Breeding landbird survey, midbay region of GBNPP, June 1998

Mary F. Willson and Scott M. Gende
Forestry Sciences Lab
2770 Sherwood Ln
Juneau AK 99801

Salmon runs provide significant nutrient supplements to freshwater streams and adjacent riparian zones (e.g., Willson et al. 1998 BioScience 48: 455-462). Stream productivity is enhanced by nutrient augmentation. Furthermore, bears and wolves move salmon carcasses from stream to land and excrete digesta from salmon consumption, supplementing the nutrients available for riparian organisms. The nutrients are known to enter terrestrial vegetation, but there is no information on upper trophic levels, including the forest bird community. We compared the breeding bird communities along streams that are thought to support salmon runs with those along streams that are thought to lack salmon runs. A similar study near Juneau revealed no difference in species richness between bird communities along streams with and without salmon, but a slightly higher density of birds along salmon streams.

During the first three weeks of June, 1998, a team of four persons censused riparian birds along selected streams in Geikie Inlet and Fingers Bay on the west side of Glacier Bay and near Spokane Cove on the east side. Two of the same persons censused along the Good River and Bartlett River near Gustavus. Each stream reach was censused twice, on nonconsecutive days. At each site we conducted 8-minute point counts (birds heard and seen within a radius of 50m) at five points along a transect parallelling the stream at a distance of about 50m. Points were separated by about 150m within each transect.

For mainland sites near Juneau, avian communities vary with tree species composition (conifer vs deciduous), so for riparian bird censuses near Juneau, we have plotted avian density and diversity (species richness) vs the percentage of tree stems that is composed of deciduous trees (Willson, unpublished data). For Glacier Bay data, we used the same method, to see if differences in density and diversity emerged when tree species composition was taken into account.

We selected streams that had significant waterflow (in June, at least 2m wide) and avoided tiny streams likely to be intermittent. Streams considered to support salmon runs were determined on the basis of information from Chad Soiseth, plus our own observations of salmon bones at streamside (Fig. 1). We recognize that information on the existence of salmon runs is imperfect, and runs are continually being established and lost; our comparisons must therefore be taken with this caveat.

<u>Results</u>

There was no difference in the density or species richness of birds along salmon and nonsalmon streams. Densities ranged from 5.1 to 8.9 birds/point/day, with complete overlap in the range of densities on both types of stream (Mann-Whitney U test, $p > 0.05$). Species richness ranged from 9 to 17 species per transect on salmon streams and from 6 to 14 species per transect on nonsalmon streams, but most values in both categories fell between 9 and 14 species (Mann-Whitney U test, $p > 0.05$). No species were unique to either type of stream. Census data for each site are provided in the Appendix.

When tree species composition is taken into account, there was no relationship between density and percent deciduous trees (Fig. 2), unlike the earlier results from Juneau. Diversity tended to decrease with increasing percent deciduous trees (Fig. 3,4), a result opposite to that obtained near Juneau. Slopes and intercepts for diversity and for density were statistically similar on salmon and nonsalmon streams (t-test on regression lines and intercepts;all p's > 0.50).

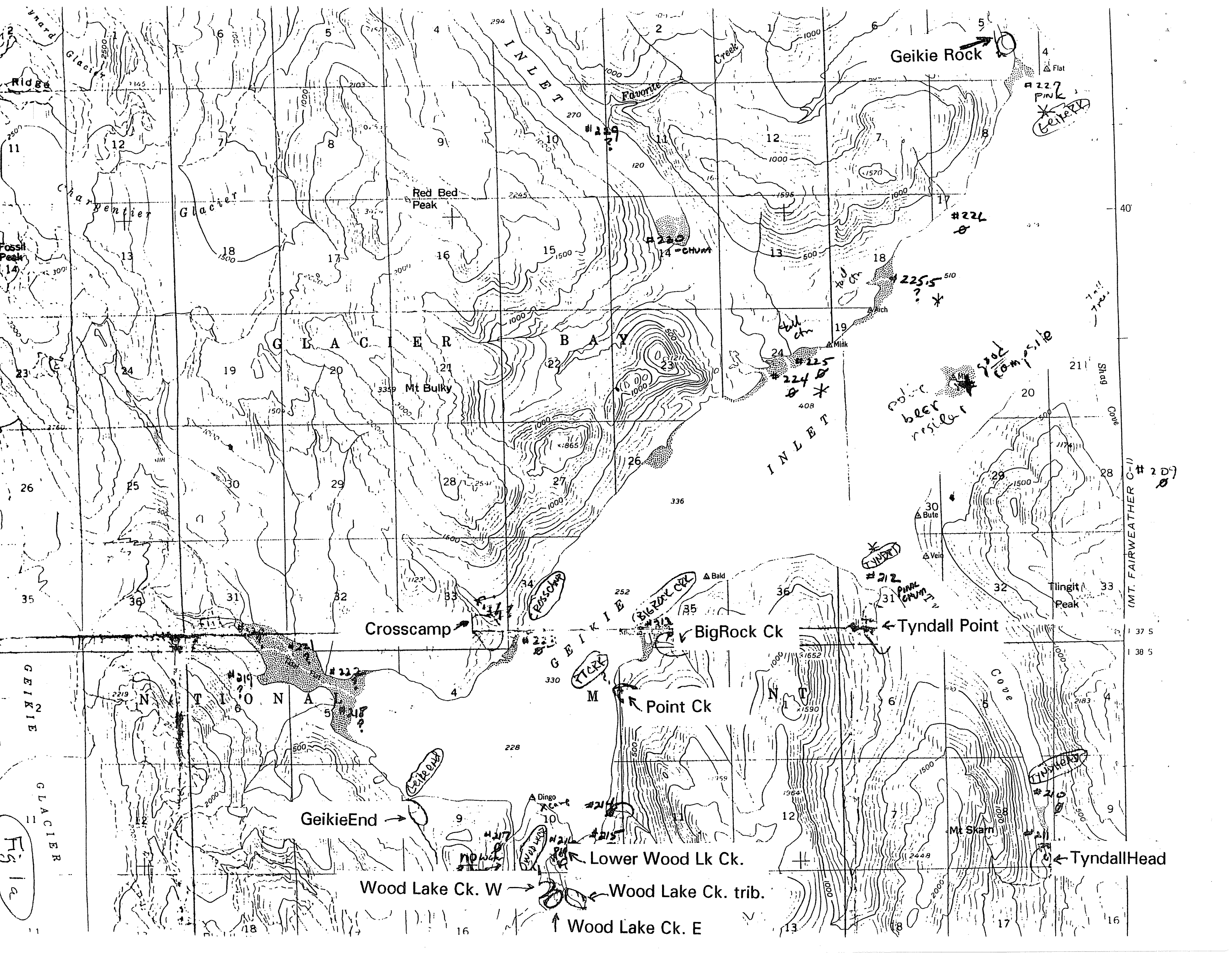
Discussion

We found no difference in avian density or species richness on salmon and nonsalmon streams, even when tree species composition was taken into account. This suggests that the productivity from salmon runs does not reach the upper trophic levels as represented by breeding birds. However, these data are from only one year and may not reflect a realistic average for the bird communities. It is also possible that the salmon runs have not been established sufficiently long, or that the bear and wolf density is too low, to create a sufficient legacy of nutrient augmentation. More detailed and longterm studies would be needed to determine which of these alternatives is correct.

In the course of this study, we also discovered another very interesting thing: the number of bird nests in the understory of the cottonwood-alder-willow forest is high. Nest searches revealed that we encountered about 5-7 nests/hr in large deciduous stands, compared to 0-2 nests/hr in conifer stands. Within the deciduous stands there are occasional clumps of mature spruce trees, which are commonly occupied by red squirrels, a major nest predator. Interestingly, the nest encounter rate near these spruce clumps was as low as in conifer forest, suggesting that red squirrels are a major determinant of nest distribution and perhaps habitat selection. This observation is tantalizing both in terms of avian community organization and of the theory of nest-site selection, and the subject certainly warrants further research. Glacier Bay is uniquely situated for these further studies because of the gradient of spruce frequency that exists there.

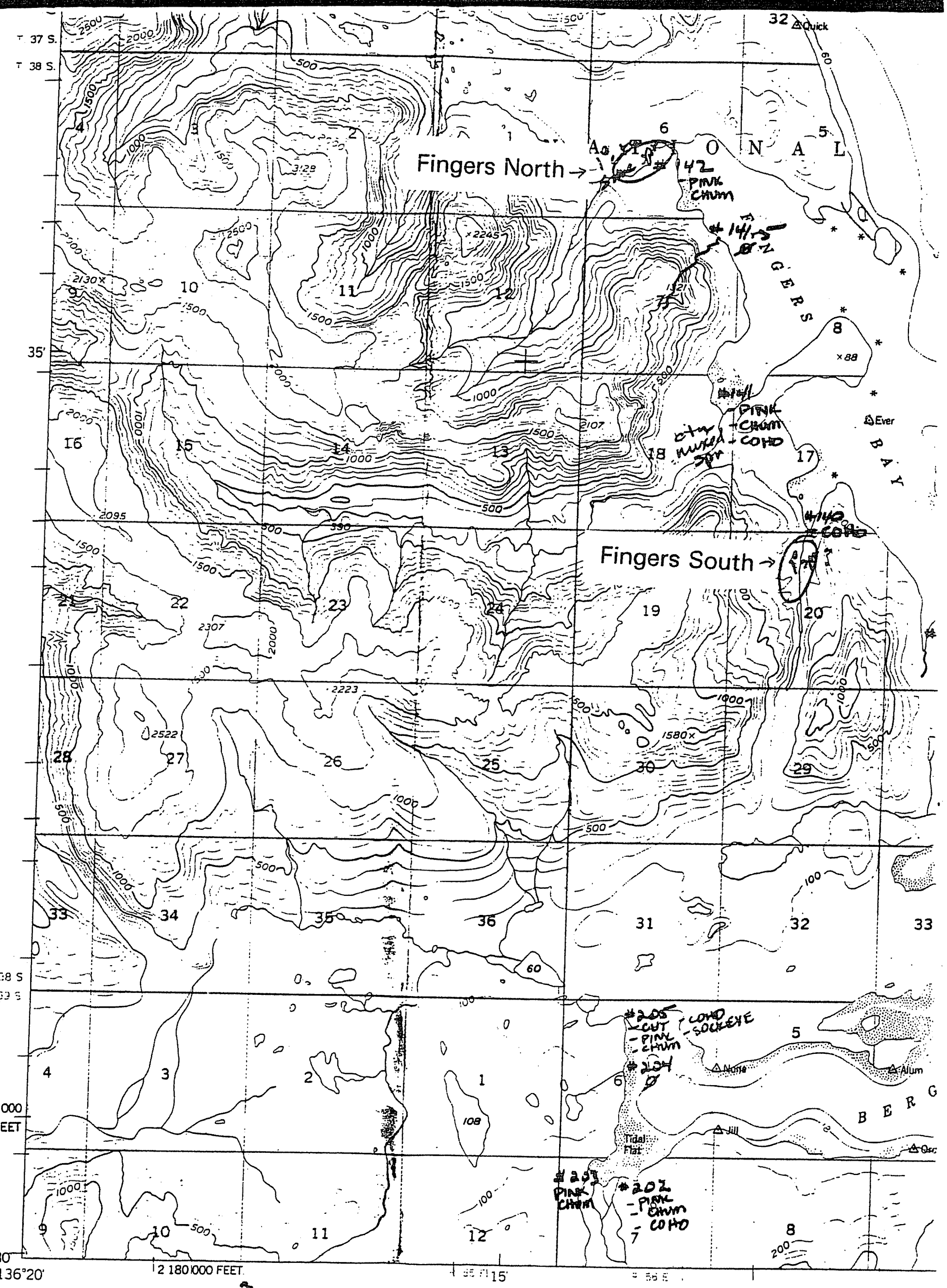
Acknowledgements

Jeff Nichols and Kim Obermeyer provided staunch and expert field assistance. Thanks to GBNPP for permission to do this study.



Geikie Rock
Tyndall Point
BigRock Ck
Point Ck
Crosscamp
GeikieEnd
Lower Wood Lk Ck.
Wood Lake Ck. W
Wood Lake Ck. trib.
Wood Lake Ck. E
TyndallHead
GLACIER BAY
INLET
GEIKIE INLET
NATIONAL MONUMENT
Red Bed Peak
Mt Bulky
Tlingit Peak
Mt Skarn
Shag Cove
Cove
Favorite Creek
Charpentier Glacier
Fossil Peak
Ridge
GEIKIE GLACIER
(MT. FAIRWEATHER C-1)
Flat
Arch
Milk
Bute
Vein
Bald
Dingo

Fig 1a



(MT. FAIRWEATHER B-2)

Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, and IBC

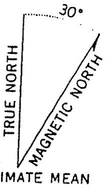
Topography by photogrammetric methods from aerial photographs taken 1948. Map not field checked

Selected hydrographic data compiled from USC&GS Charts 8202 (1:209,978 scale) and 8306. This information is not intended for navigational purposes

Universal Transverse Mercator projection, 1927 North American datum
10,000-foot grid based on Alaska coordinate system, zone 1
1000-metre Universal Transverse Mercator grid ticks, zone 8, shown in blue

Land lines represent unsurveyed and unmarked locations predetermined by the Bureau of Land Management
Folios CR-11 and CR-12, Copper River Meridian

Lake elevations are unchecked



APPROXIMATE MEAN DECLINATION, 1948

CONTOU
NATIONAL GEOD
DEPTH CURVES AND SOUNDINGS
SHORELINE SHOWN REPRESEN
THE AVERAGE RANG

FOR SALE BY
FAIRBANKS, ALASKA 99701, DENVER,
A FOLDER DESCRIBING TOPOGRAPHIC

Fig 1b

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

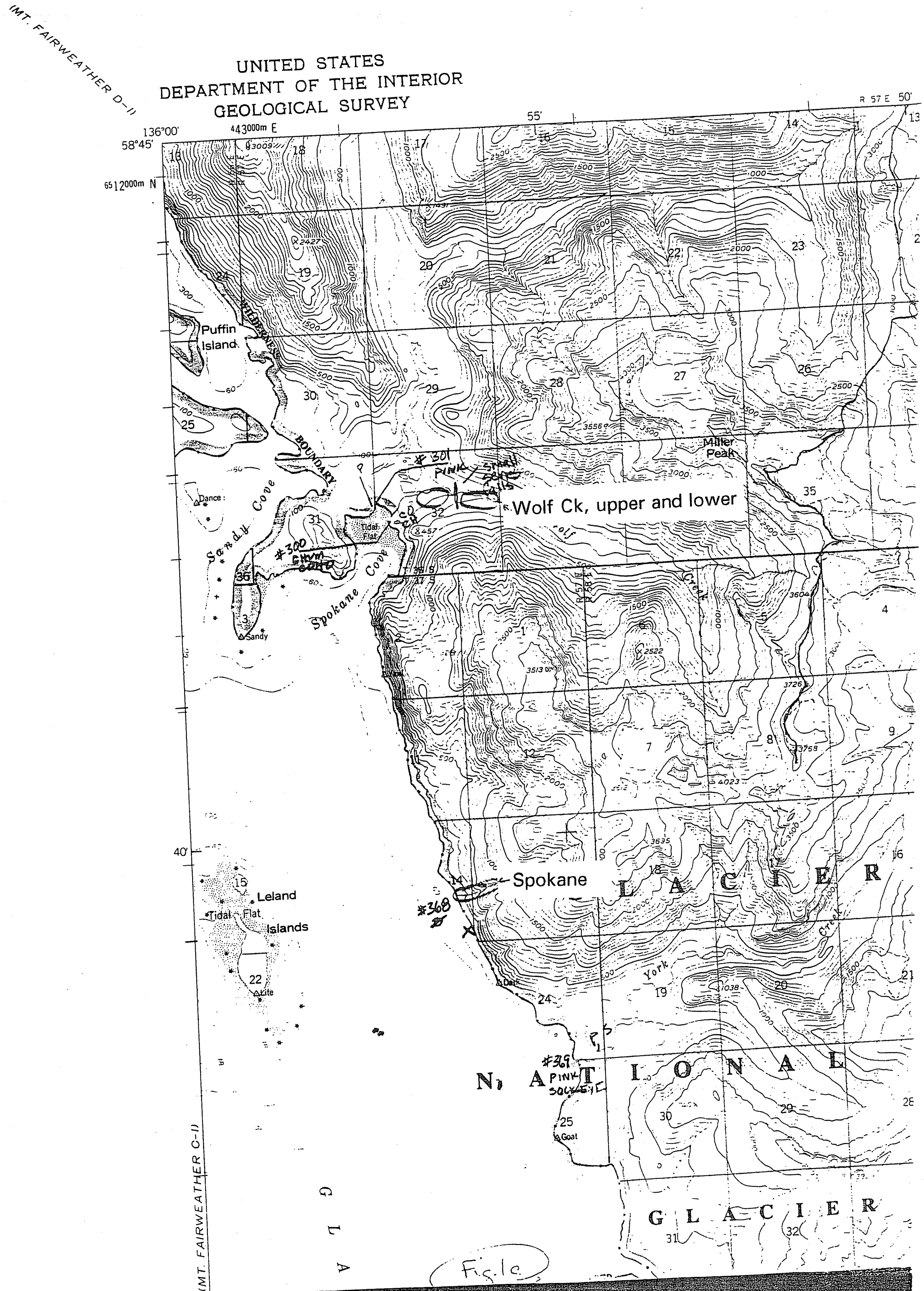


Fig. 1c

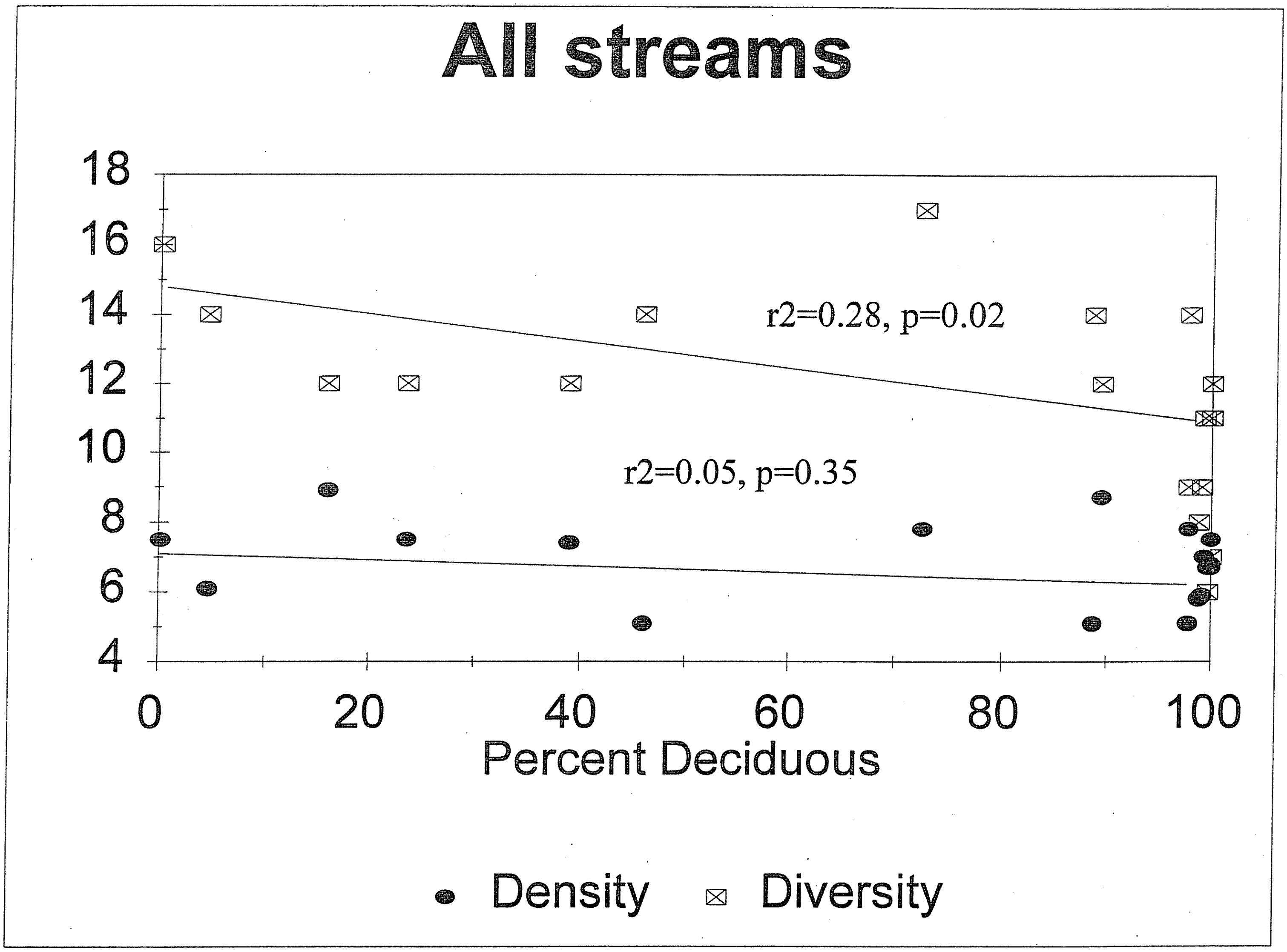

All streams
18
16
14
12
10
8
6
4
0
20
40
60
80
100
Percent Deciduous
r2=0.28, p=0.02
r2=0.05, p=0.35
Density
Diversity

Fig 2.

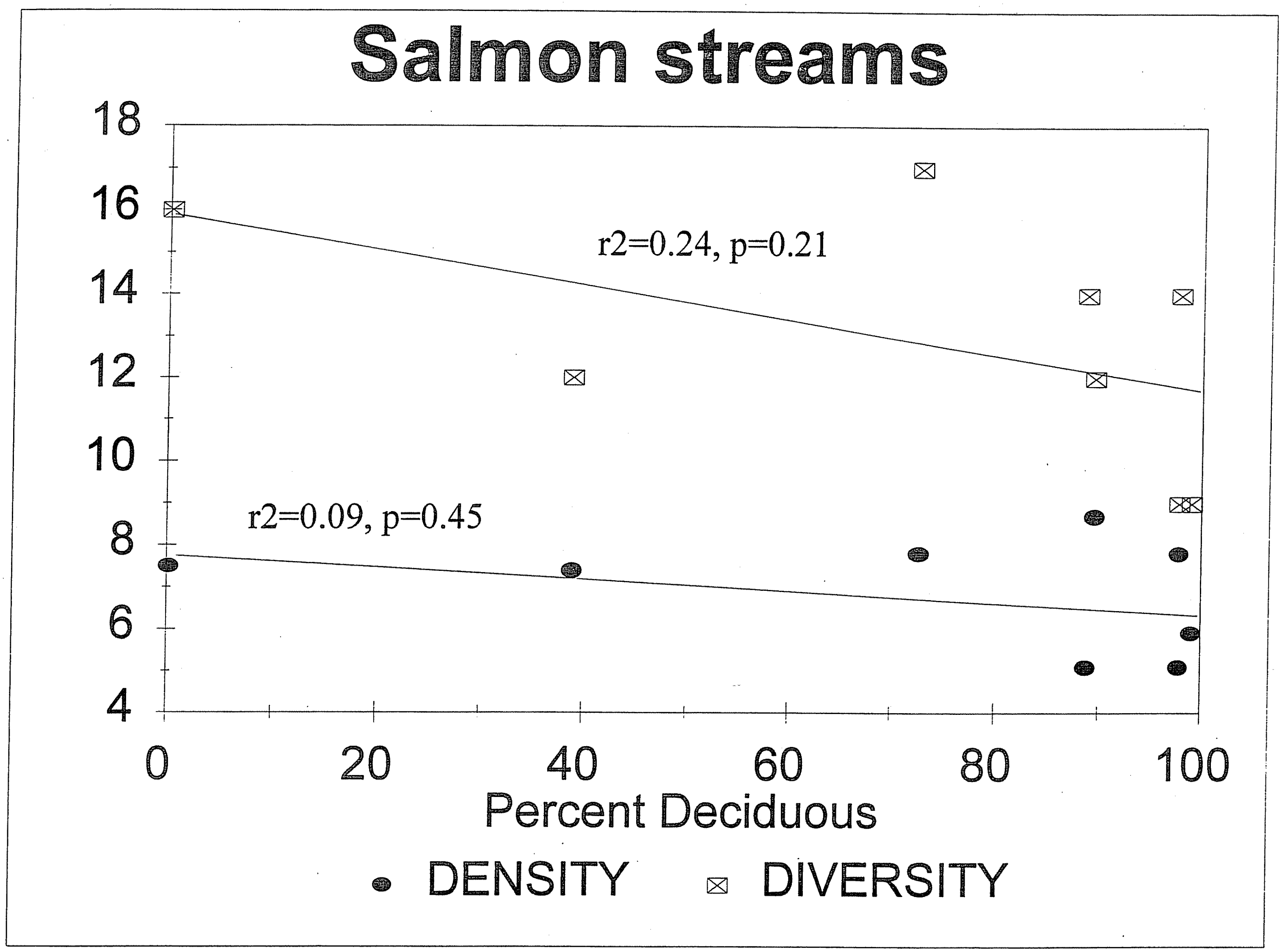

Salmon streams
18
16
14
12
10
8
6
4
0
20
40
60
80
100
Percent Deciduous
r2=0.24, p=0.21
r2=0.09, p=0.45
DENSITY
DIVERSITY

Fig 3

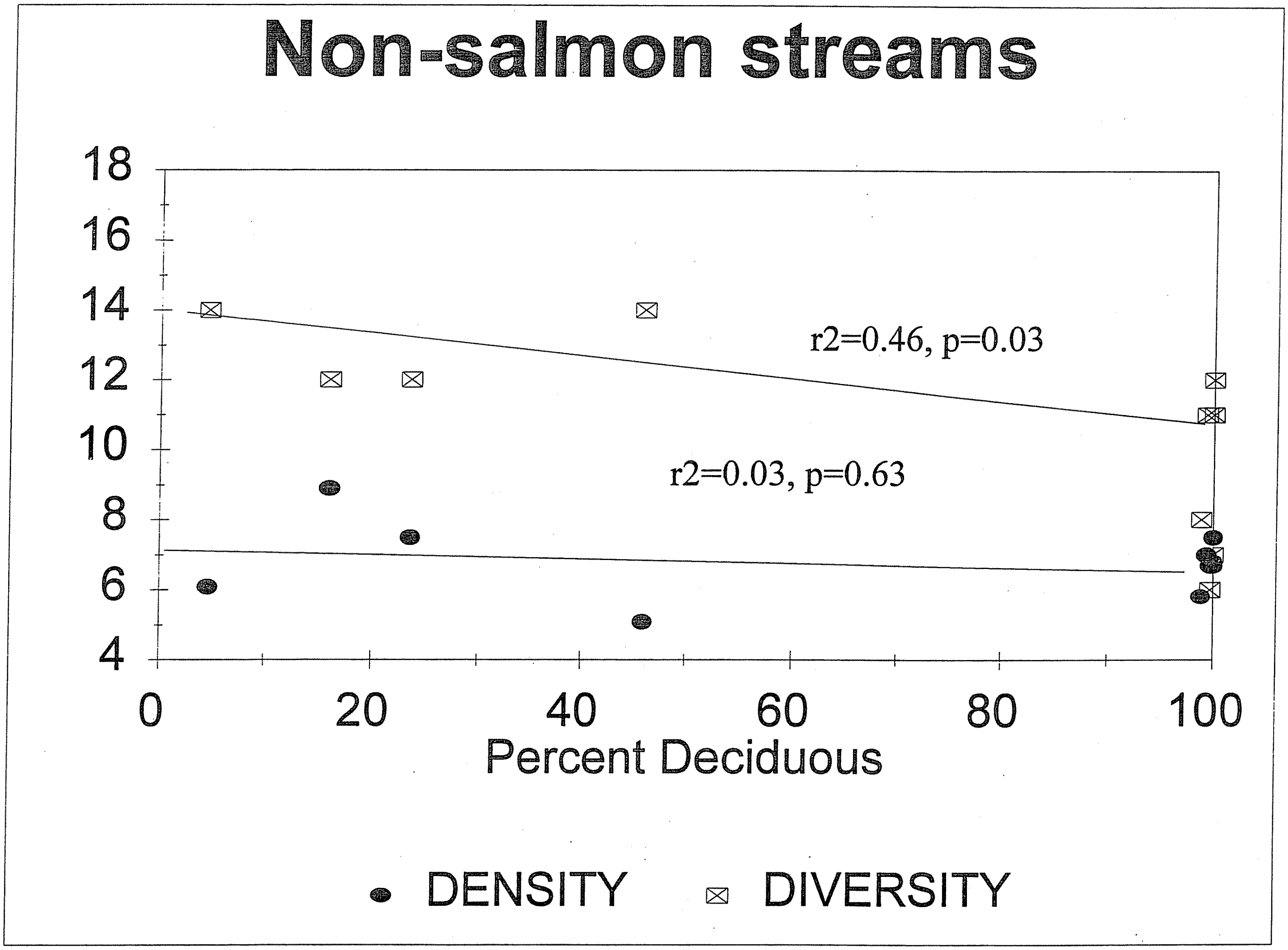

Non-salmon streams
18
16
14
12
10
8
6
4
0
20
40
60
80
100
Percent Deciduous
r2=0.46, p=0.03
r2=0.03, p=0.63
DENSITY
DIVERSITY

Fig 4

APPENDIX

SALMON STREAMS

BARRIV

SPECIES	FREQ	%
CBCH	2	3.3
DEJU	1	1.7
GCKI	7	11.7
HAWO	1	1.7
HETH	4	6.7
MYWA	6	10
OCWA	3	5
PISI	2	3.3
RCKI	8	13.3
RECR	1	1.7
RUHU	1	1.7
SWTH	1	1.7
TOWA	8	13.3
VATH	8	13.3
WEFL	2	3.3
WIWR	5	8.3

GEIKROCK

SPECIES	FREQ	%
FOSP	7	11.3
GCTH	8	12.9
HETH	10	16.1
OCWA	2	3.2
PIGR	1	1.6
PISI	4	6.5
RCKI	6	9.7
SWTH	1	1.6
UNKN	1	1.6
VATH	1	1.6
WEFL	7	11.3
WETA	1	1.6
WIWA	5	8.1
WIWR	1	1.6
YWAR	7	11.3

TYNDHEAD

SPECIES	FREQ	%
CBCH	2	4.3
DEJU	1	2.1
FOSP	2	4.3
GCTH	2	4.3
HETH	6	12.8
OCWA	1	2.1
RCKI	9	19.1
TOWA	1	2.1
UNKN	1	2.1
VATH	1	2.1
WEFL	7	14.9
WETA	1	2.1
WIWA	10	21.3
WIWR	2	4.3
YWAR	1	2.1

CROSCAMP

SPECIES	FREQ	%
FOSP	1	2.3
GCTH	6	14
HETH	7	16.3
PISI	1	2.3
RCKI	5	11.6
VATH	5	11.6
WEFL	5	11.6
WIWA	4	9.3
YWAR	9	20.9

LWODLKCR

SPECIES	FREQ	%
DEJU	1	1.6
FOSP	6	9.5
GCTH	9	14.3
HETH	8	12.7
MYWA	3	4.8
PISI	1	1.6
RCKI	8	12.7
VATH	4	6.3
WEFL	2	3.2
WIWA	10	15.9
WIWR	1	1.6
YWAR	10	15.9

TYNDPNT

SPECIES	FREQ	%
FOSP	2	4.5
GCTH	6	13.6
HETH	8	18.2
OCWA	6	13.6
SWTH	1	2.3
WETA	1	2.3
WIWA	9	20.5
WIWR	1	2.3
YWAR	10	22.7

LWOLFCRK

SPECIES	FREQ	%
CBCH	4	6.5
GCKI	5	8.1
HETH	4	6.5
OCWA	3	4.8
PISI	2	3.2
RCKI	5	8.1
SWTH	3	4.8
TOWA	6	9.7
UNKN	1	1.6
VATH	9	14.5
WEFL	4	6.5
WIWA	9	14.5
WIWR	7	11.3

NFINGER

SPECIES	FREQ	%
CBCH	3	4.8
GCKI	2	3.2
GCTH	3	4.8
HETH	9	14.3
OCWA	1	1.6
PISI	1	1.6
RCKI	5	7.9
RUHU	3	4.8
SWTH	4	6.3
TOWA	7	11.1
TRSW	1	1.6
UNKN	4	6.3
VATH	3	4.8
WEFL	6	9.5
WETA	1	1.6
WIWA	6	9.5
WIWR	3	4.8
YWAR	1	1.6

NON-SALMON STREAMS

BIGROCK

SPECIES	FREQ	%
FOSP	4	8.9
GCTH	7	15.6
HETH	6	13.3
OCWA	2	4.4
RCKI	1	2.2
SWTH	1	2.2
VATH	3	6.7
WEFL	2	4.4
WETA	1	2.2
WIWA	9	20
YWAR	9	20

GEIKEND

SPECIES	FREQ	%
FOSP	8	15.7
GCTH	4	7.8
HETH	7	13.7
MYWA	1	2
OCWA	4	7.8
RCKI	3	5.9
UNKN	1	2
VATH	1	2
WEFL	2	3.9
WIWA	9	17.6
YWAR	11	21.6

SPOKCRK

SPECIES	FREQ	%
CBCH	5	9.3
GCKI	6	11.1
HETH	1	1.9
OCWA	2	3.7
PISI	1	1.9
RCKI	5	9.3
SWTH	1	1.9
TOWA	9	16.7
VATH	8	14.8
WEFL	7	13
WIWA	4	7.4
WIWR	5	9.3

GOODRIV

SPECIES	FREQ	%
AMRO	5	9.6
CBCH	4	7.7
GCKI	4	7.7
HETH	3	5.8
MYWA	4	7.7
PISI	2	3.8
RCKI	4	7.7
RECR	4	7.7
TOWA	6	11.5
TTWO	1	1.9
VATH	7	13.5
WEFL	6	11.5
WIWR	1	1.9
YWAR	1	1.9

UWOLFCRK

SPECIES	FREQ	%
CBCH	1	2.3
DEJU	1	2.3
GCKI	6	14
HETH	5	11.6
OCWA	1	2.3
PISI	1	2.3
RCKI	2	4.7
RUHU	2	4.7
SWTH	1	2.3
TOWA	3	7
UNKN	2	4.7
VATH	9	20.9
WEFL	3	7
WIWA	4	9.3
WIWR	2	4.7

WODLKTRB

SPECIES	FREQ	%
AMRO	1	2.2
FOSP	4	8.7
GCTH	8	17.4
HETH	3	6.5
MYWA	2	4.3
NOWA	1	2.2
OCWA	3	6.5
RCKI	1	2.2
VATH	1	2.2
WEFL	1	2.2
WIWA	11	23.9
YWAR	10	21.7

WOODCRKW

SPECIES	FREQ	%
AMRO	1	2.6
FOSP	4	10.5
GCTH	10	26.3
HETH	5	13.2
UNKN	1	2.6
WIWA	7	18.4
YWAR	10	26.3

WOODCRKE

SPECIES	FREQ	%
FOSP	2	7.7
GCTH	3	11.5
HETH	4	15.4
MYWA	2	7.7
OCWA	2	7.7
UNKN	1	3.8
WIWA	6	23.1
YWAR	6	23.1

POINTCRK

SPECIES	FREQ	%
FOSP	2	5.3
GCTH	3	7.9
HETH	7	18.4
PISI	1	2.6
RCKI	5	13.2
UNKN	1	2.6
WEFL	3	7.9
WIWA	6	15.8
YWAR	10	26.3

SFINGER

SPECIES	FREQ	%
CBCH	2	3.1
DEJU	2	3.1
GCKI	6	9.4
HETH	9	14.1
OCWA	2	3.1
PISI	3	4.7
RCKI	3	4.7
TOWA	7	10.9
UNKN	1	1.6
VATH	7	10.9
WEFL	9	14.1
WIWA	9	14.1
WIWR	4	6.3

ABBREVIATION	COMMON NAME
AMRO	AMERICAN ROBIN
CBCH	CHESTNUT-BACKED CHICKADEE
DEJU	DARK-EYED JUNCO
FOSP	FOX SPARROW
GCKI	GOLDEN-CROWNED KINGLET
GCTH	GREY-CHEEKED THRUSH
HAWO	HAIRY WOODPECKER
HETH	HERMIT THRUSH
MYWA	MYRTLE WARBLER
NOWA	NORTHERN WATERTHRUSH
OCWA	ORANGE-CROWNED WARBLER
PIGR	PINE GROSBEAK
PISI	PINE SISKIN
RCKI	RUBY-CROWNED KINGLET
RECR	RED CROSSBILL
RUHU	RUFOUS HUMINGBIRD
SWTH	SWAINSON'S THRUSH
TOWA	TOWNSEND'S WARBLER
TRSW	TREE SWALLOW
TTWO	THREE-TOED WOODPECKER
UNKN	UNKNOWN
VATH	VARIED THRUSH
WEFL	WESTERN FLYCATCHER
WIWA	WILSON'S WARBLER
WIWR	WINTER WREN
YWAR	YELLOW WARBLER