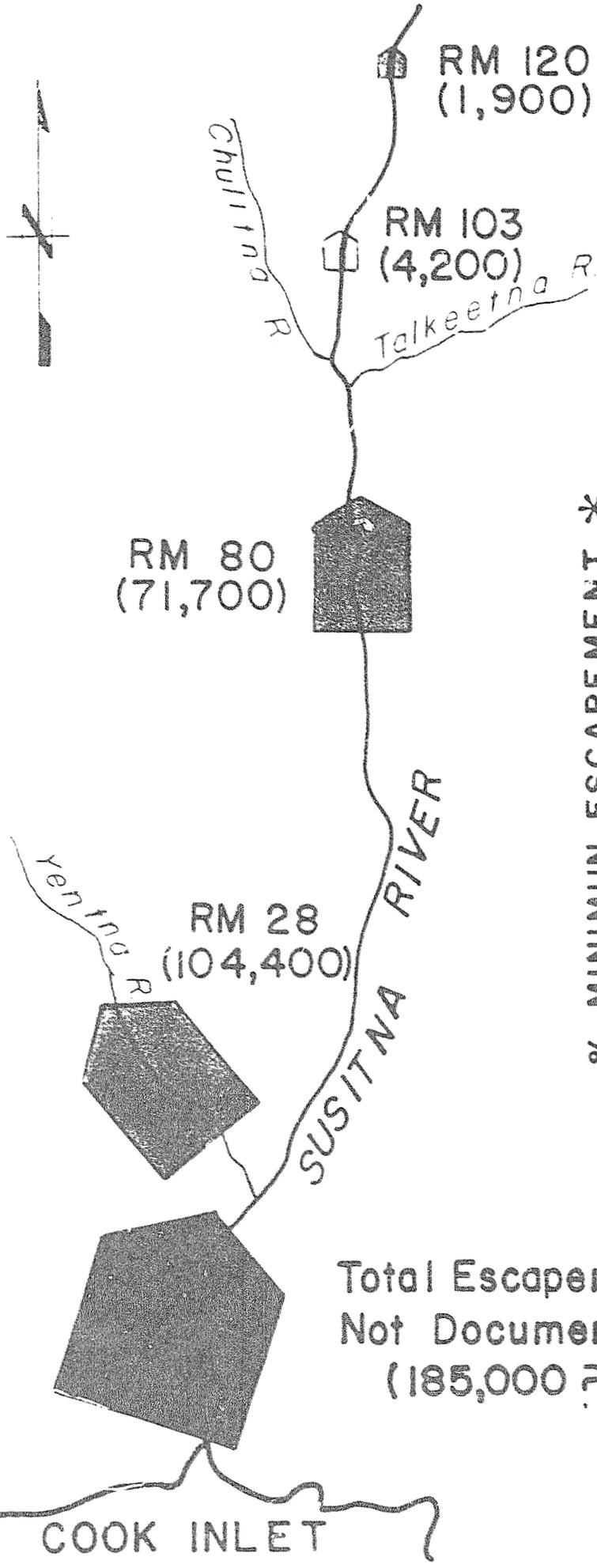
$\approx 10-30\%$ [∟]

1983 HARVEST (PRE.) ≈ 4.8 MILLION

10 YEAR AVERAGE (74-83) ≈ 2.0 MILLION

[∟]
BASED ON PROFESSIONAL JUDGEMENT

SUSITNA 1983 SOCKEYE ESCAPEMENT



* Min. Escapement = Yenitna River Plus Above RM 80

1983 SOCKEYE SPAWNING AREAS

MAIN CHANNEL

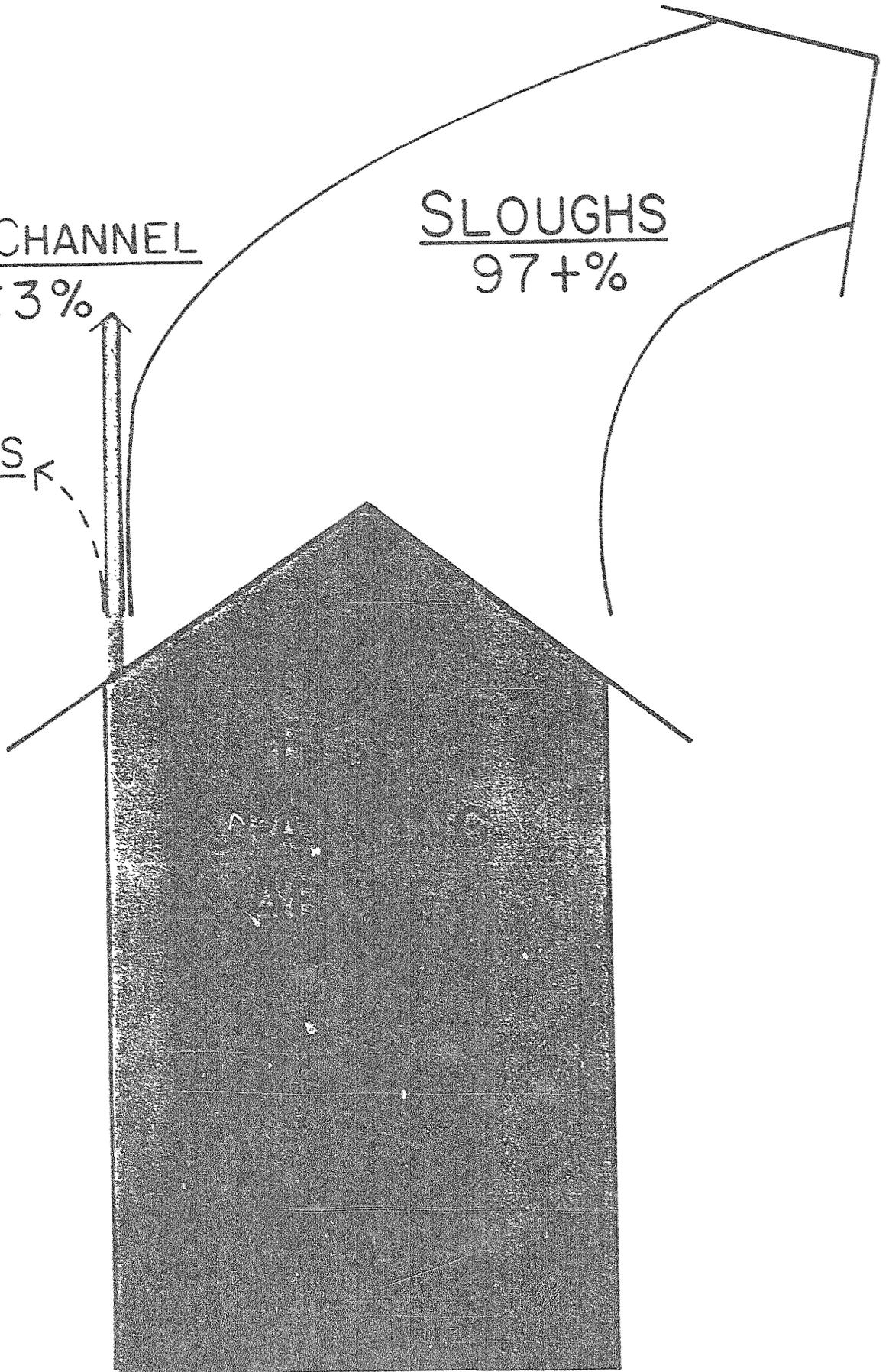
< 3%

SLOUGHS

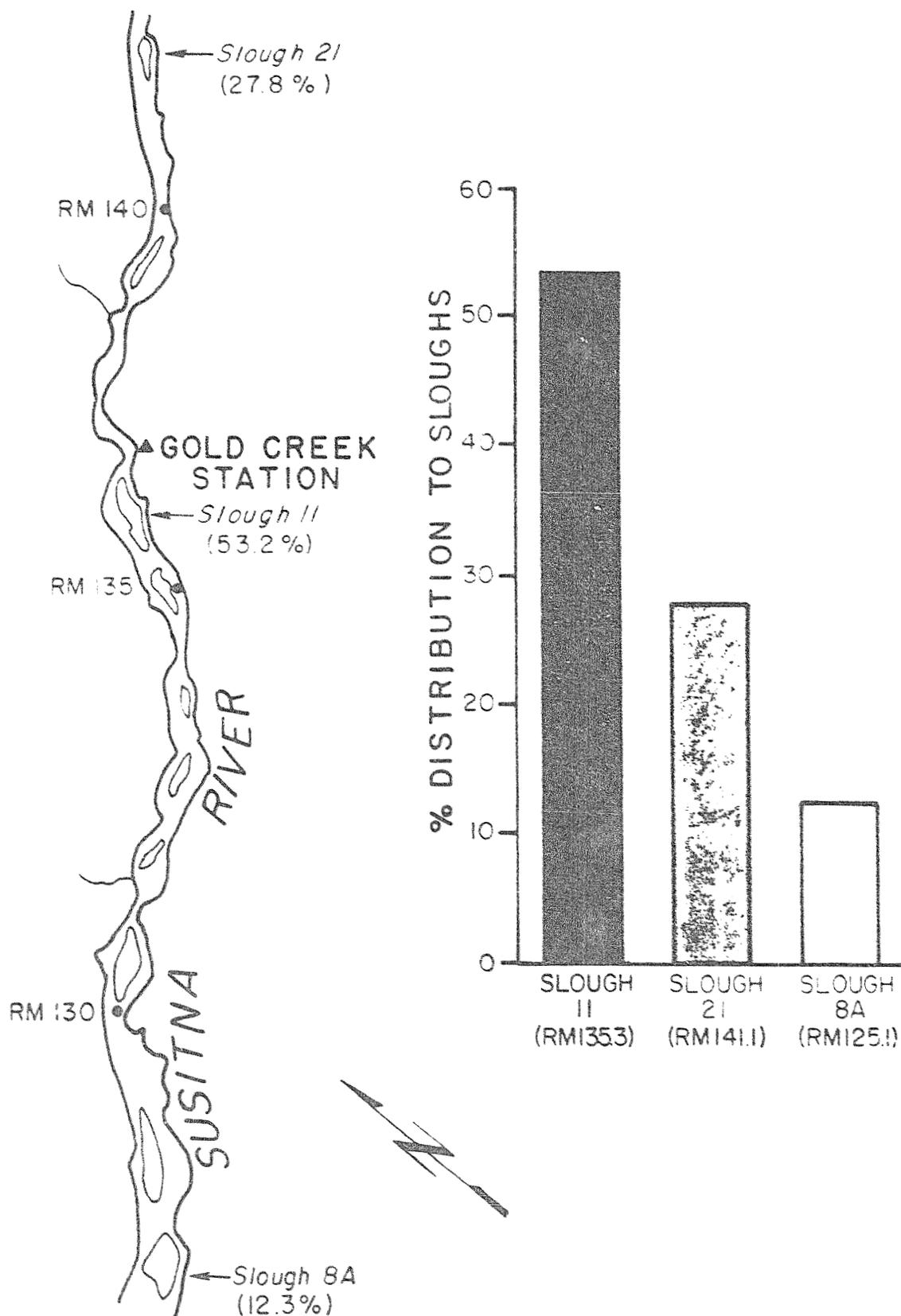
97+%

TRIBUTARIES

0%



1983 SECOND RUN SOCKEYE SALMON SPAWNING SLOUGHS ABOVE RM 98.6



CONTRIBUTION
OF SUSITNA RIVER TO
UPPER COOK INLET

COMMERCIAL PINK SALMON CATCH:

≈ 80-90% ↓

1982 HARVEST (PRE.) ≈ 790 THOUSAND

1983 HARVEST (PRE.) ≈ 80 THOUSAND

10 YEAR AVERAGES (63-83)

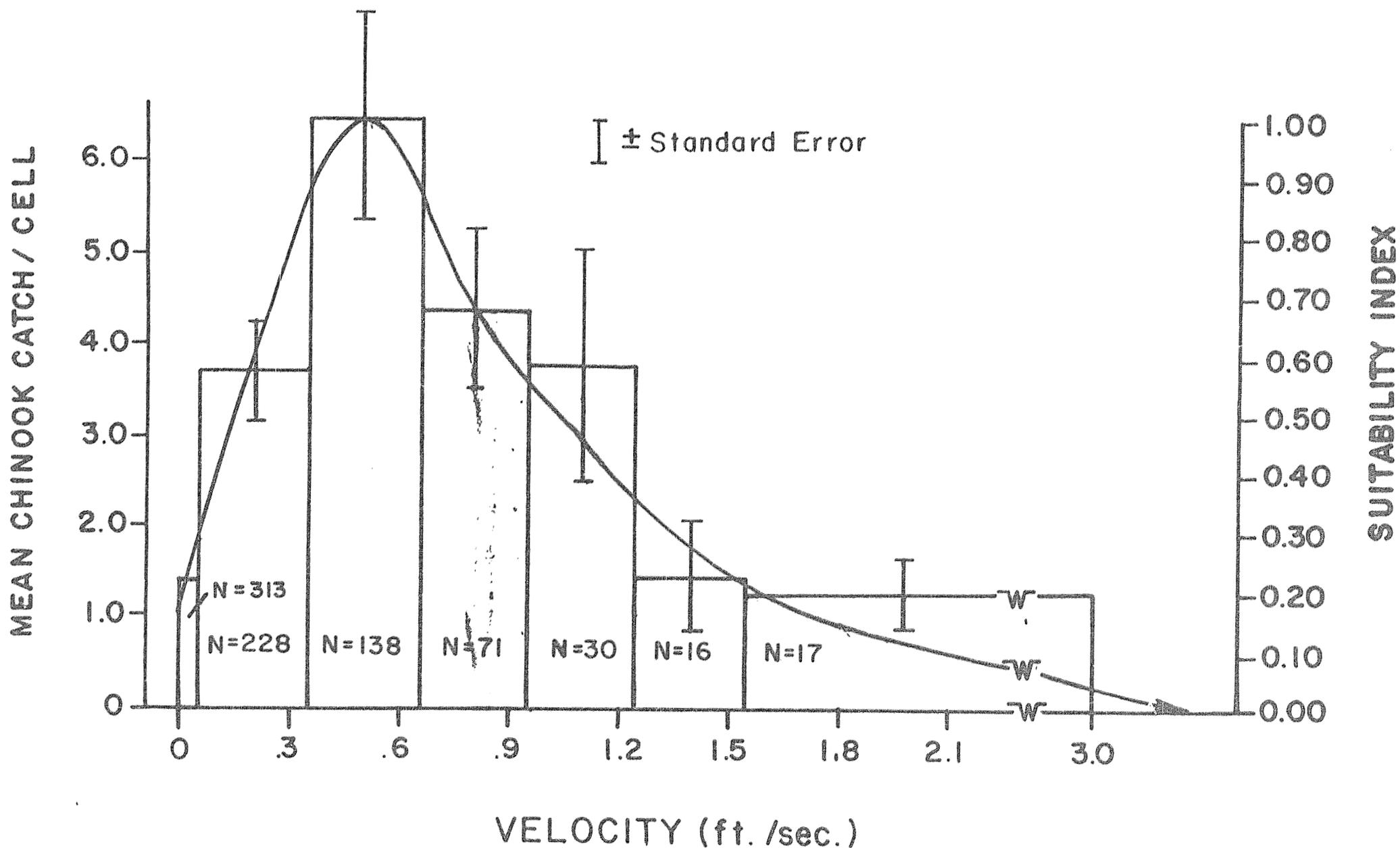
-EVEN YEAR ≈ 1.5 MILLION

-ODD YEAR 165 THOUSAND

↓
BASED ON PROFESSIONAL JUDGEMENT

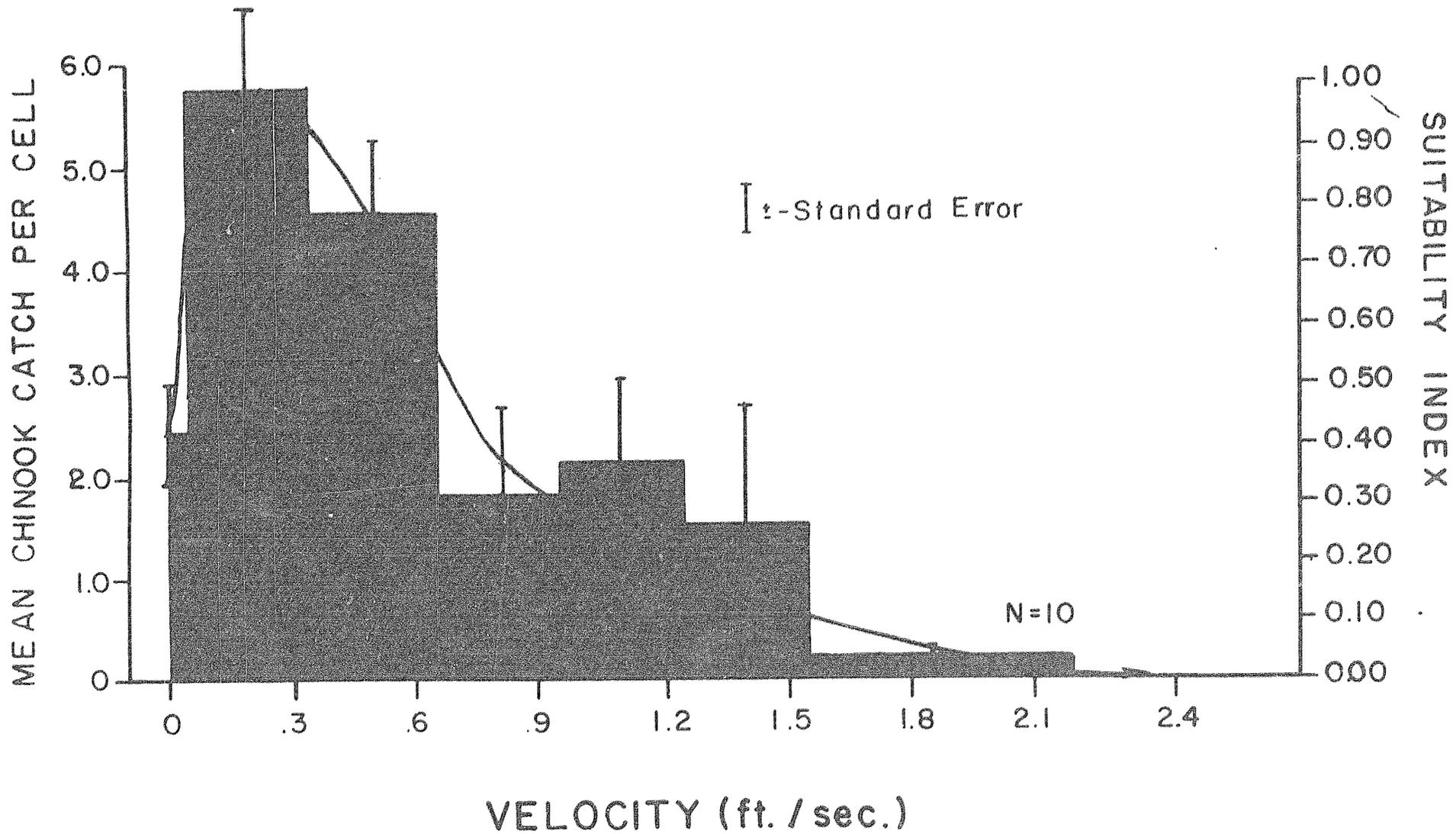
JUVENILE CHINOOK SALMON

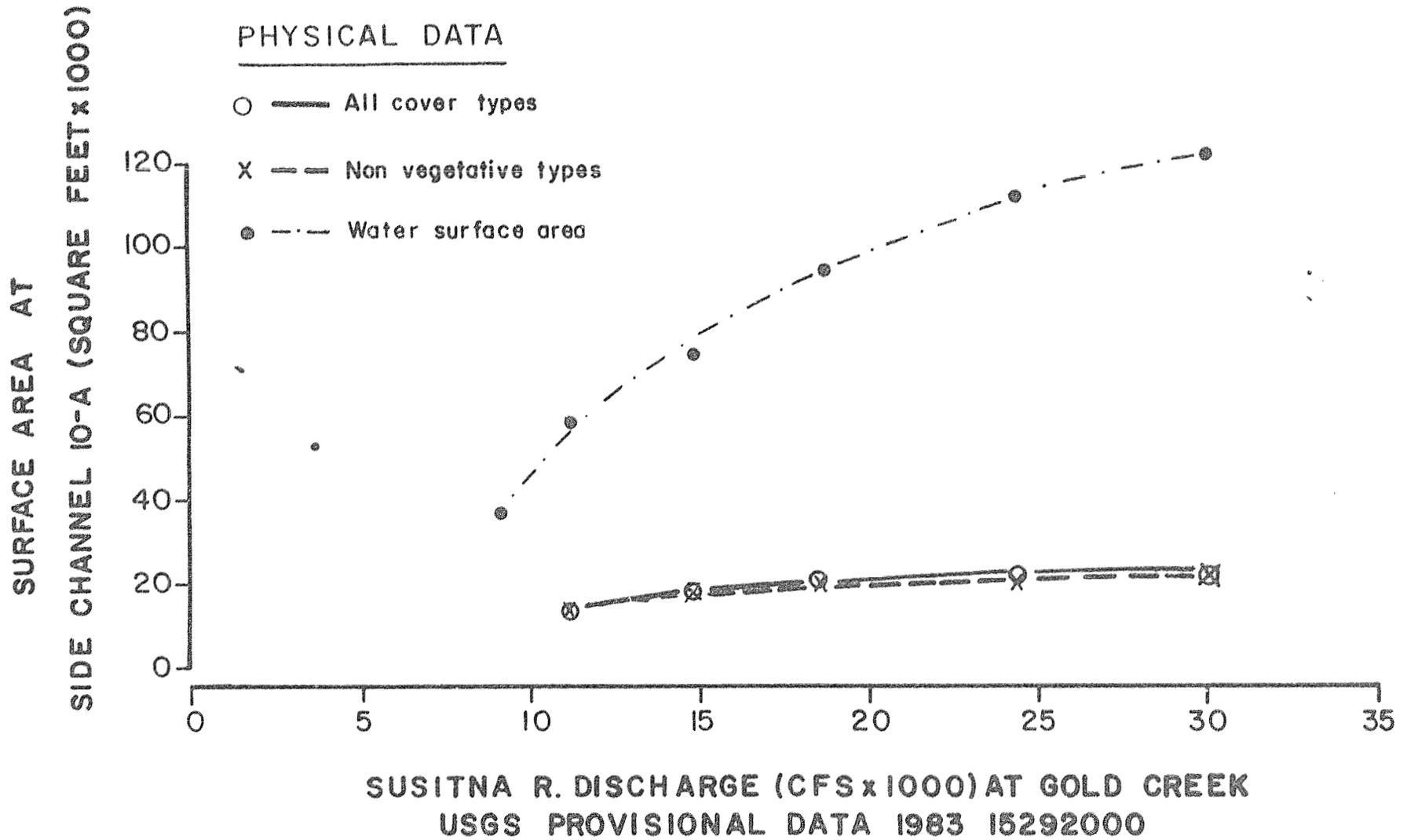
VELOCITY SUITABILITY INDEX UNDER LOW TURBIDITY CONDITIONS



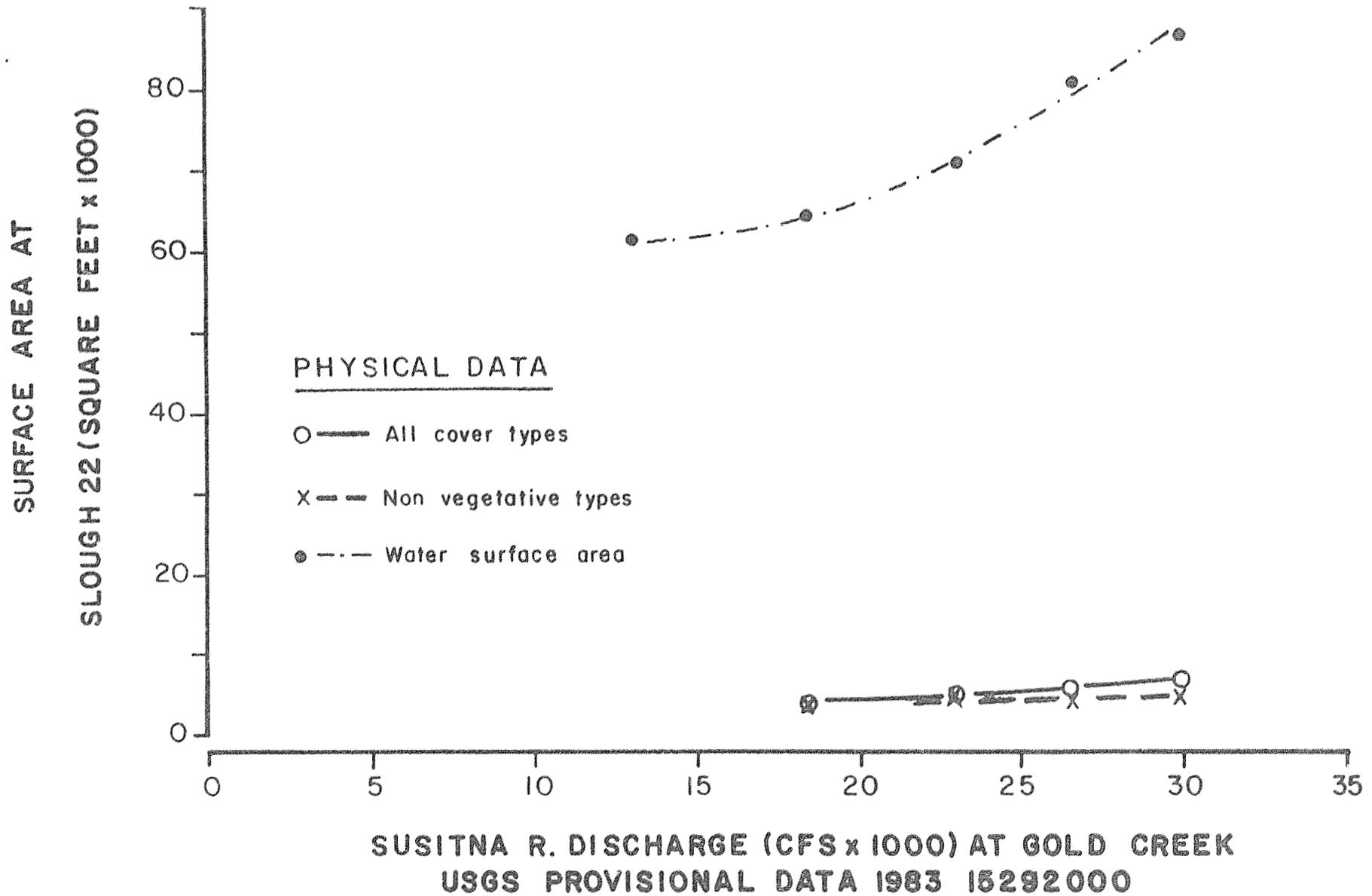
JUVENILE CHINOOK SALMON

VELOCITY SUITABILITY INDEX UNDER HIGH TURBIDITY CONDITIONS

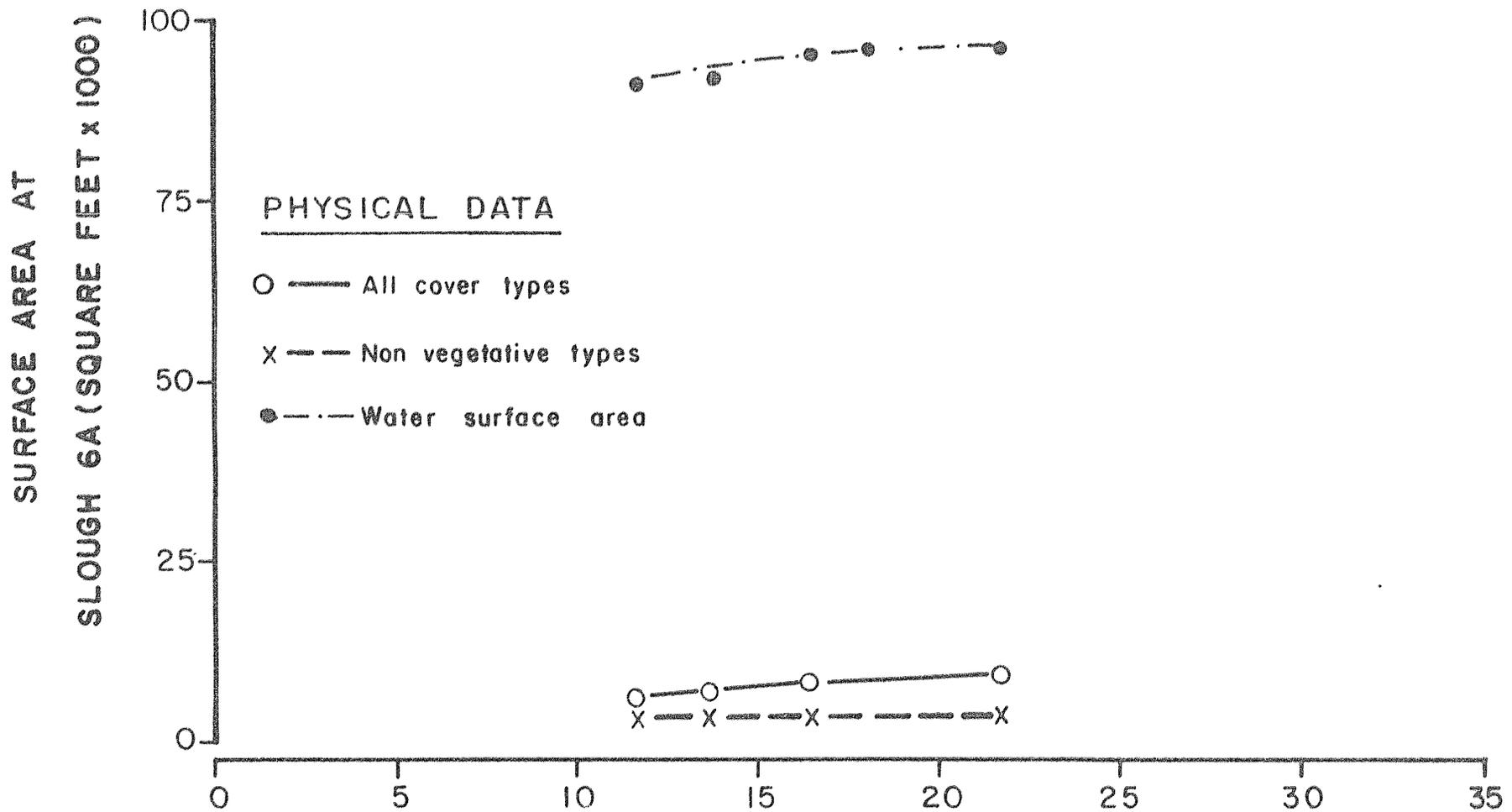




Physical cover and water surface area measured in the 1983 Side Channel IOA study area versus mainstem discharge at Gold Creek,



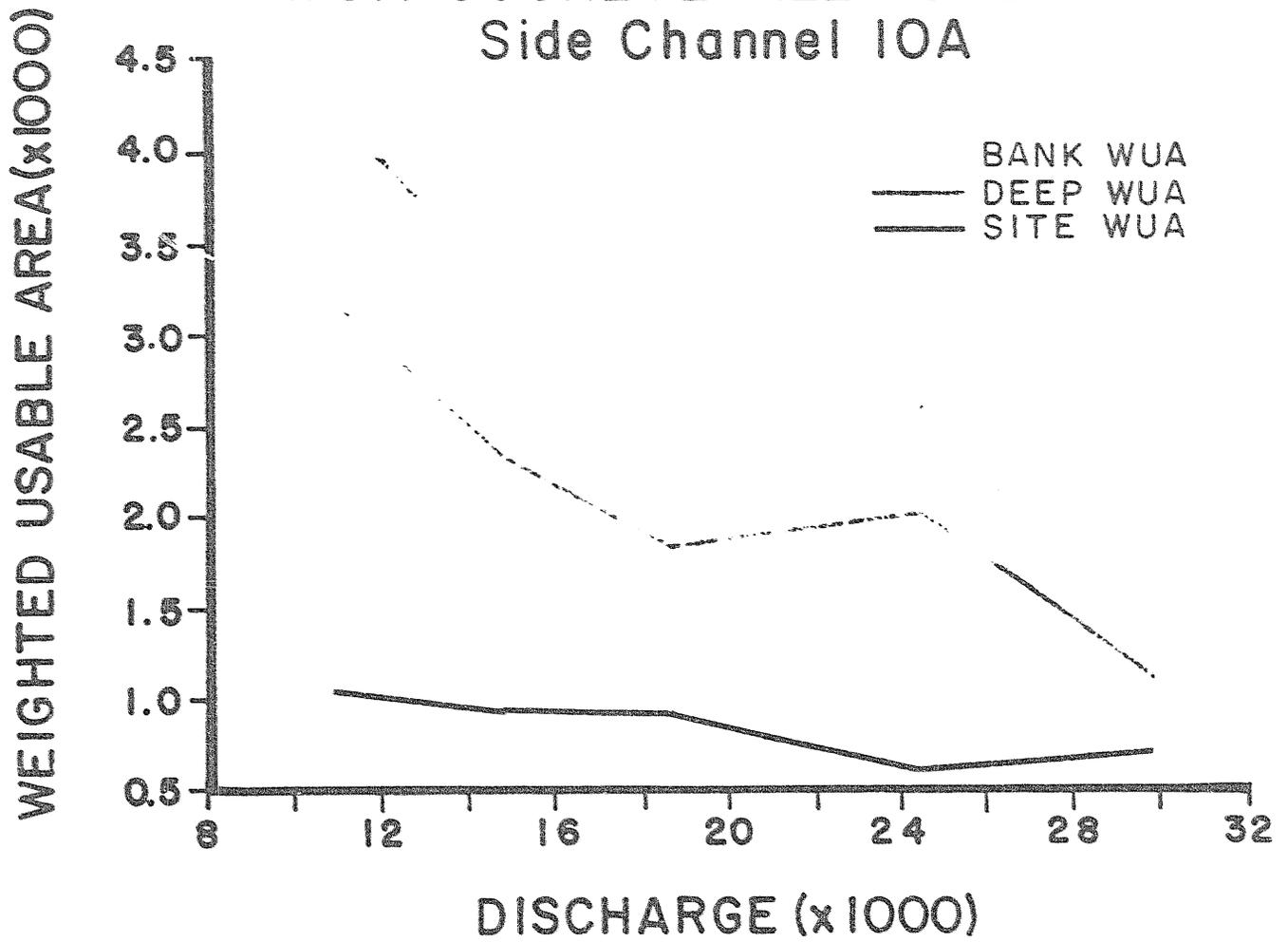
Physical cover and water surface area measured in the 1983 Slough 22 study area versus mainstem discharge at Gold Creek.



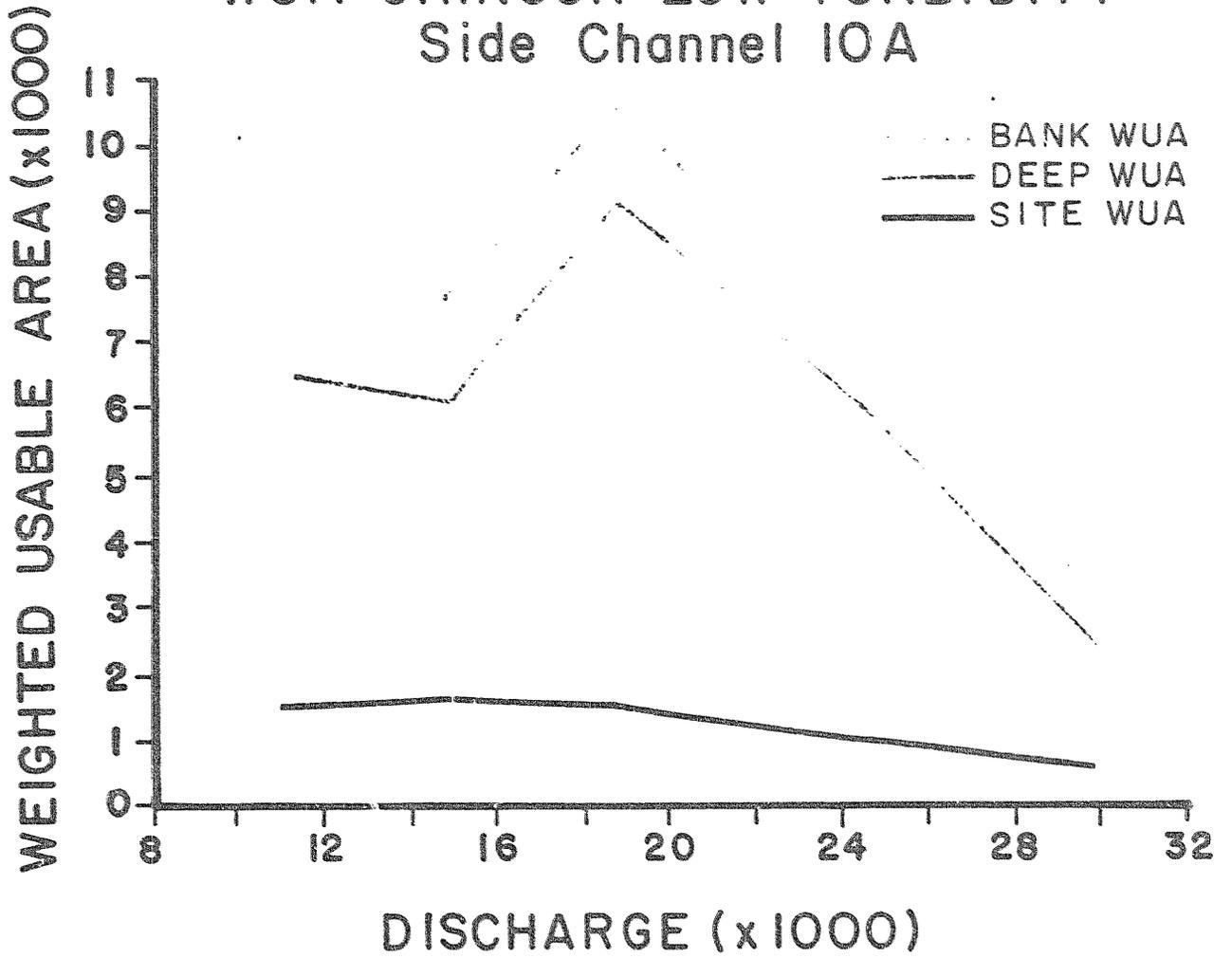
SUSITNA R. DISCHARGE (CFS x 1000) AT GOLD CREEK
 USGS PROVISIONAL DATA 1983 15292000

Physical cover and water surface area measured in the 1983 Slough 6A study area versus mainstem discharge at Gold Creek.

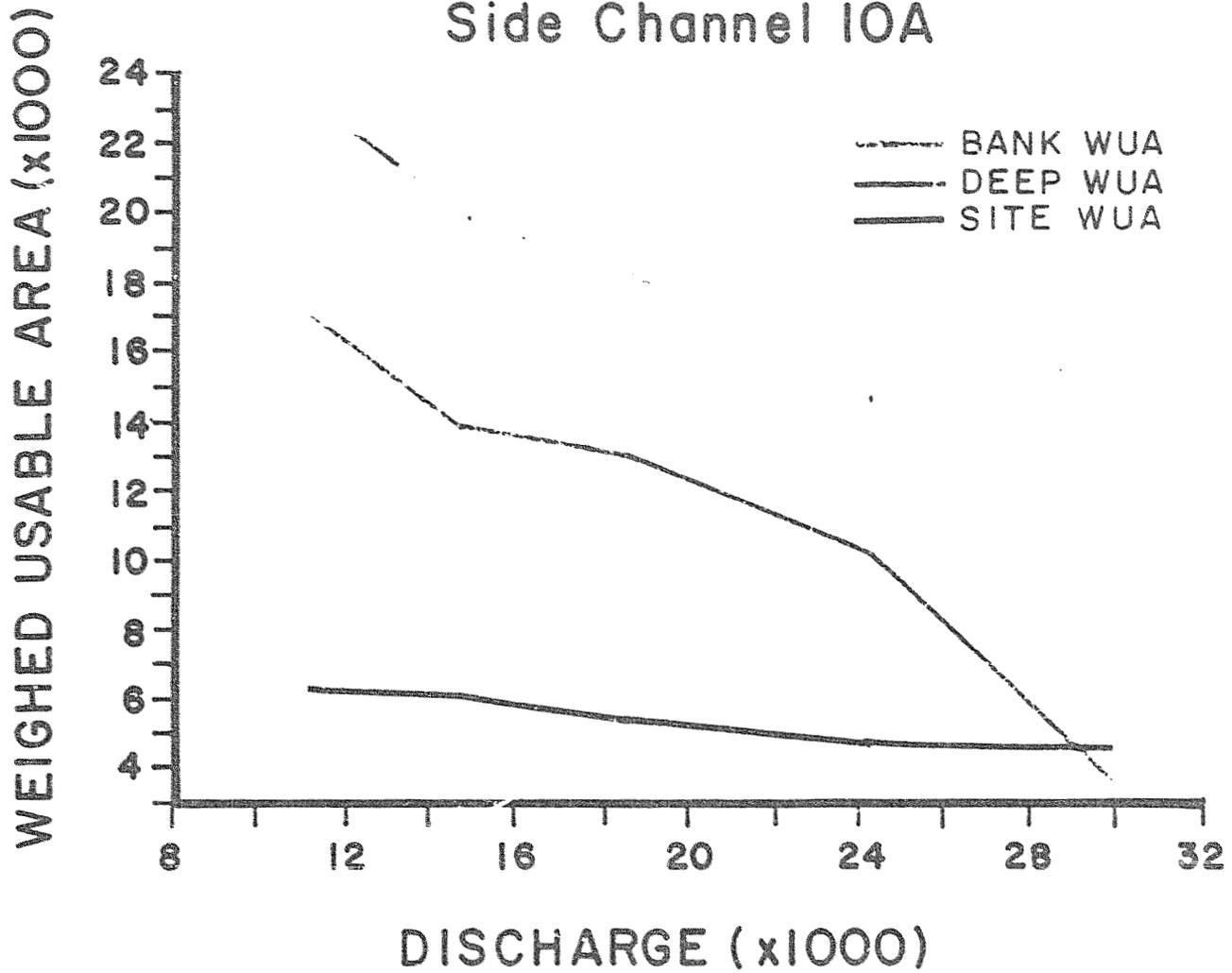
WUA SOCKEYE ALL TURBIDITY Side Channel 10A



WUA CHINOOK LOW TURBIDITY Side Channel IOA

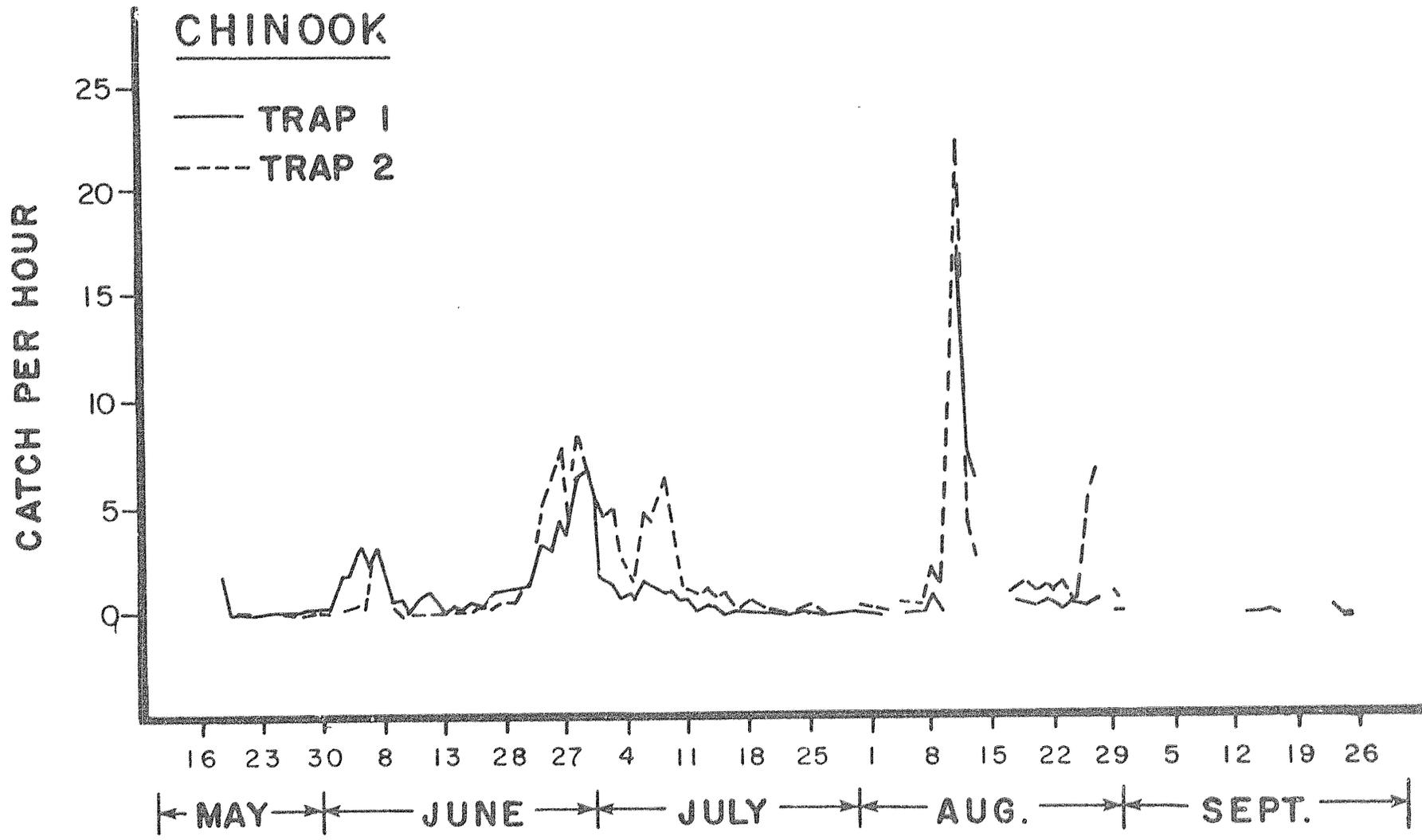


WUA CHINOOK HIGH TURBIDITY Side Channel IOA

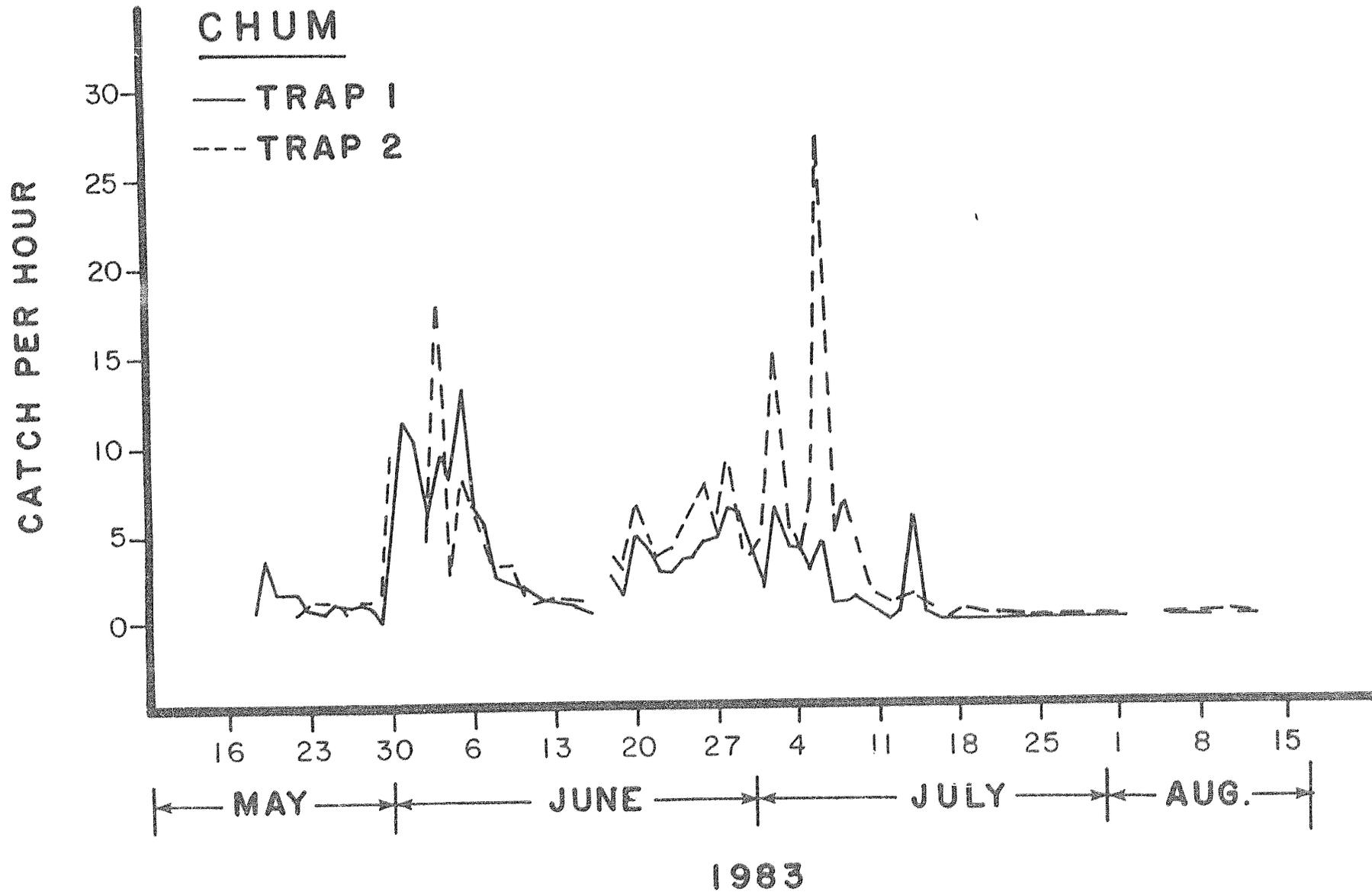


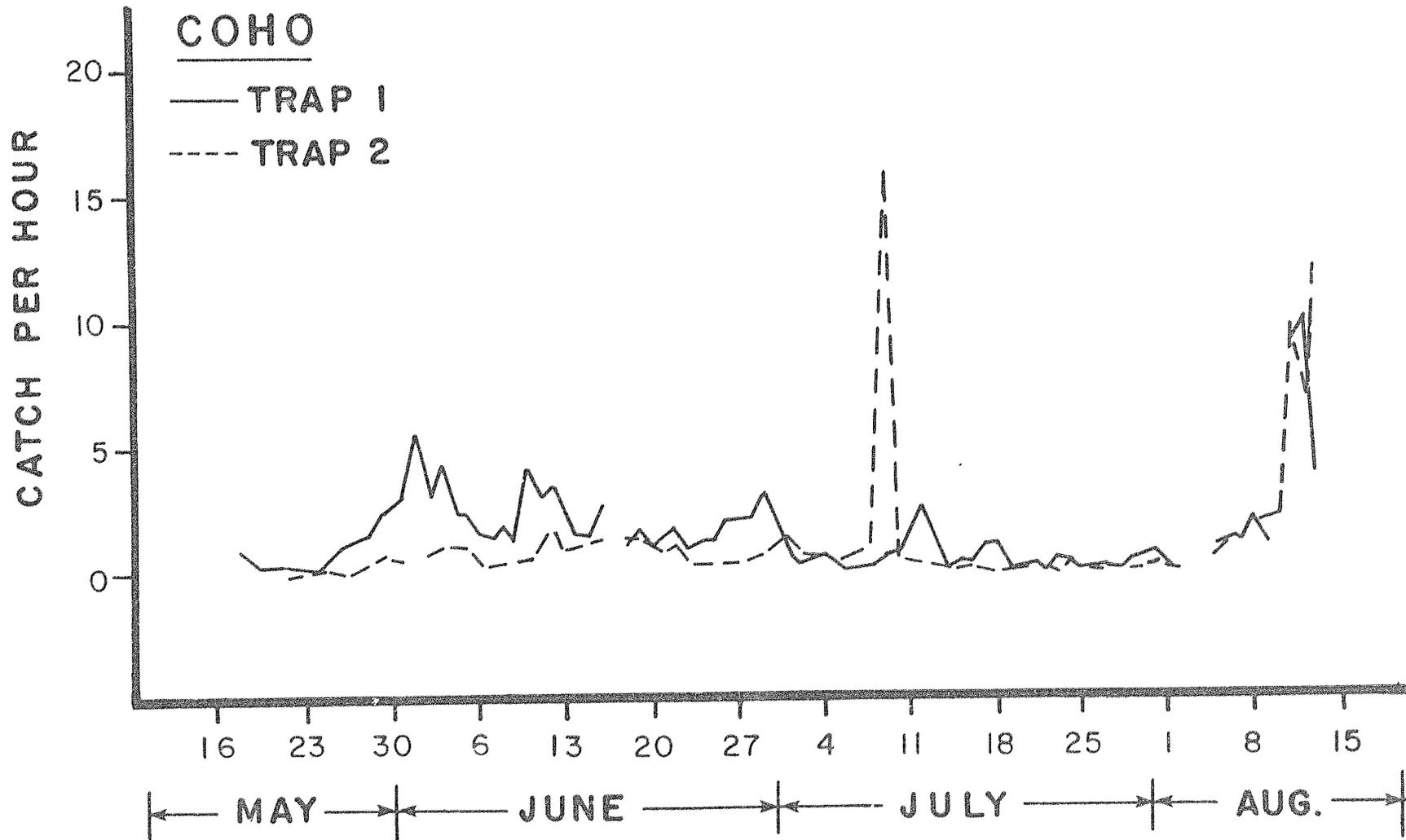
Species	Number	% Survival *
Chum Salmon	3,000,000	10 %
Sockeye Salmon	500,000	38 %

* % egg to fry survival for 1982 brood year spawning
above the Chulitna Confluence

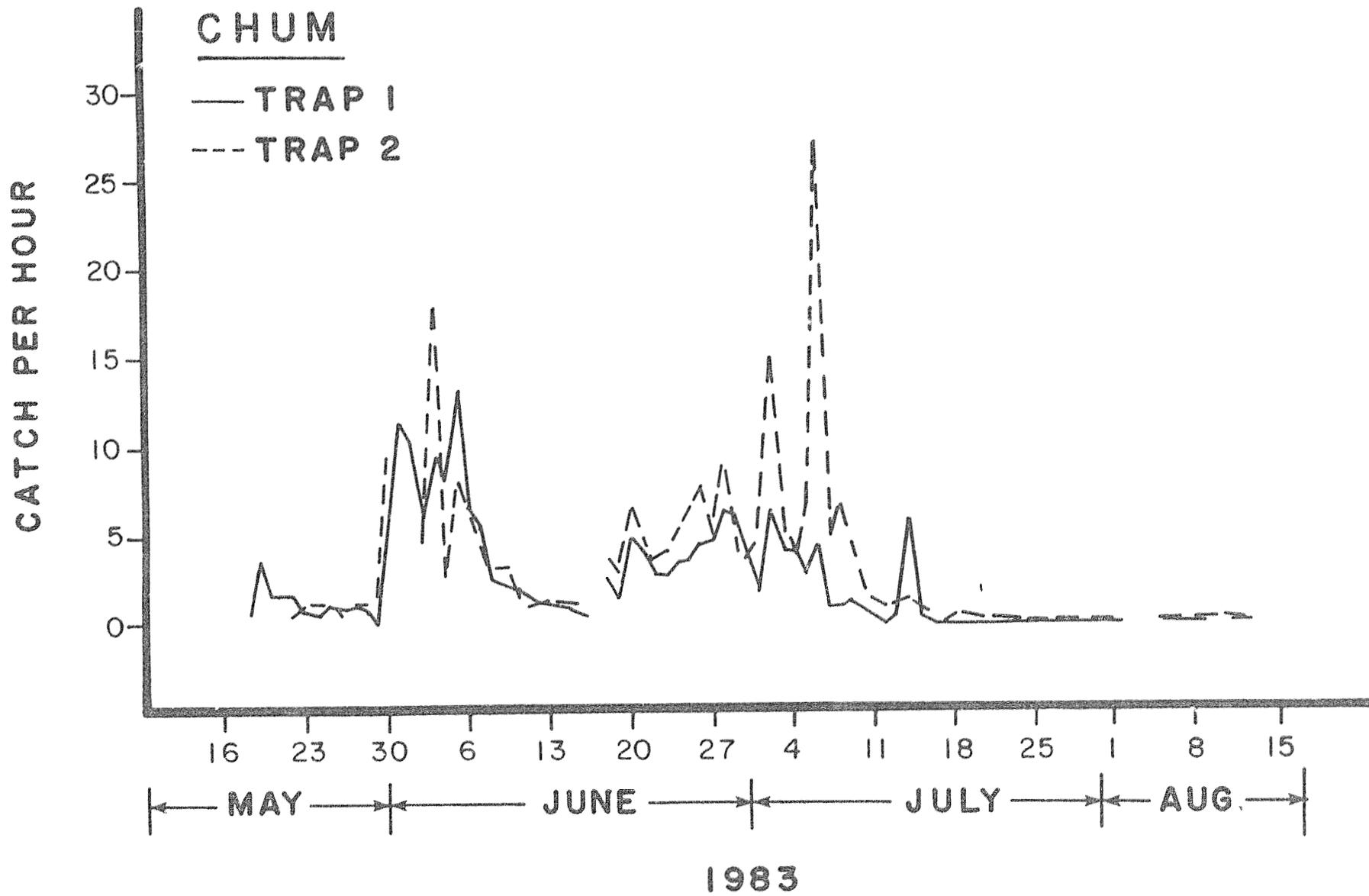


1983





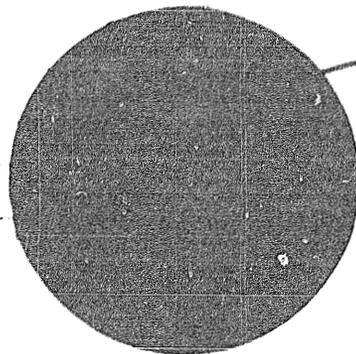
1983



Four Sloughs
Combined 1.2%

Slough 8 9.1%

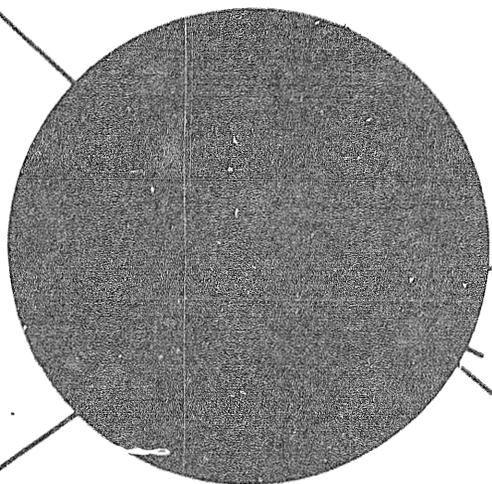
Slough 9 55%



Slough 11

SIDE SLOUGHS

n = 870



**COMBINED
MACROHABITAT
TYPES**

n = 1174

Slough 10
Side Channel
5.5%

Mainstem Side Channel
n = 46

2.9%

McKenzie Creek

Four Tributaries
Combined 2.0%

29.9%

Chase Creek

11.2%

56.9%

Indian
River

TRIBUTARIES

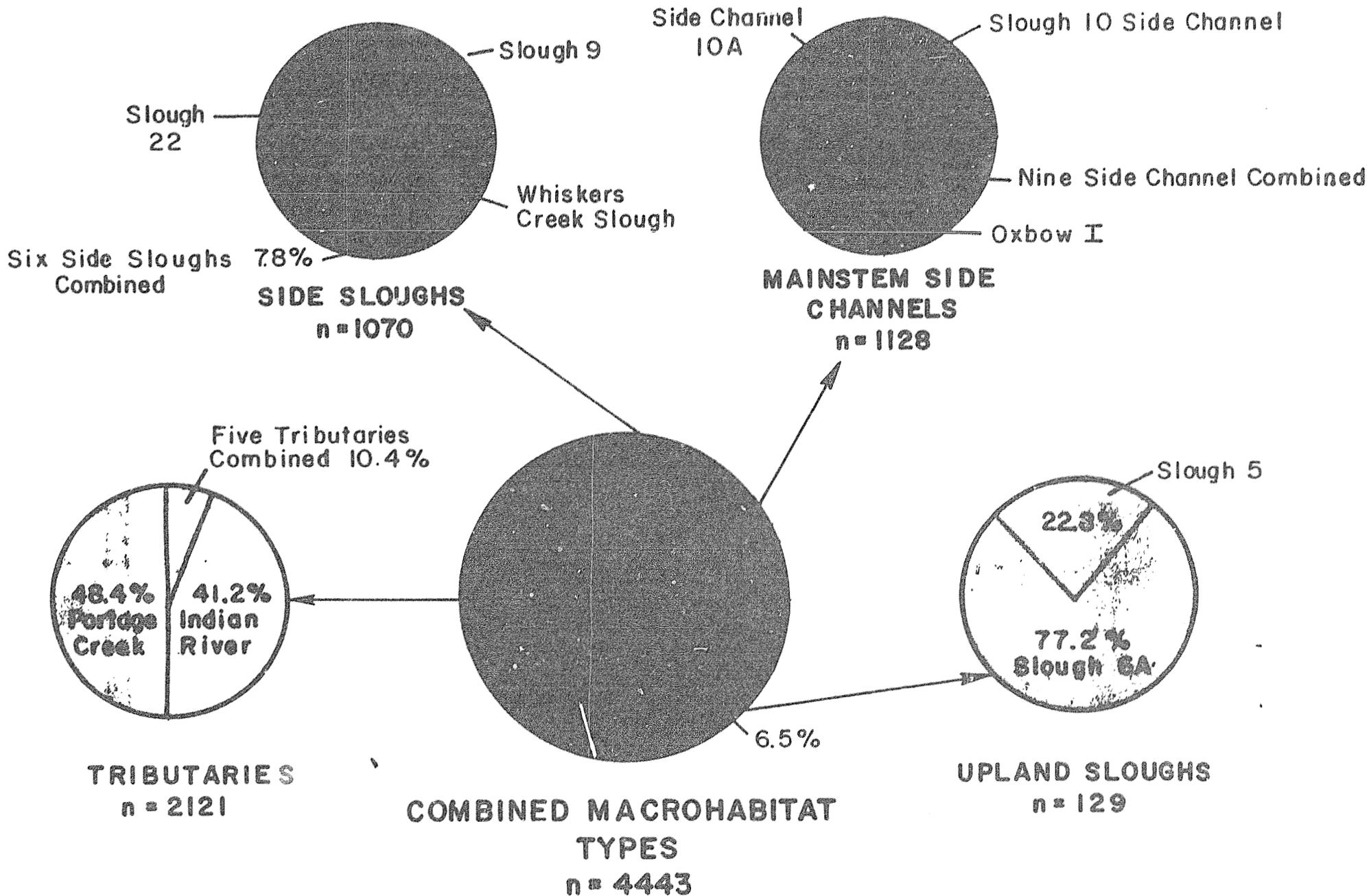
n = 247

UPLAND SLOUGHS

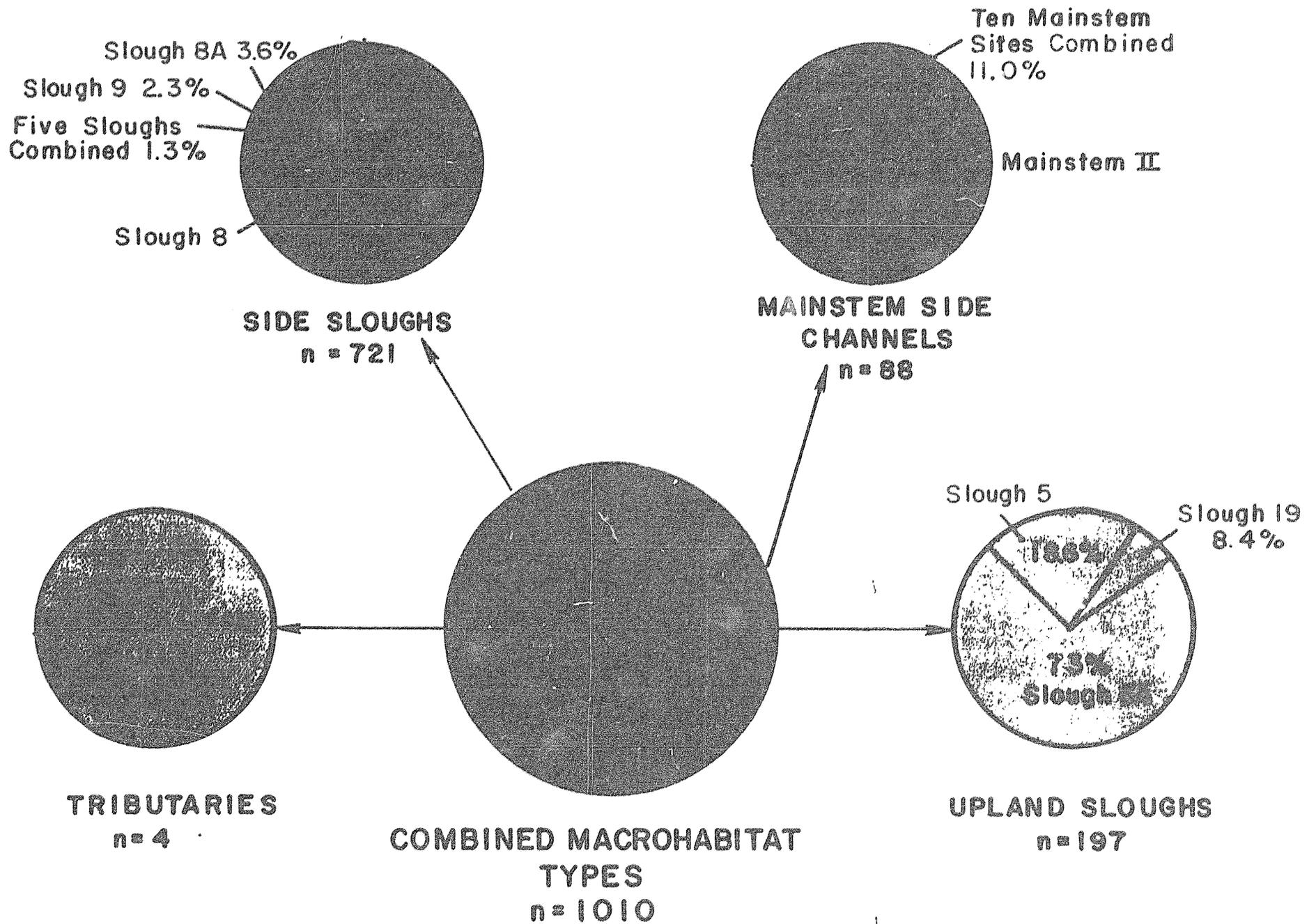
n = 11

100 %
Slough 6A

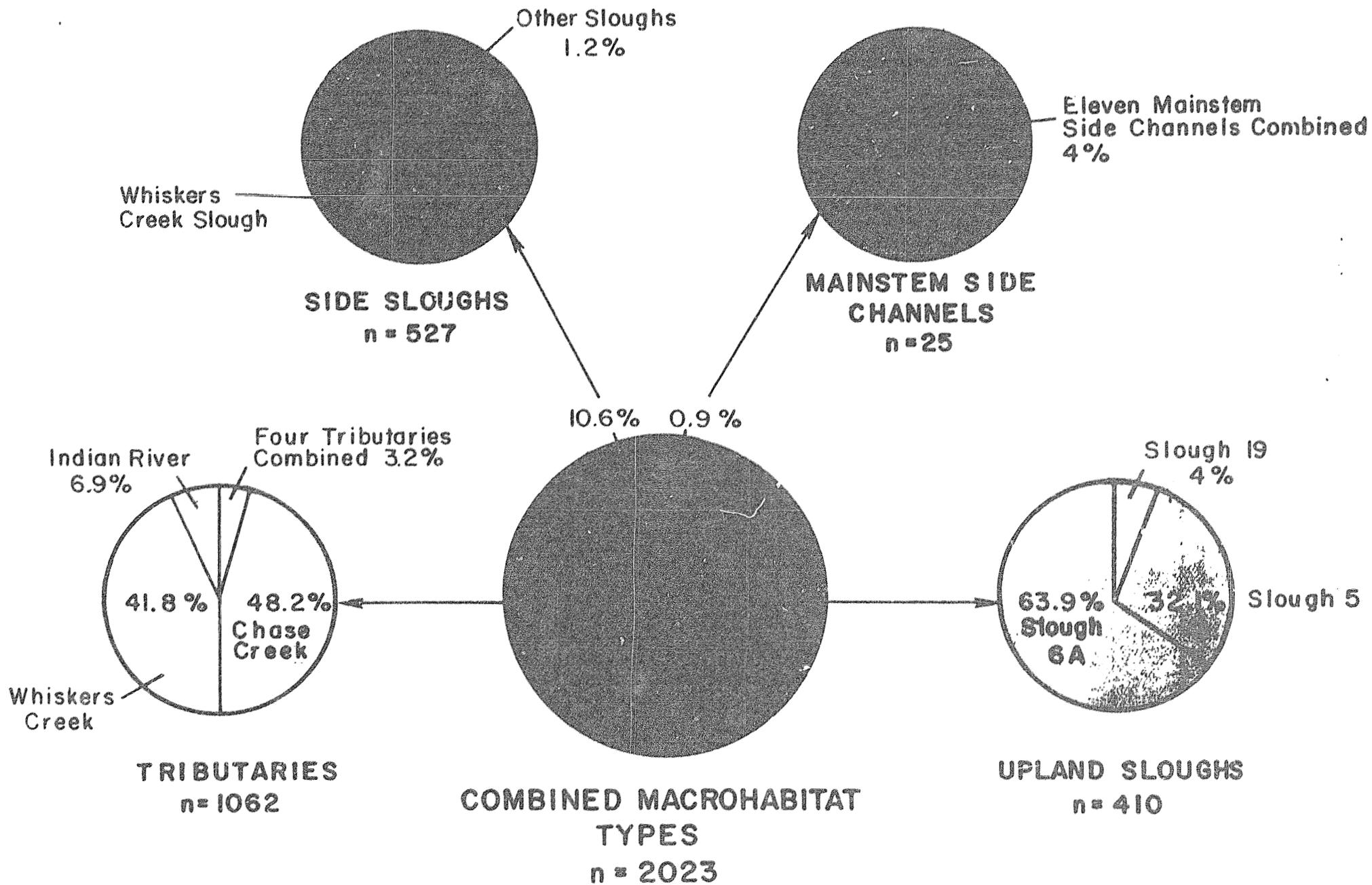
DISTRIBUTION AND ABUNDANCE OF JUVENILE CHUM SALMON BY MACROHABITAT.
(Percent based on mean catch per cell).



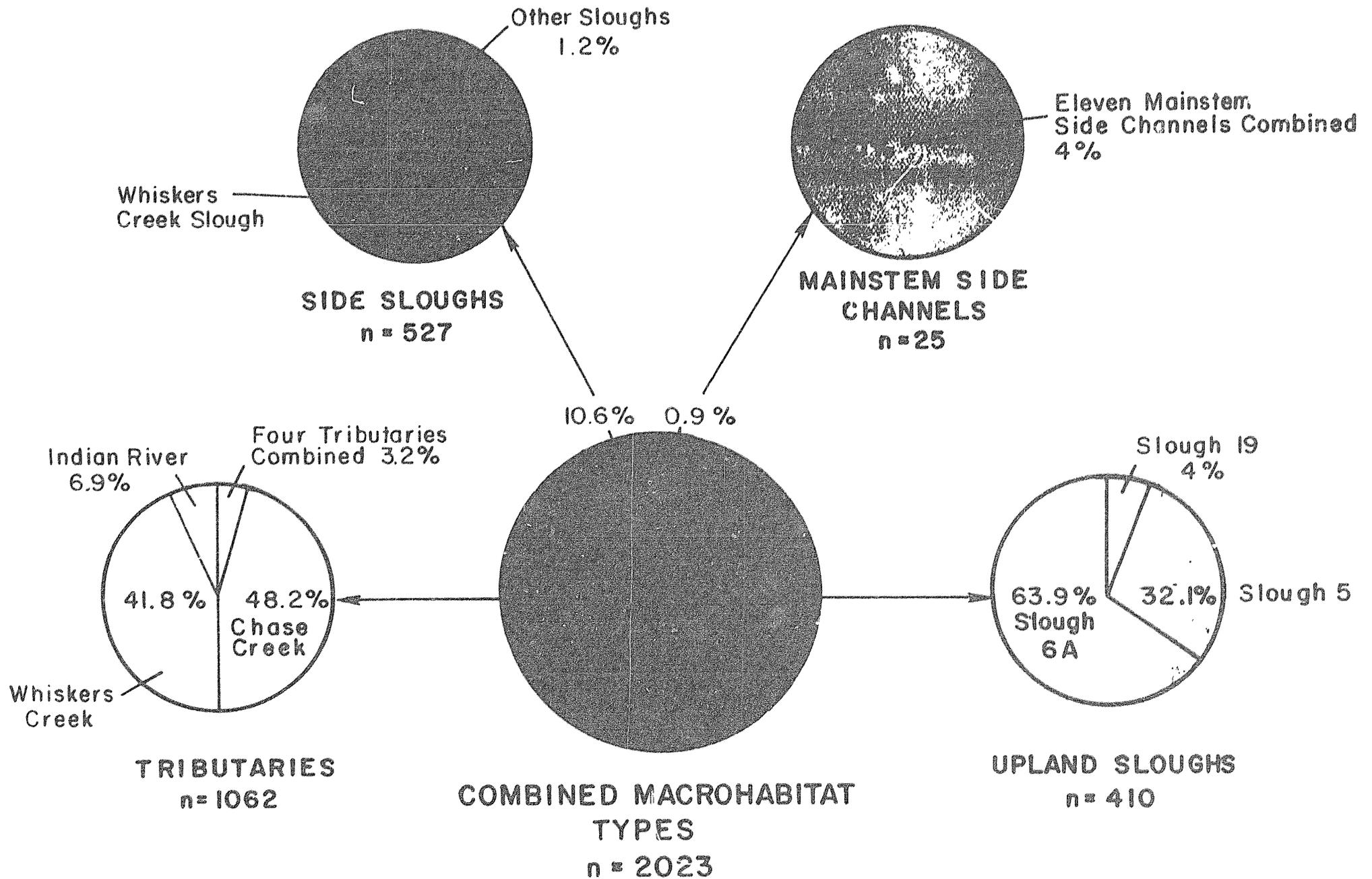
DISTRIBUTION AND ABUNDANCE OF JUVENILE CHINOOK SALMON BY MACROHABITAT. (Percent based on mean catch per cell)



DISTRIBUTION AND ABUNDANCE OF JUVENILE SOCKEYE SALMON BY MACROHABITAT. (Percent based on mean catch per cell)

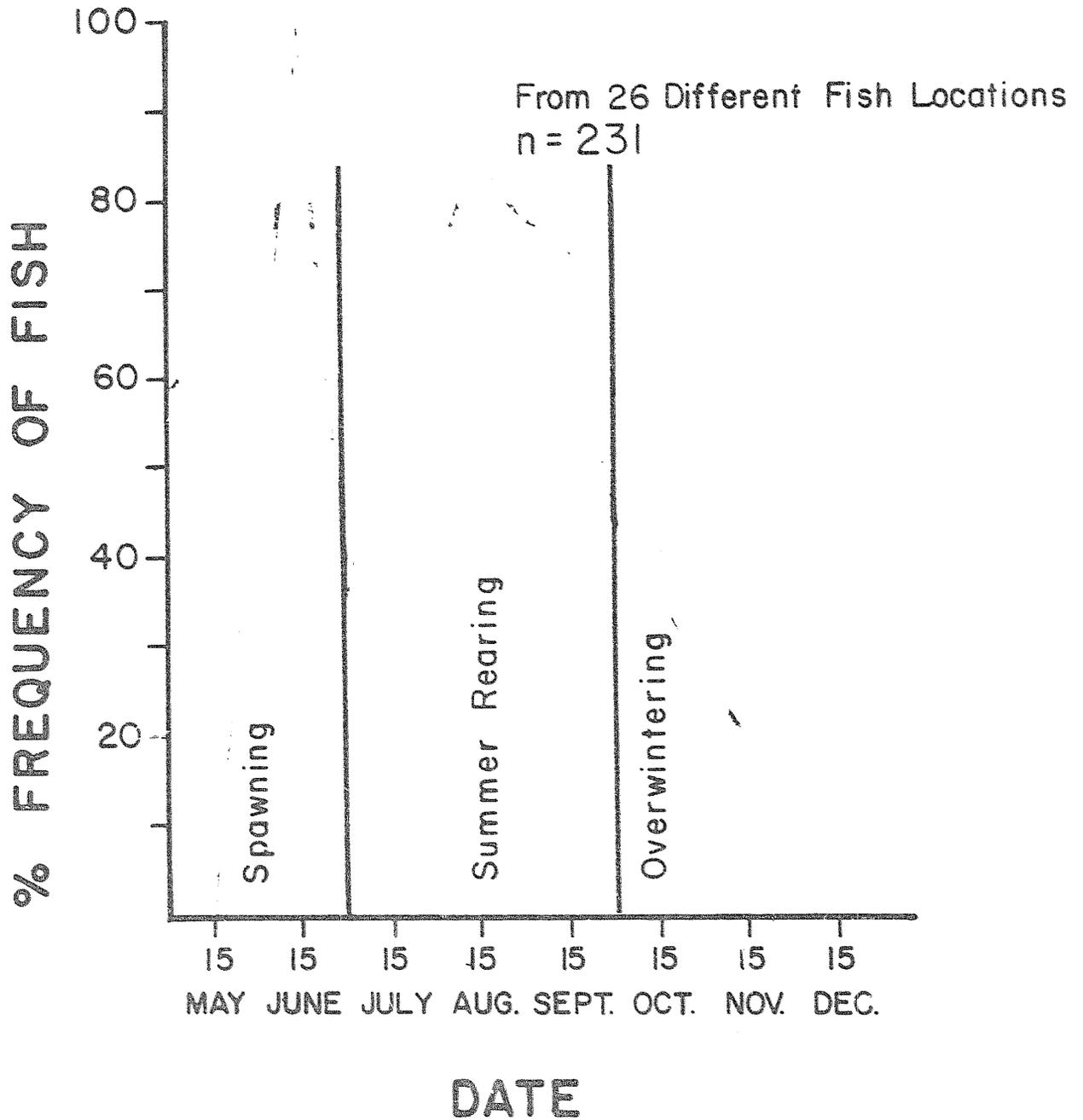


DISTRIBUTION AND ABUNDANCE OF JUVENILE COHO SALMON BY MACROHABITAT. (Percent based on mean catch per cell)



DISTRIBUTION AND ABUNDANCE OF JUVENILE COHO SALMON BY MACROHABITAT. (Percent based on mean catch per cell)

INCIDENCE OF RADIO - TAGGED
RAINBOW TROUT LOCATED IN
TRIBUTARIES , AT TRIBUTARY
MOUTHS OR IN SLOUGHS VERSUS
MAINSTEM SITES DURING 1983 -
1984 TRACKING.



The Importance of Rearing to Adult Production

Sockeye - Major limitation to production because of limited habitat but rearing habitat above the Chulitna confluence has little response to mainstem discharge

Coho - Major limitation to production but utilized habitat above the Chulitna confluence has little response to mainstem flows

Chinook - Significant limitation with major use of mainstem affected areas

Chum - Probably of minor importance although major use is made of areas affected by mainstem discharge

Pink - Little or no use of rearing habitats in fresh water

Pink - No significant rearing above Chulitna confluence

Chum - Rear from emergence until the last week of June
near natal areas (Slough & Tributary mouths)

Coho - Rear in small tributaries or upland sloughs

Sockeye - Initially rear near natal area- Migrate primarily
out of the system or into upland sloughs

Chinook - Estimate 50% of rearing in side channels

or other areas affected by the flow in
the Susitna mainstem

— Overwintering of Chinook juveniles and
other rearing species occurs apparently
in sloughs and other areas affected directly
by mainstem flows.

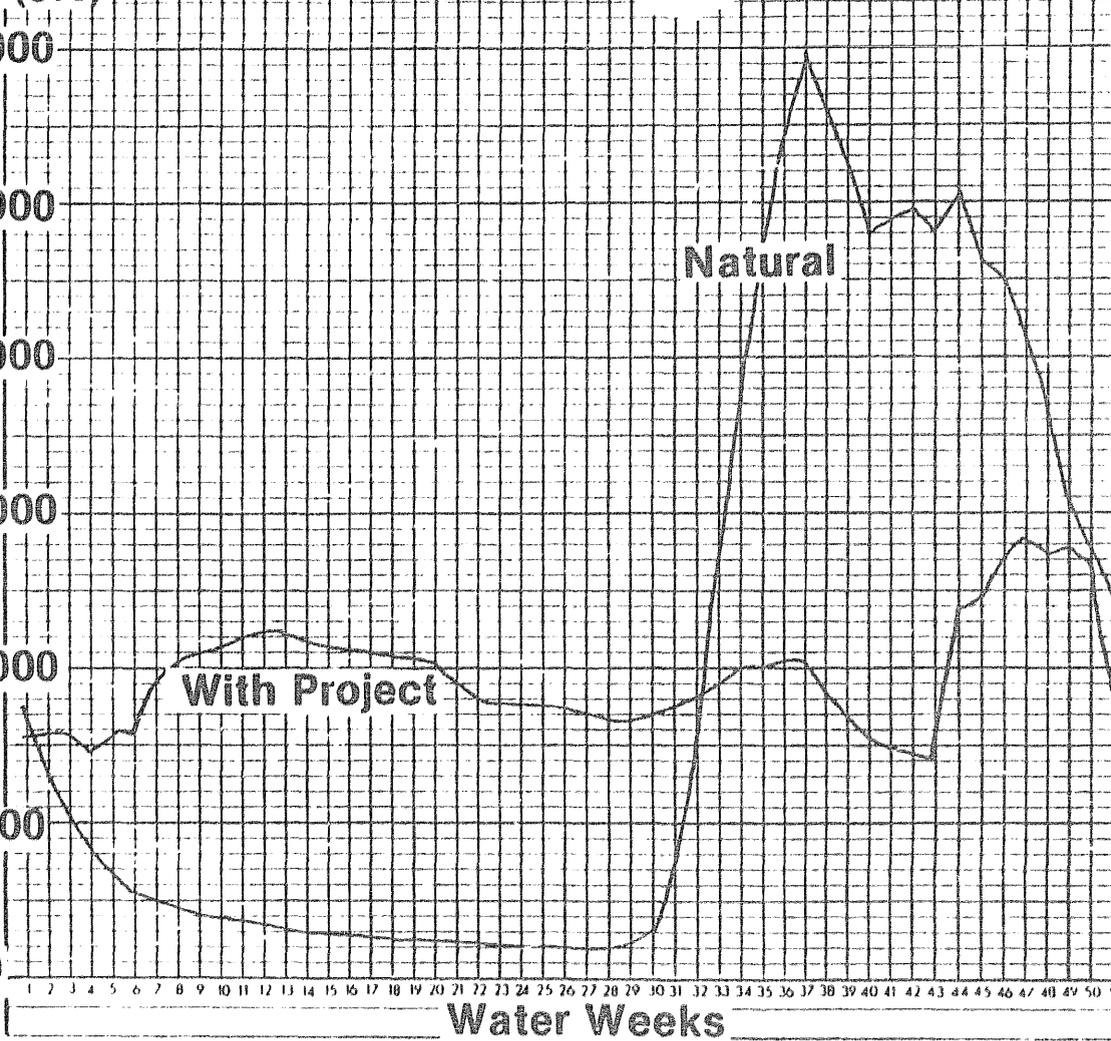
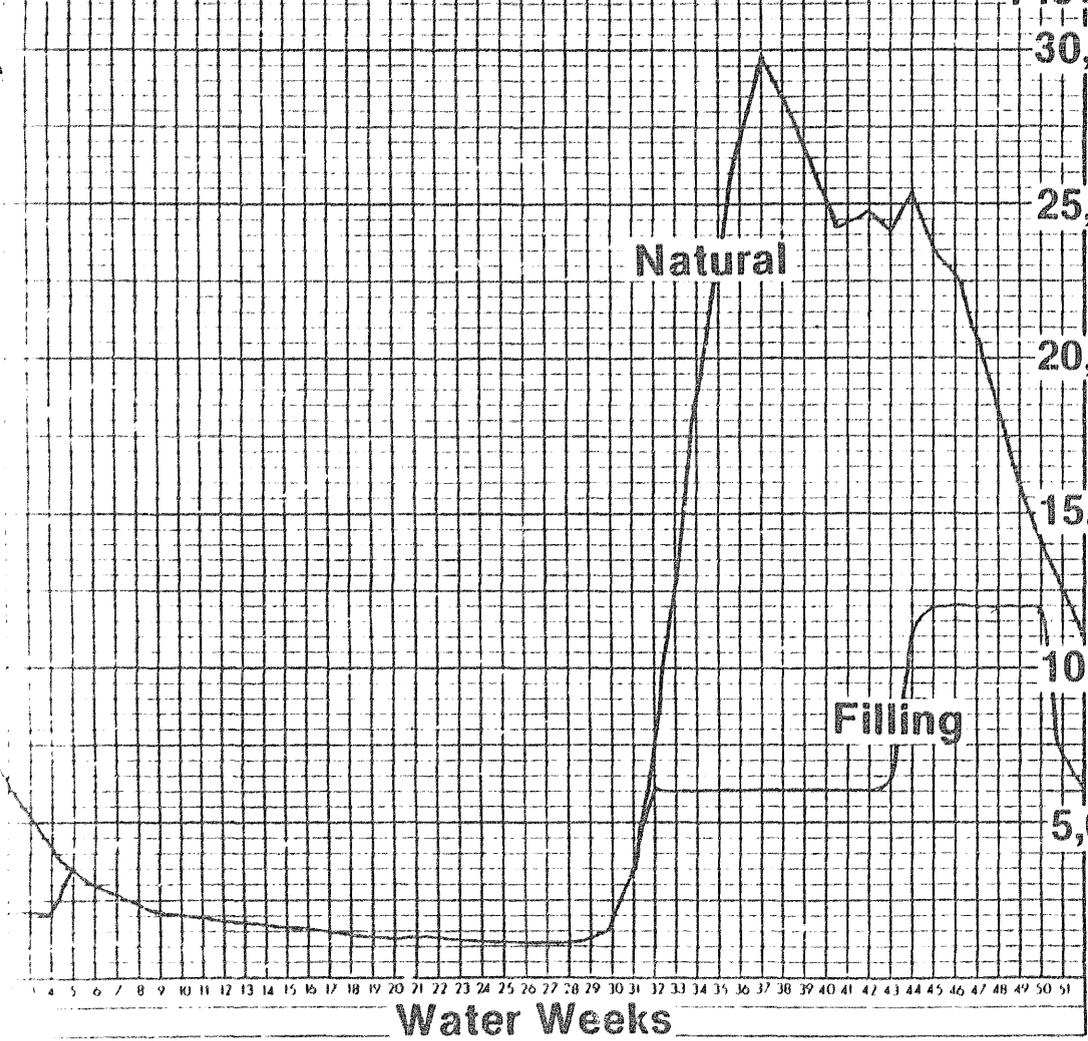
GOLD CREEK

W. Wilson

Mean Weekly Flow—Watana Filling

Mean Weekly Flow—Two Daris With Project

Flow (cfs)



Water Weeks

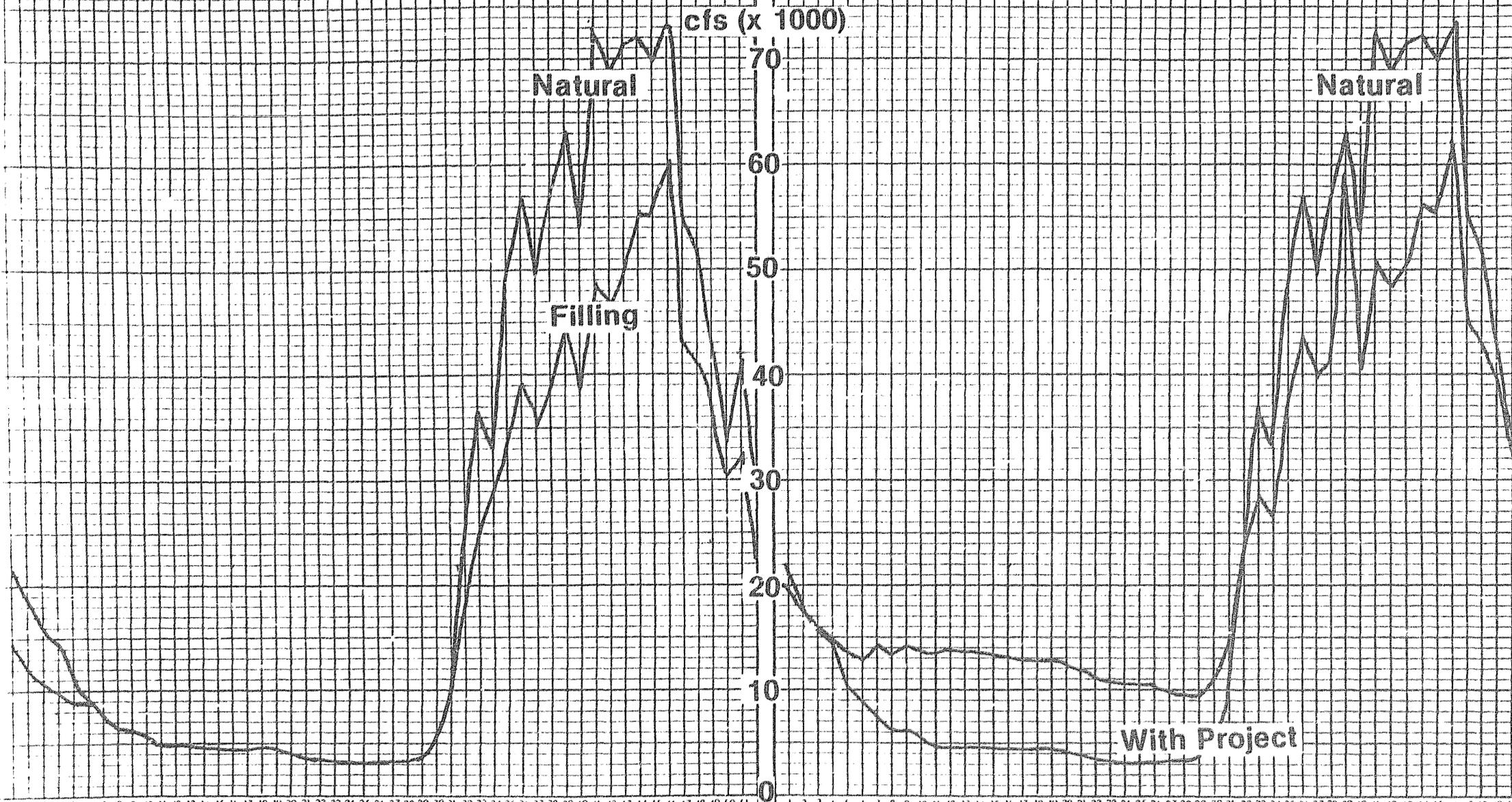
Water Weeks

SUNSHINE

Mean Weekly Flow—Watana Filling

Mean Weekly Flow—Two Dams With Project

cfs (x 1000)



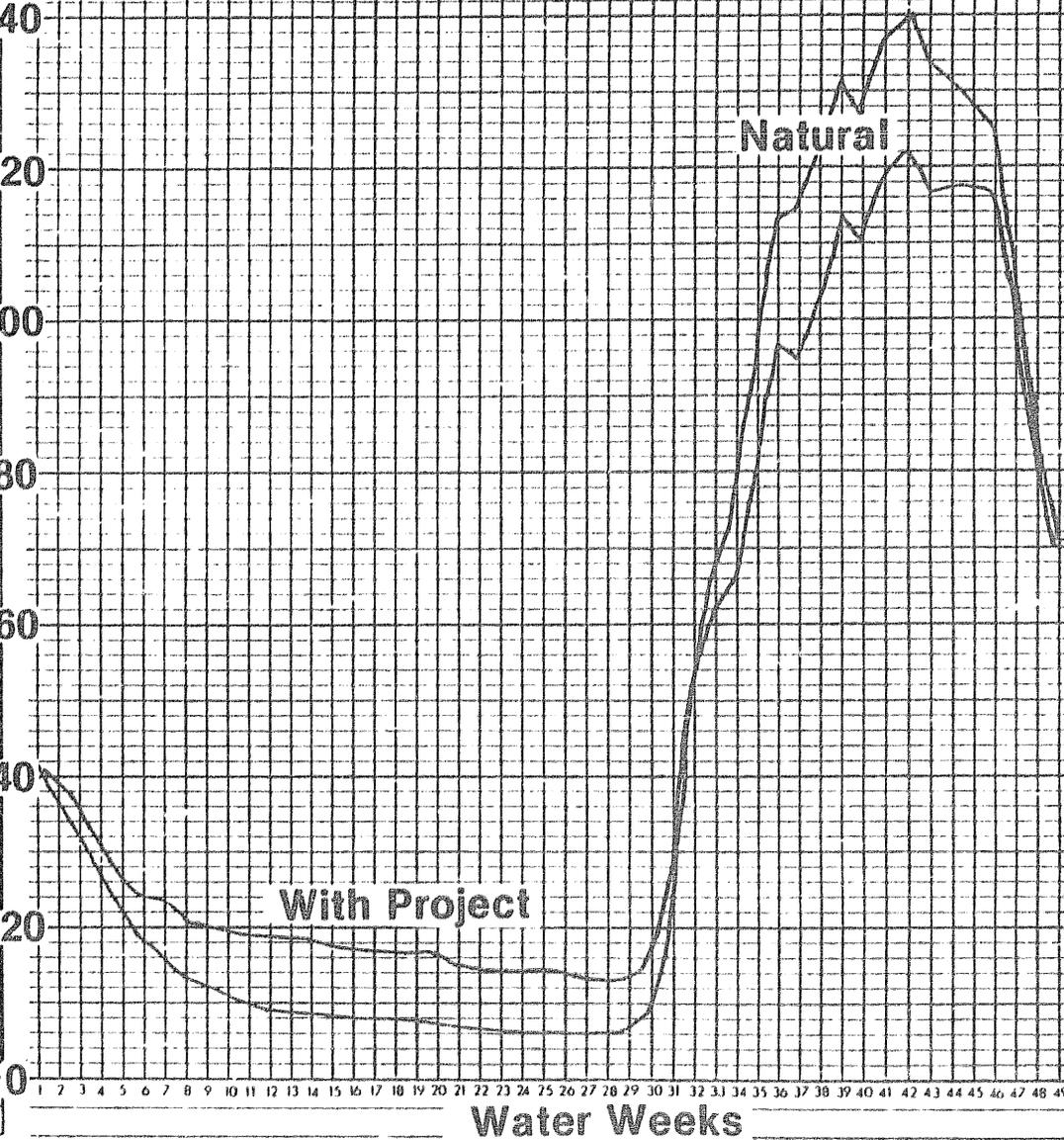
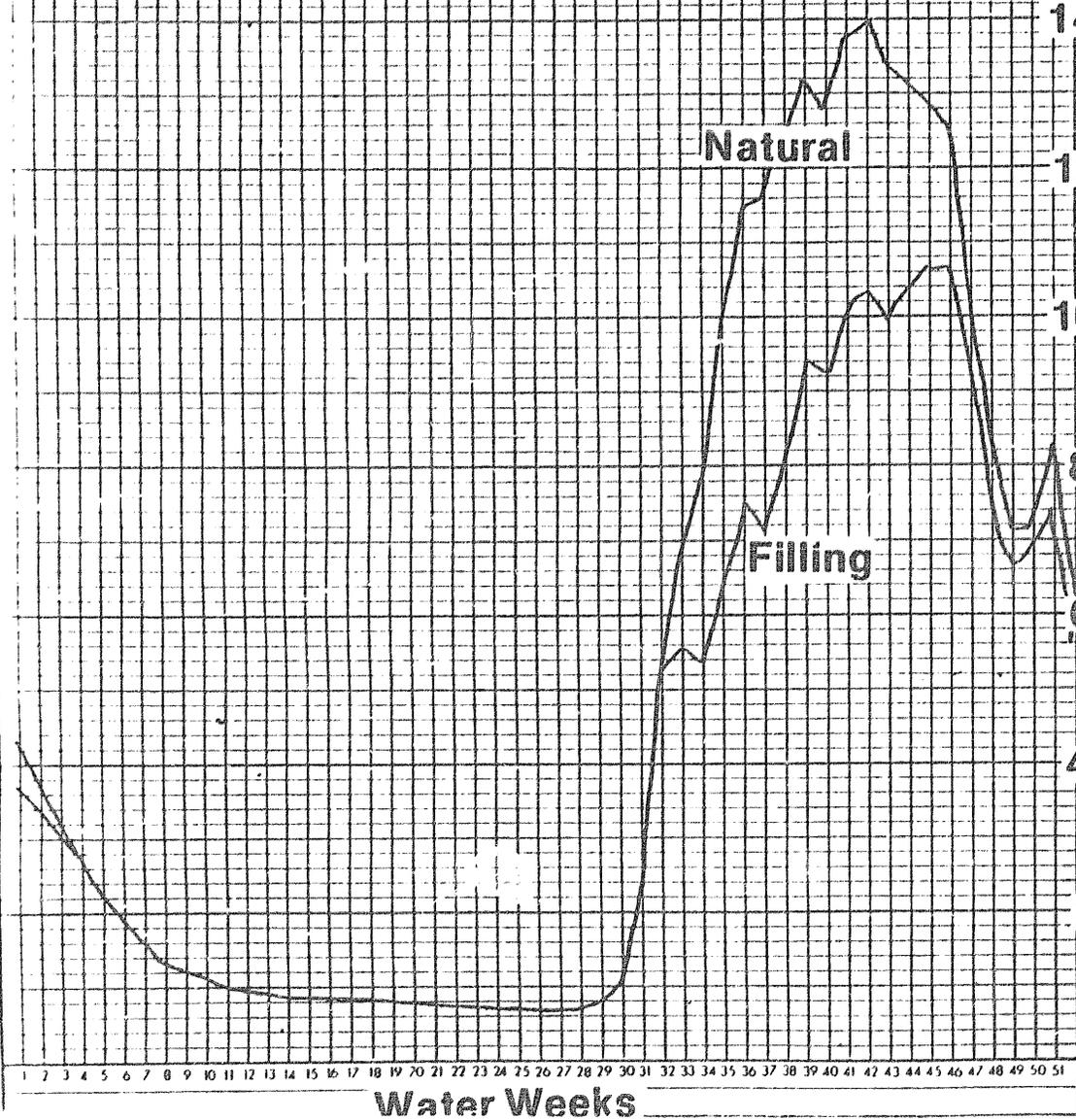
Water Weeks

Water Weeks

Mean Weekly Flow—Watana Filling

Mean Weekly Flow—Two Dams With Project

Flow (cfs x 1000)



Water Weeks

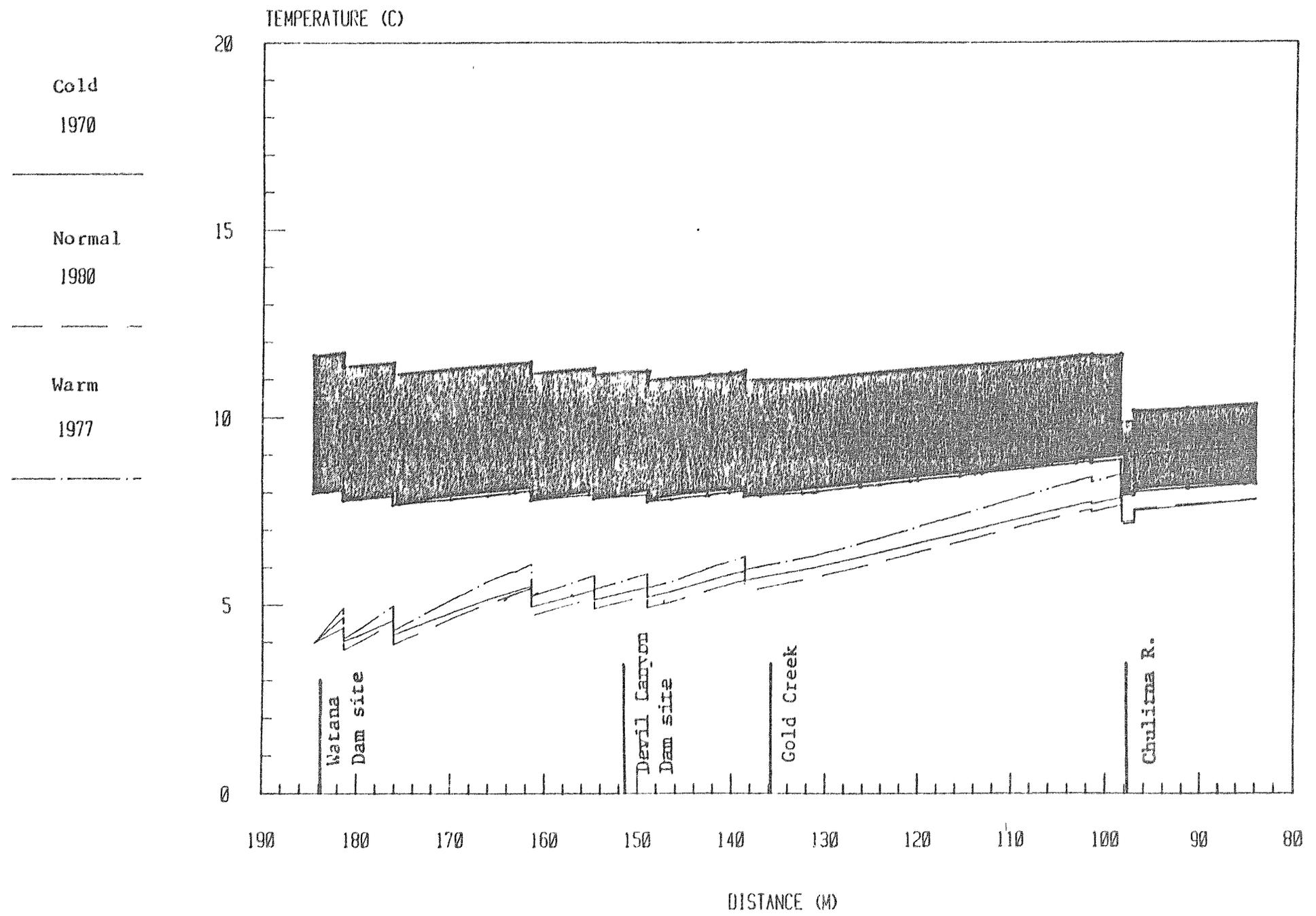
Water Weeks

Two Dams With Project Streamflow—Gold Creek

License Application Case	Oct-Apr	May-Jun	Jul	Aug	Sep
A	5,000	4,000	4,000	6,000	5,000
A1	5,000	5,000	5,100	8,000	6,500
A2	5,000	5,000	5,320	10,000	7,670
C	5,000	6,000	6,480	12,000	9,300
C1	5,000	6,000	6,530	14,000	10,450
C2	5,000	6,000	6,920	16,000	11,620
D	5,000	6,000	7,260	11,620	13,170

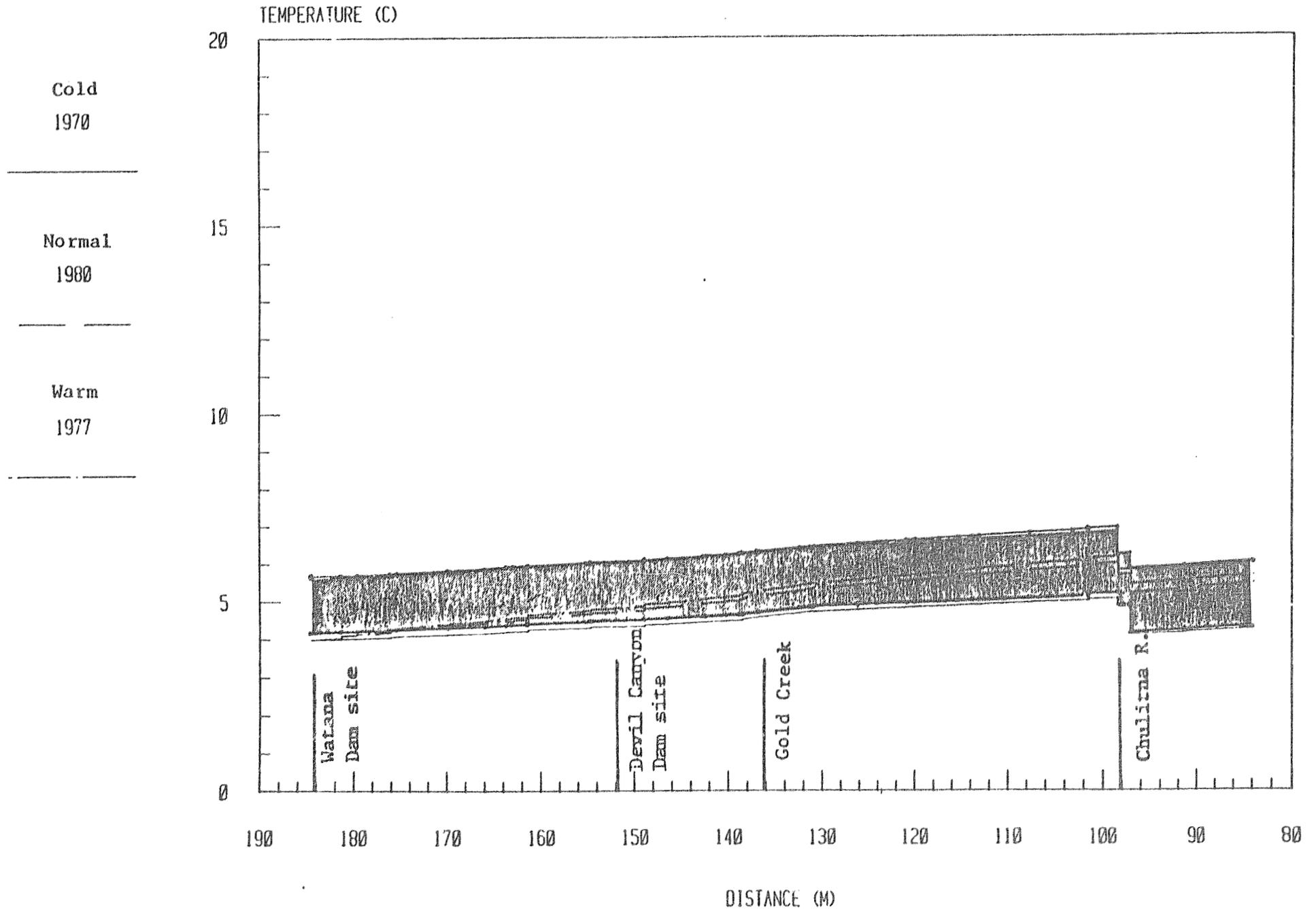
SUSITNA WATER TEMPERATURES, JUNE

Year 2. Watana Filling Flows



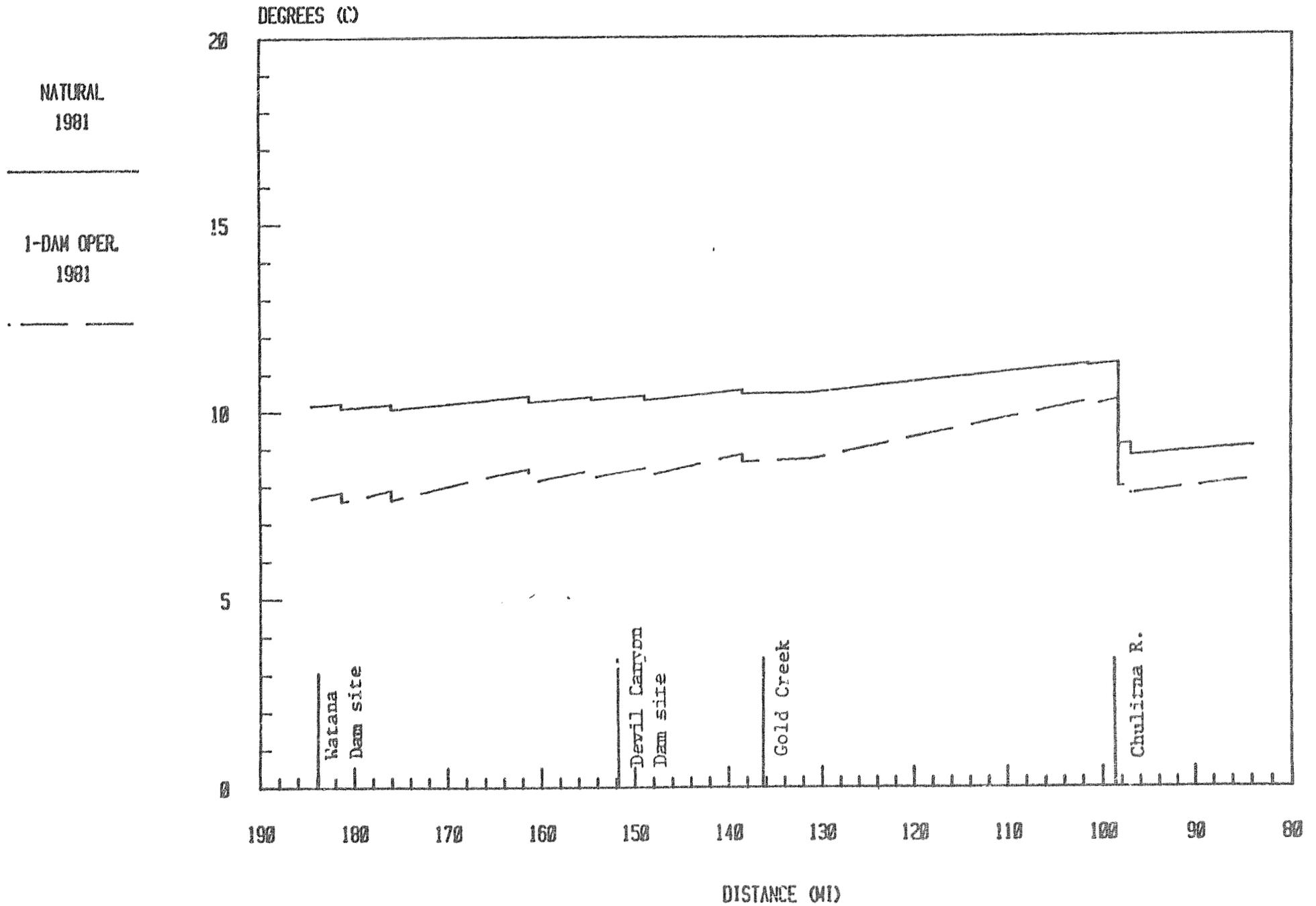
SUSITNA WATER TEMPERATURES, SEPTEMBER

Year 2, Watana Filling Flows



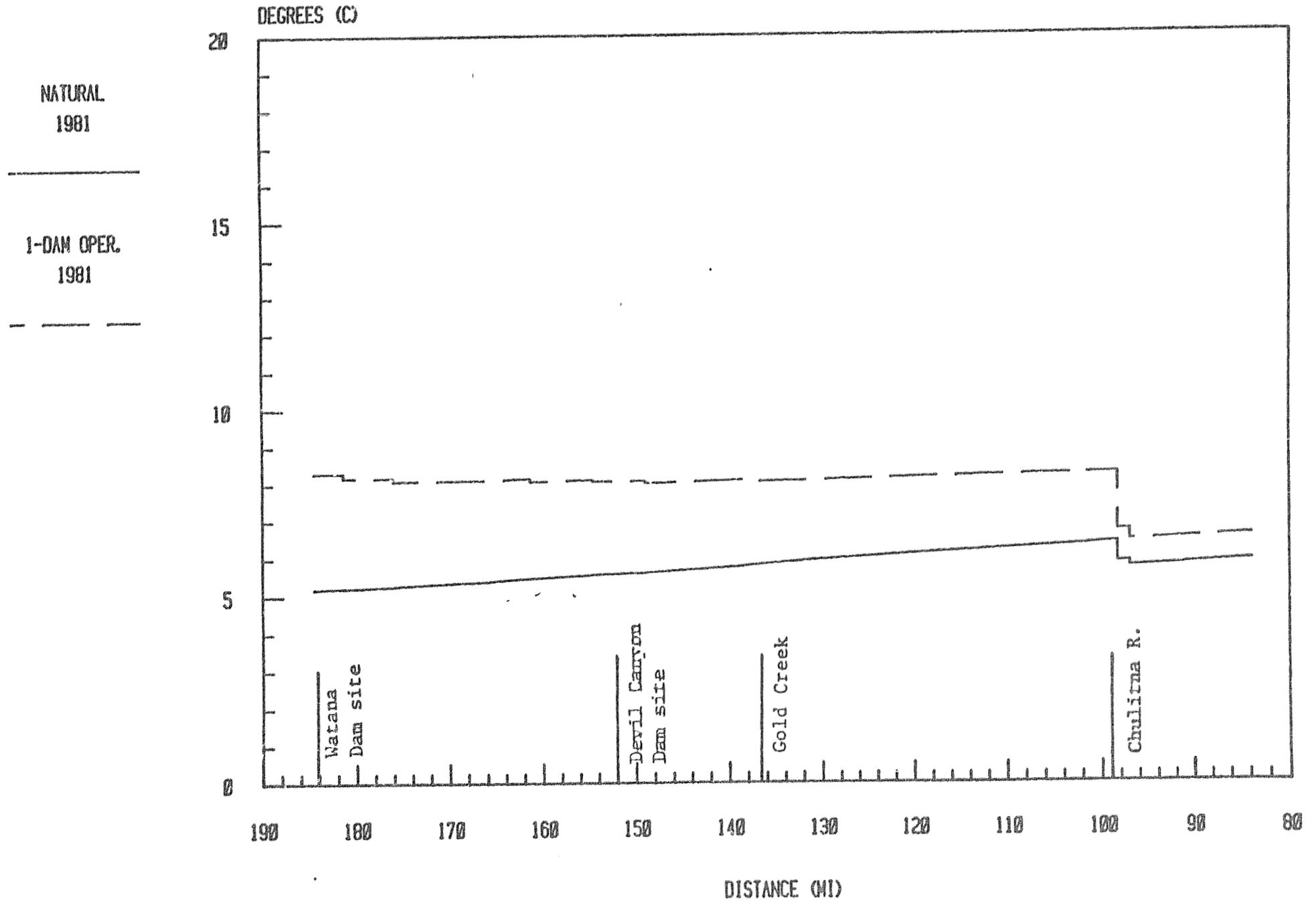
SUSITNA WATER TEMPERATURES, JUNE

NATURAL AND 1-DAM OPERATIONAL



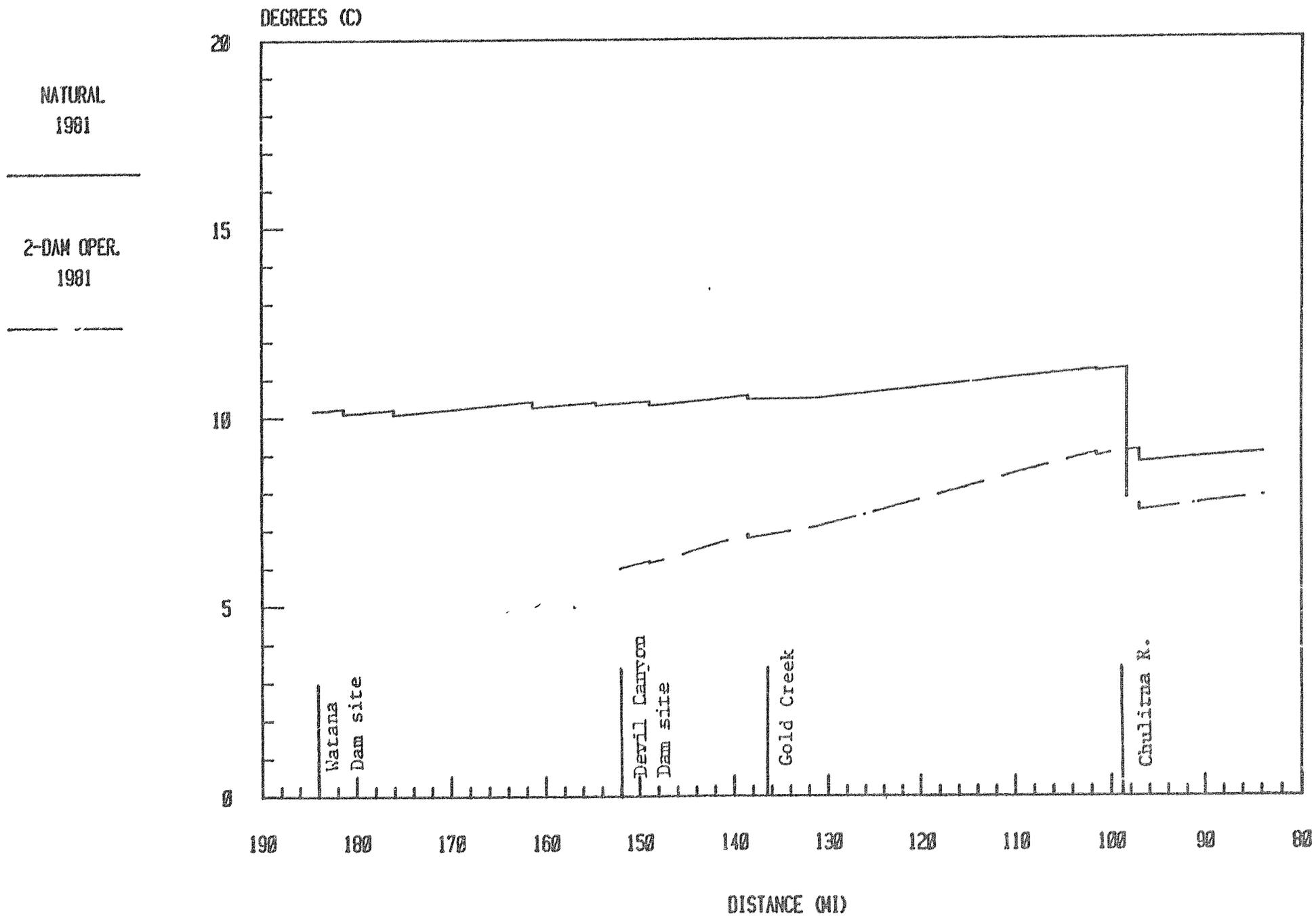
SUSITNA WATER TEMPERATURES, SEPTEMBER

NATURAL AND I-DAM OPERATIONAL



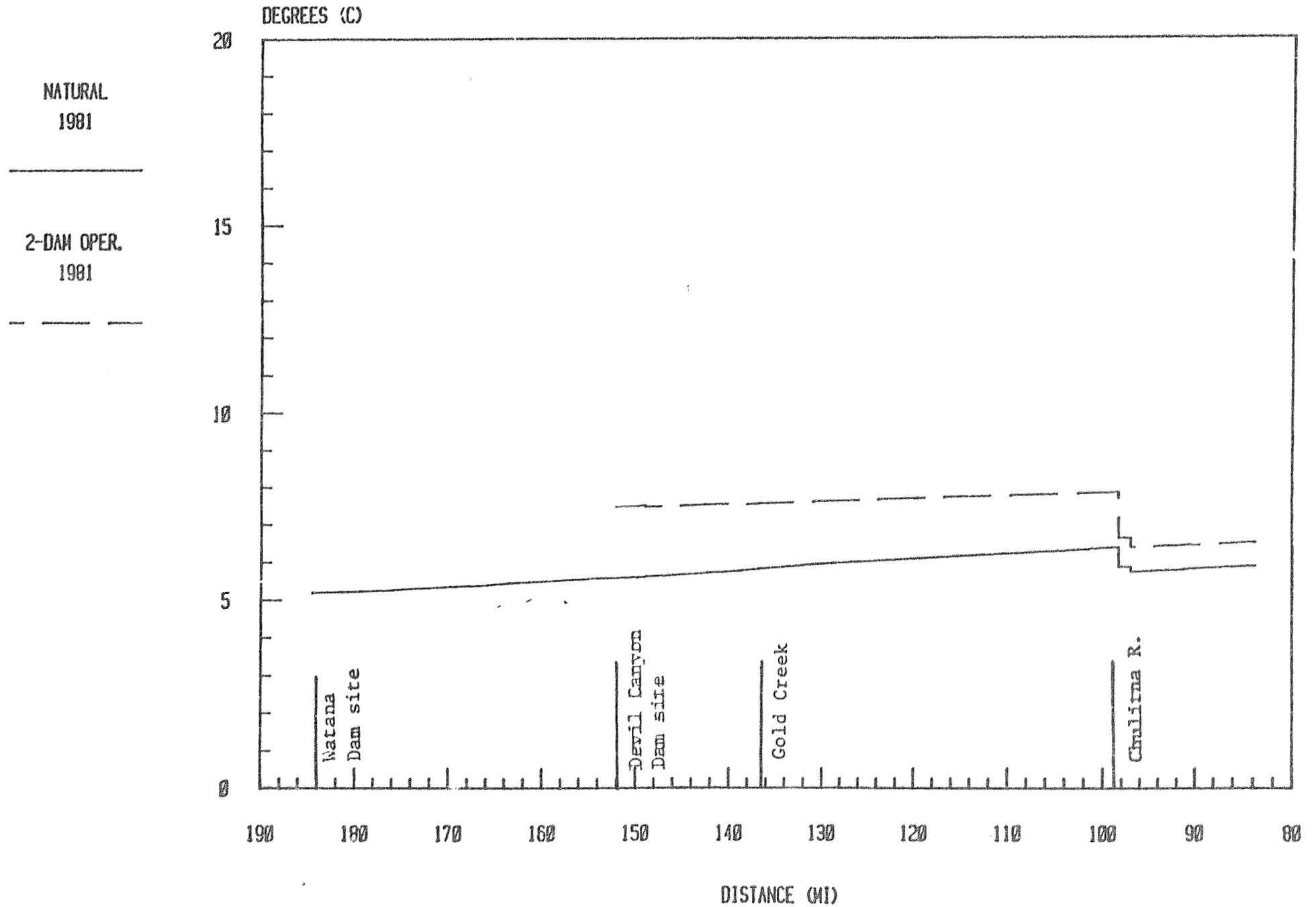
SUSITNA WATER TEMPERATURES, JUNE

NATURAL AND 2-DAM OPERATIONAL

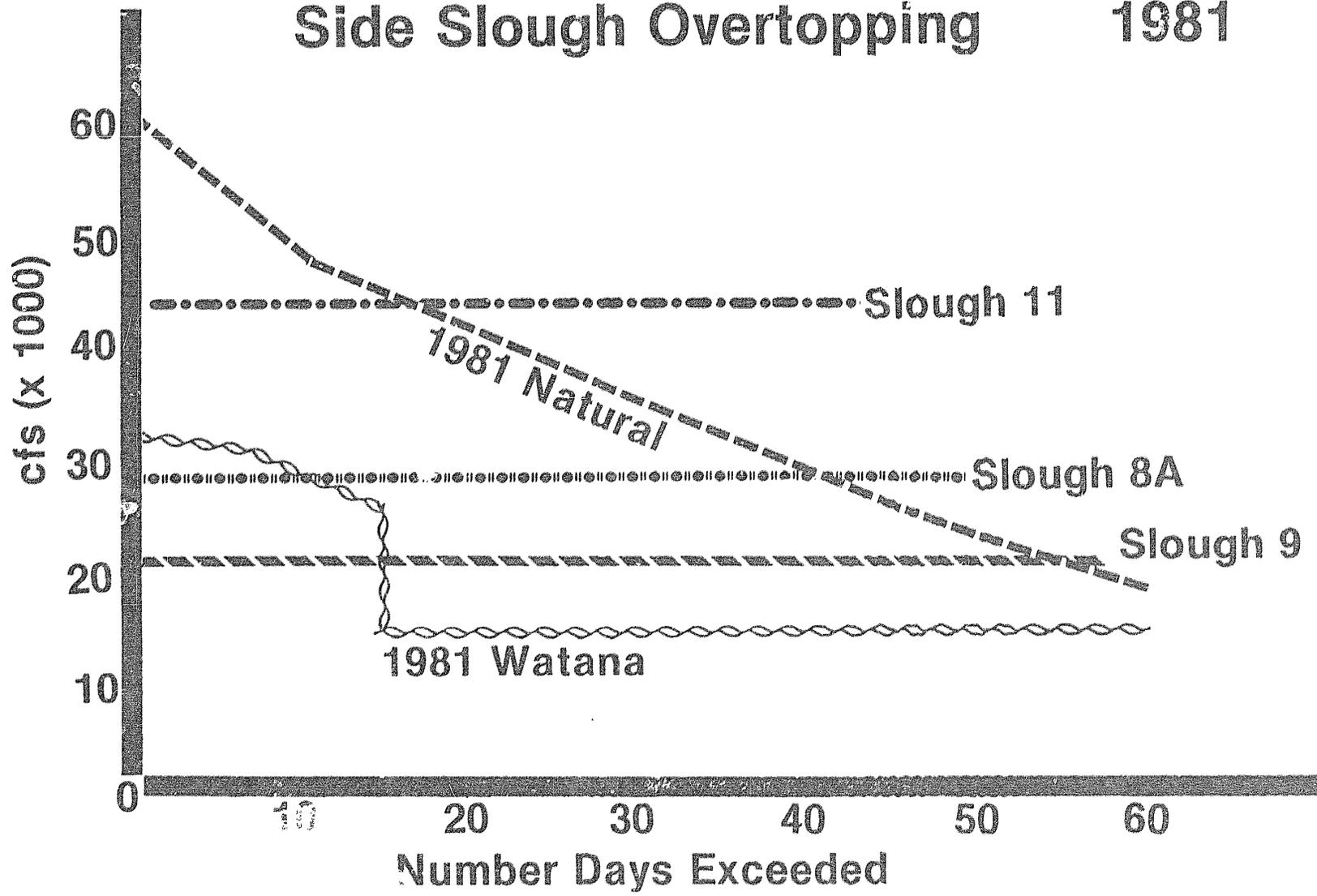


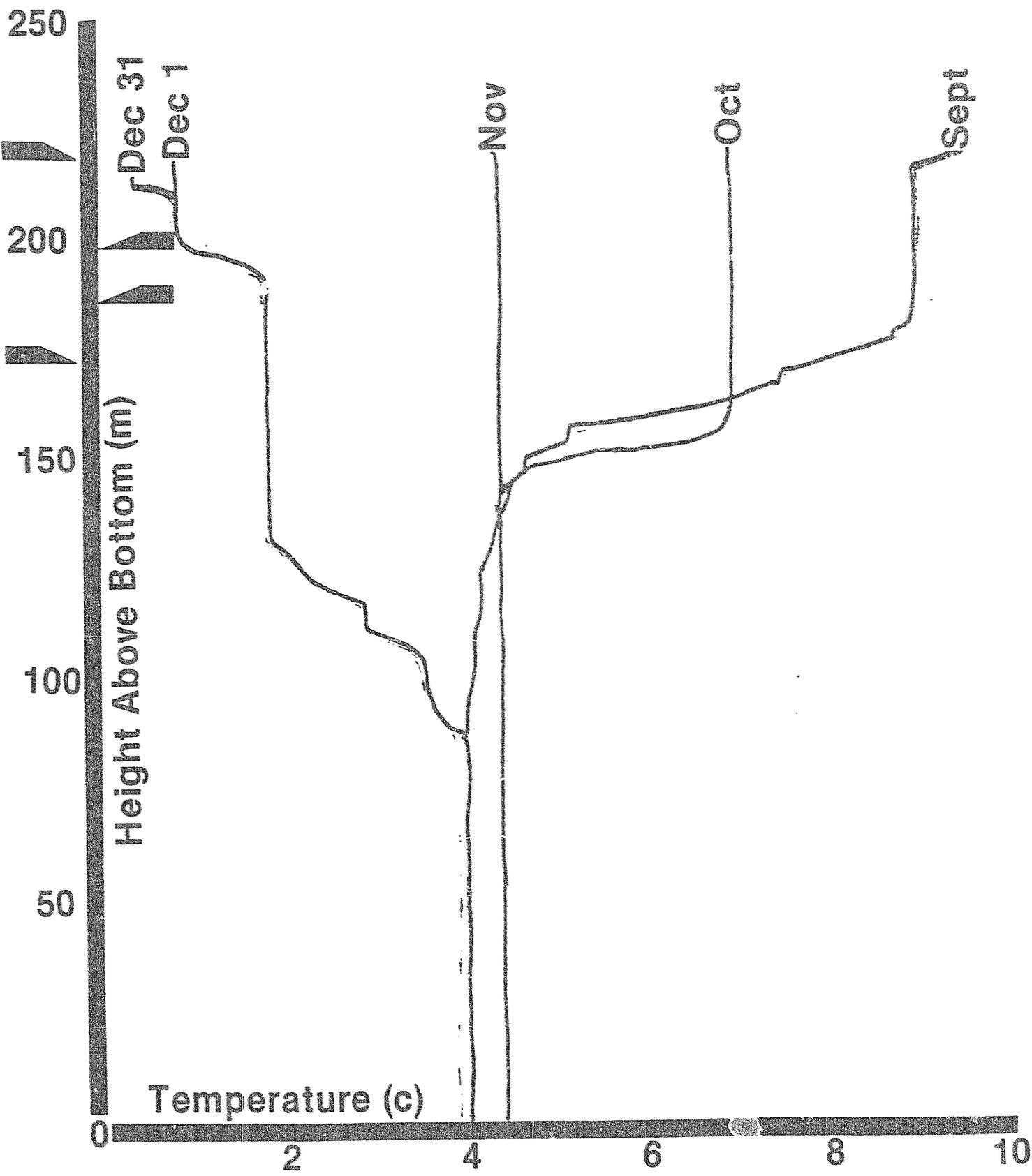
SUSITNA WATER TEMPERATURES, SEPTEMBER

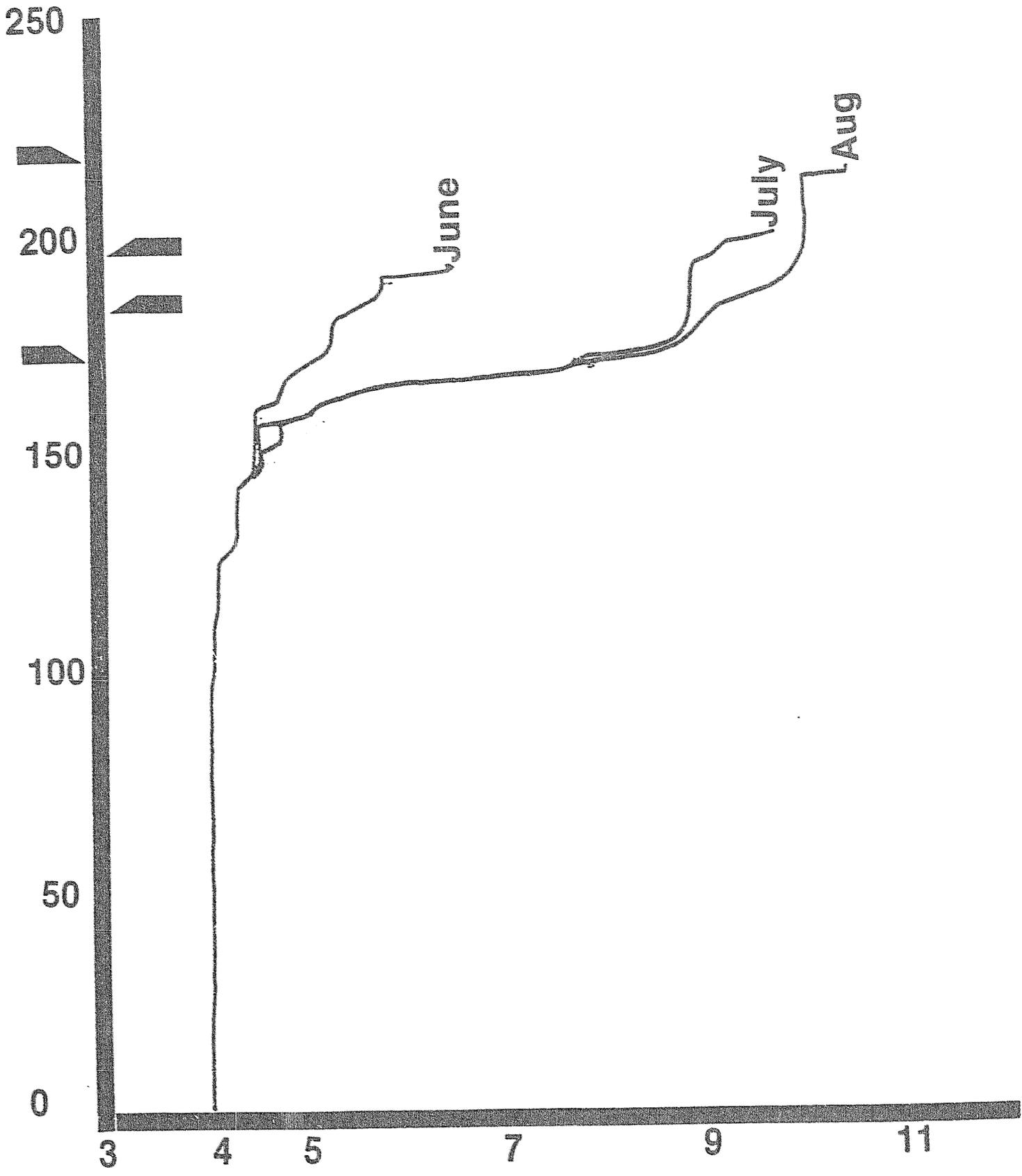
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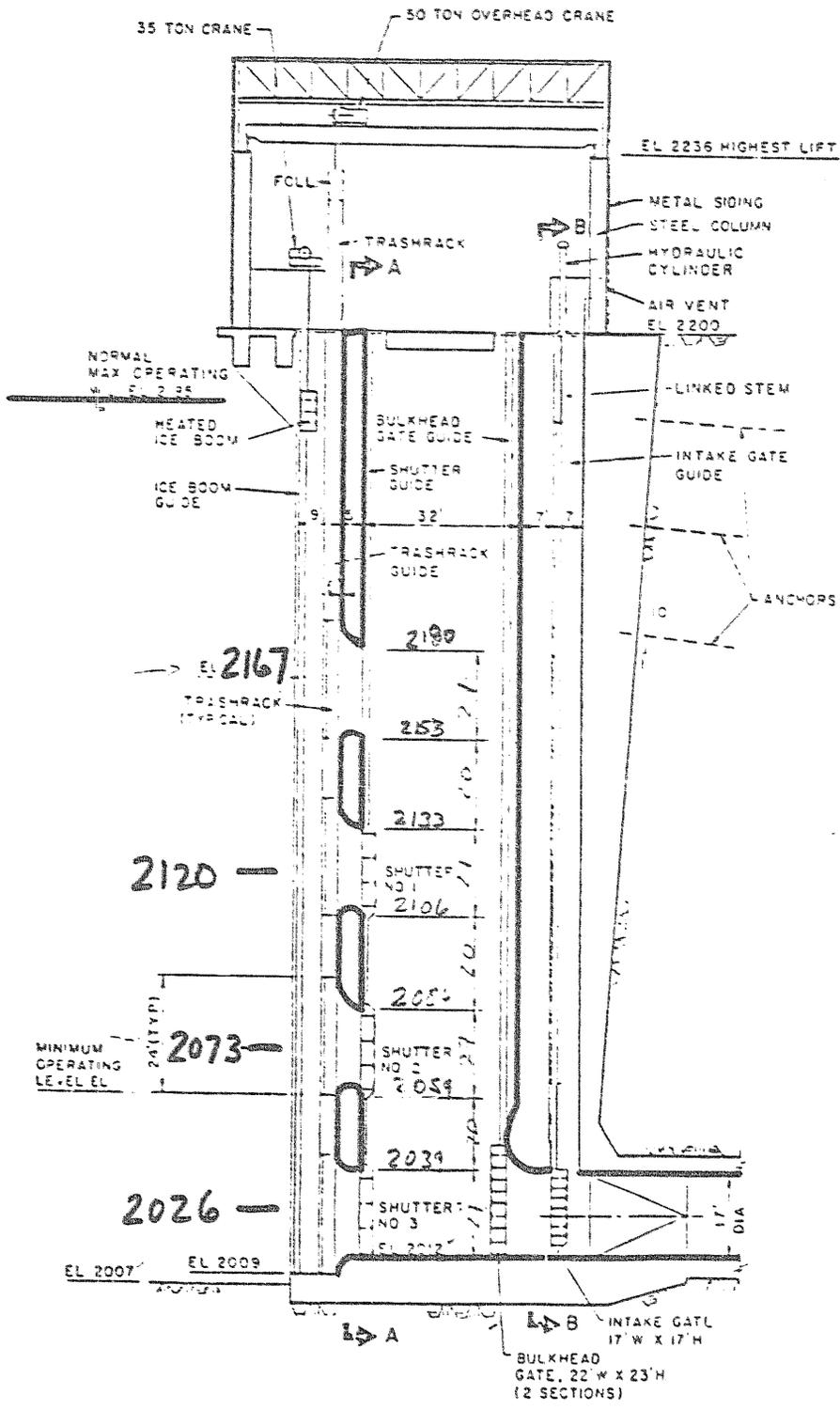


Side Slough Overtopping 1981









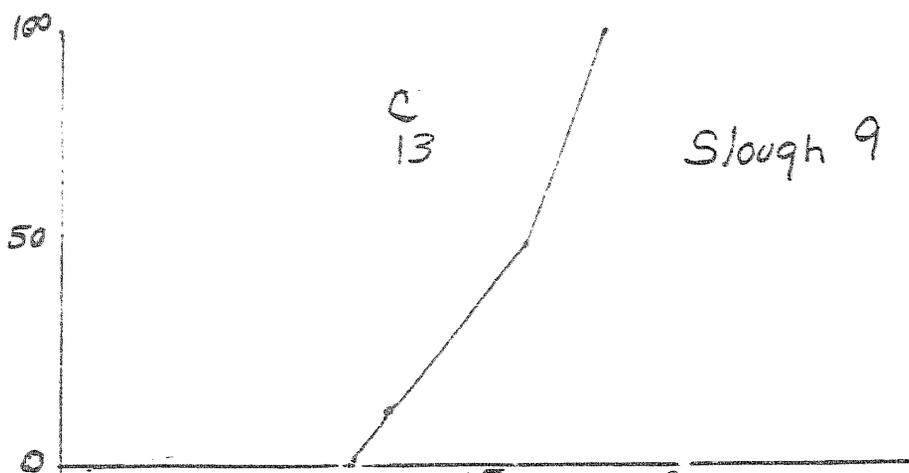
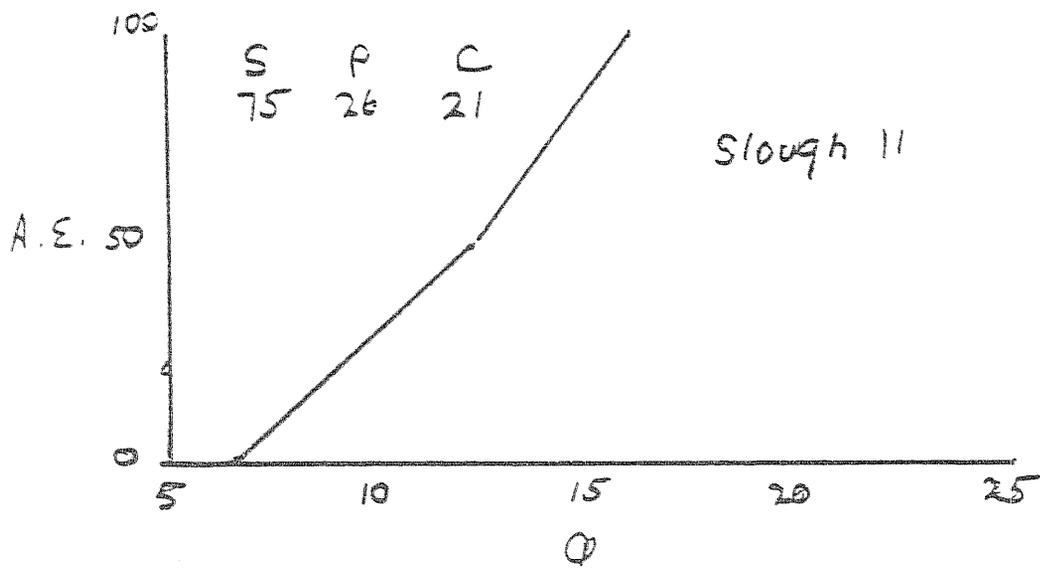
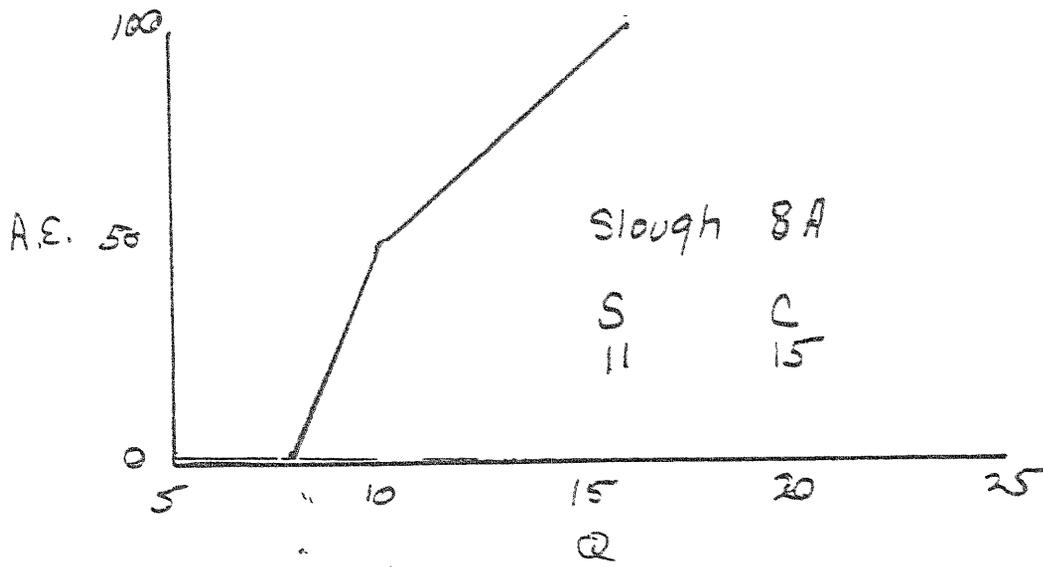
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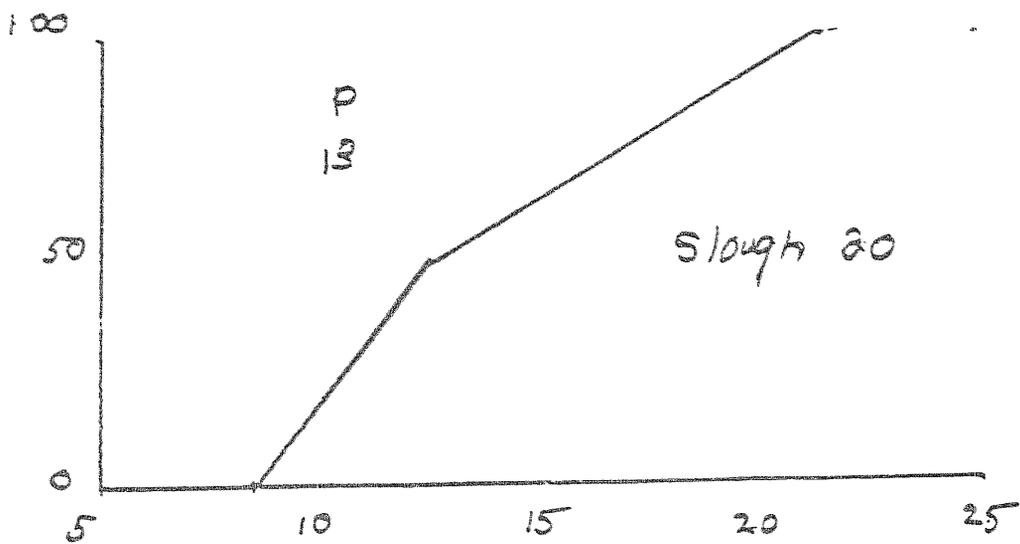
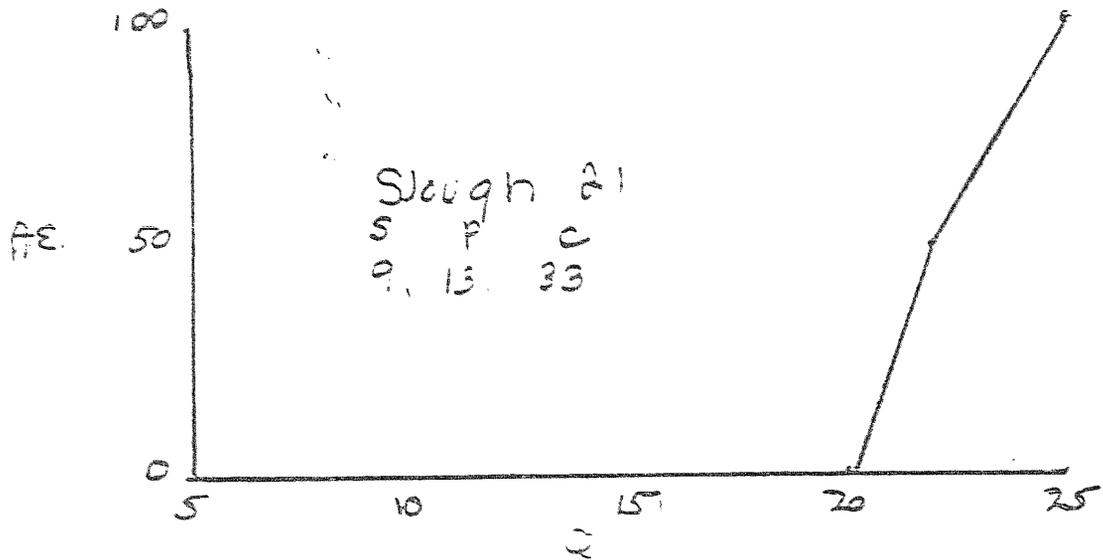
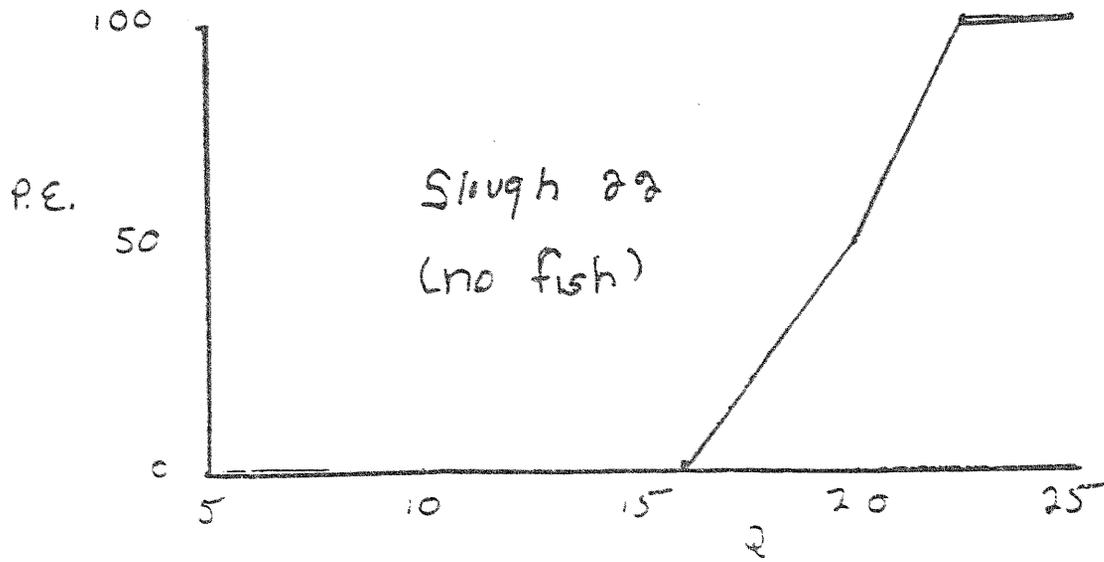
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MINIMUM OPERATING LEVEL EL





Composite Access Relationship

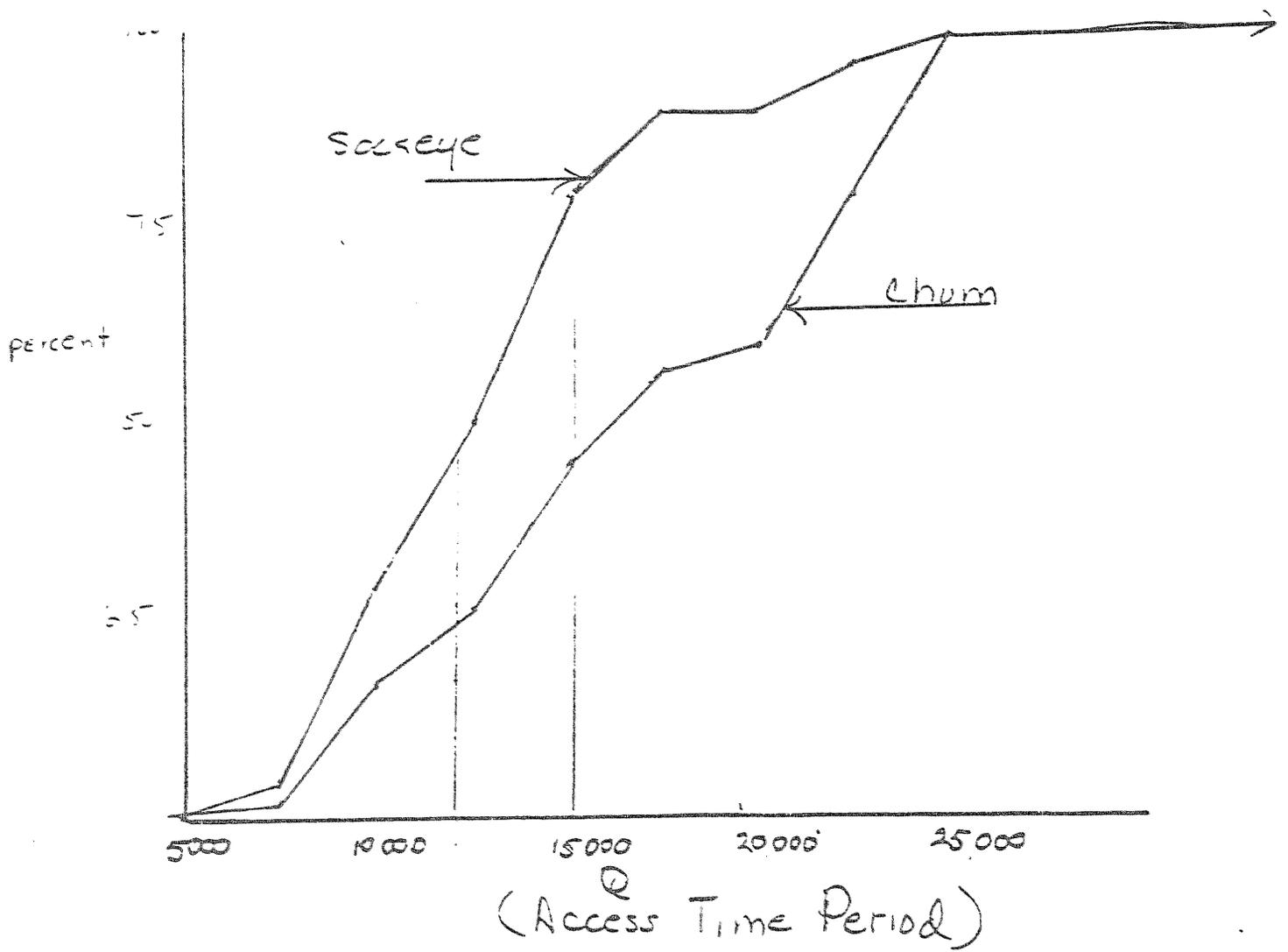
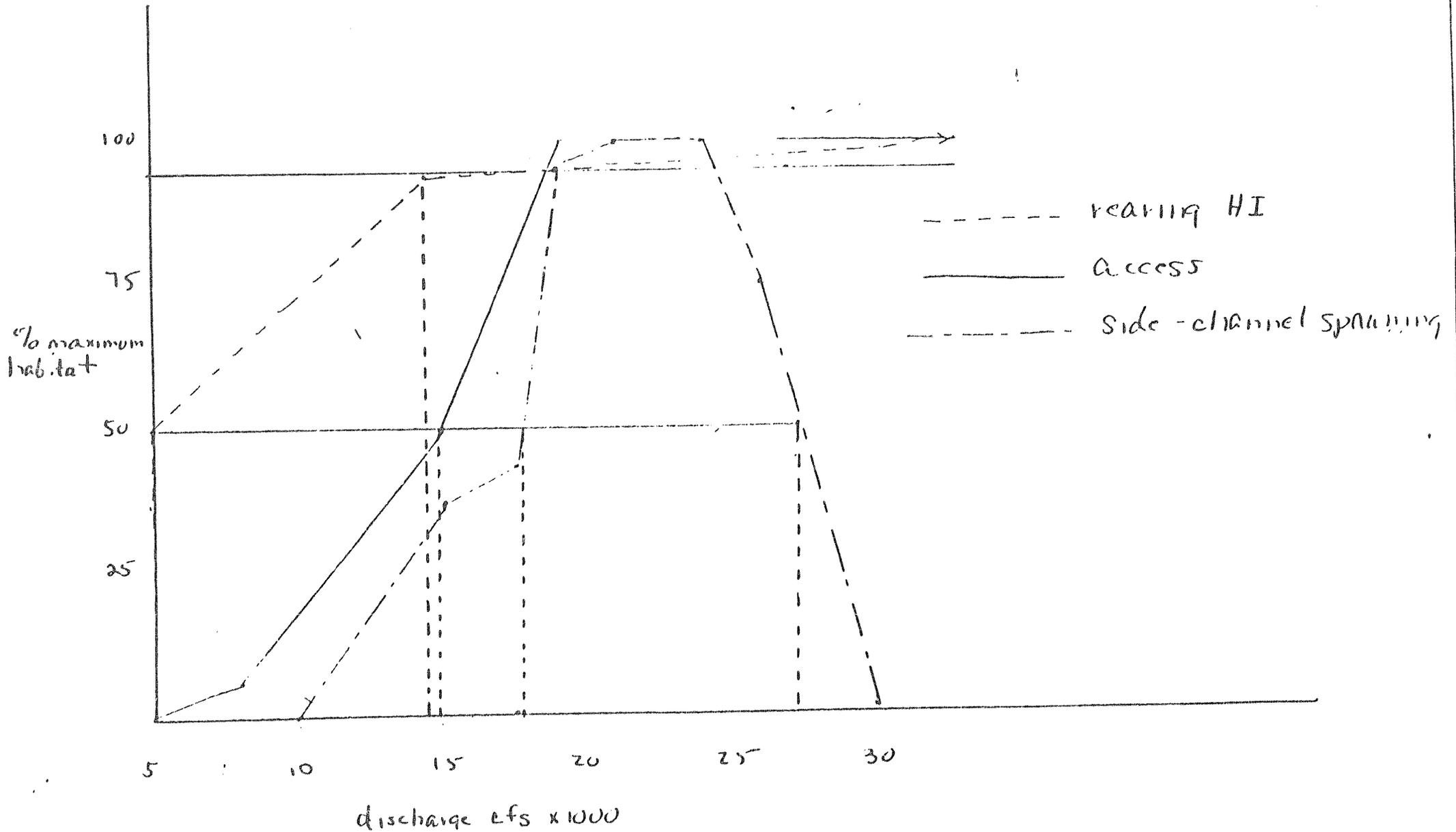
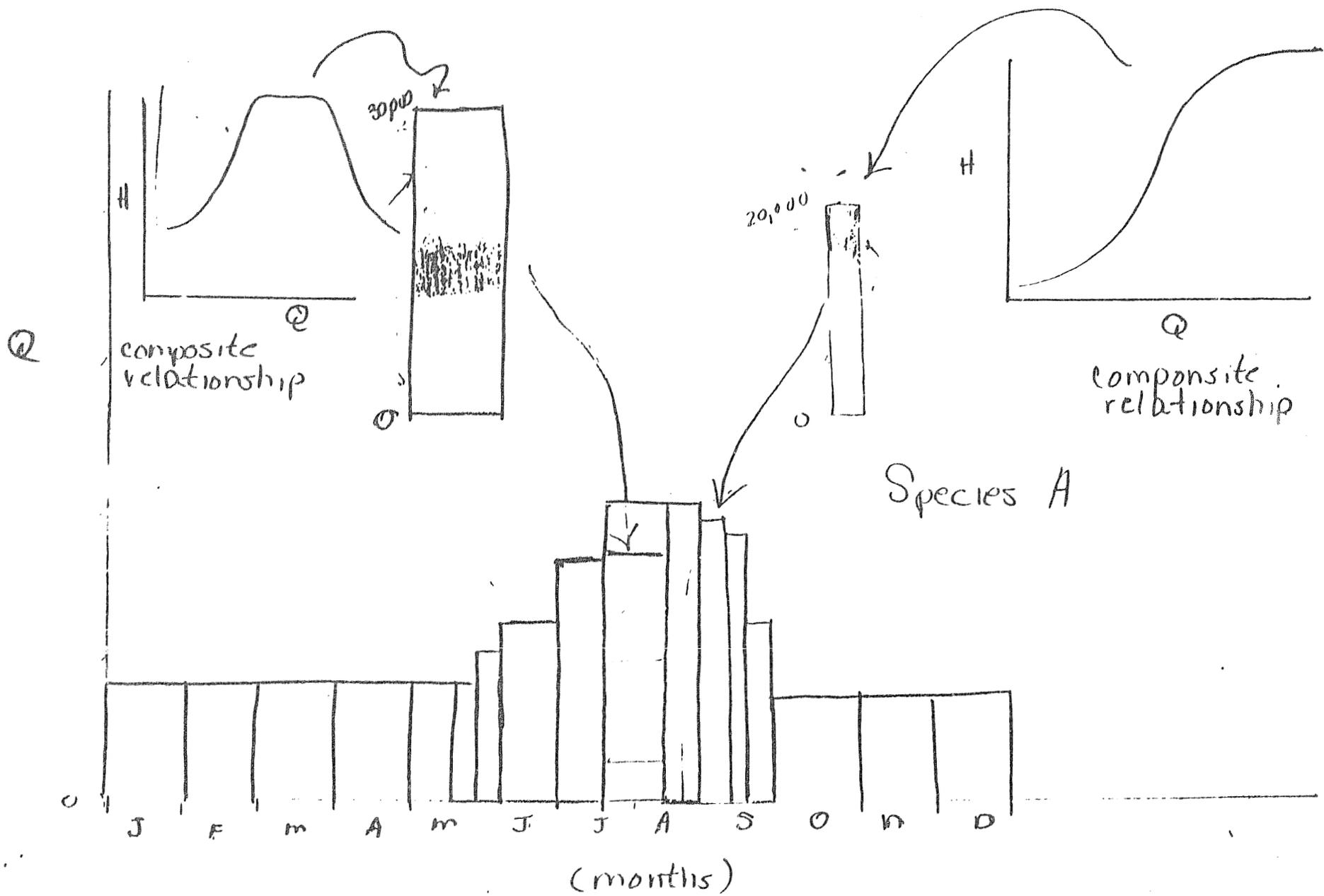


Figure — Superimposed habitat relationships for rearing, access and side-channel spawning, applicable to determination of an August composite flow requirement.





Physical Habitat
at Mainstem Q
(d, v, s, c, Surface Area)

Biological Response
(Preference, Density)

Habitat Relationships

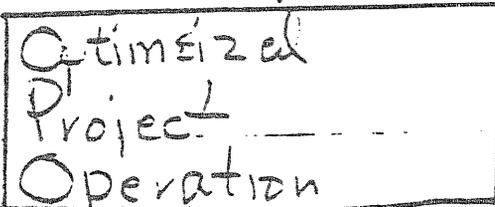
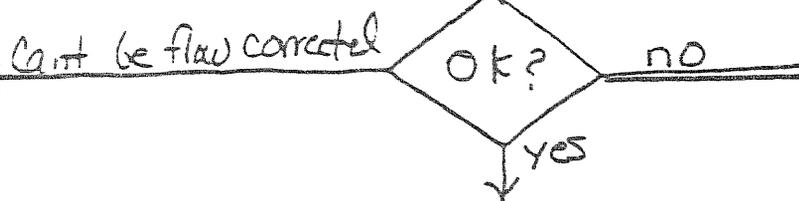
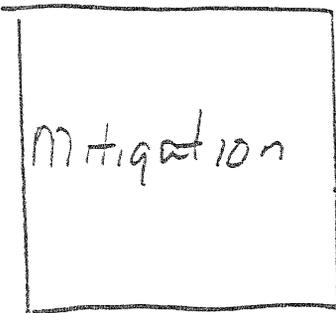
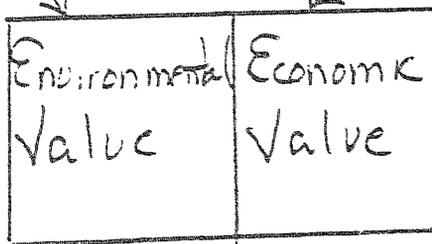
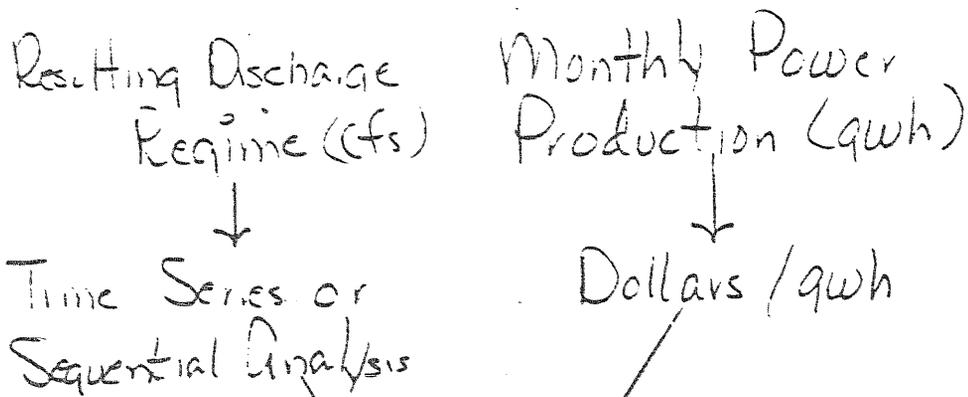
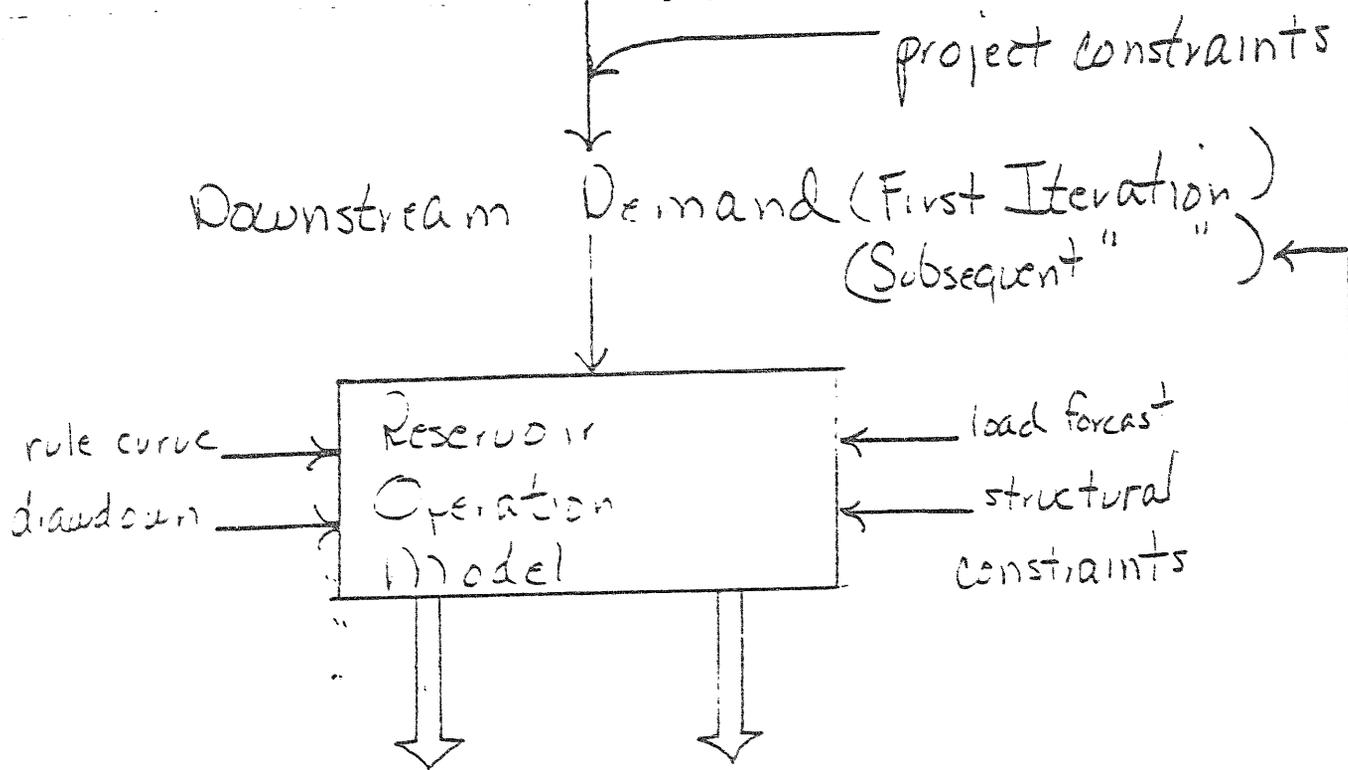
— Distribution and Abundance

Composite Relationships

— Timing

Flow Relationships
Hydrograph

Flow Relationships Hydrograph



Resulting Discharge Regime (August)

32 August mean monthly discharges

32 August Composite Hab. ta

