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STATE OF ALASKA

Bill Sheffield, Governor

Annual Performance Report for

MATANUSKA-SUSITNA LAKE ENHANCEMENT EVALUATION

by

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ALASKA DEPARTMENT OF FISH AND GAME
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RESEARCH PROJECT SEGMENT

State: Alaska

Name: Sport Fish Investigations of Alaska

Project: F-9-18

Study: T-3

Study Title: COOK INLET TROUT

Job: T-3-2

Job Title: Matanuska-Susitna Lake Enhancement Evaluation

Cooperator: Alan C. Havens

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ABSTRACT

This research project was initiated in 1973 to provide information for the development of improved stocking practices through identification and analysis of various limnological parameters and their effects on stocked-fish populations.

Specific conductance measurements collected in February or March and July 1985 were used to determine summer and winter morphoedaphic index values in 46 Matanuska-Susitna Valley lakes. Winter morphoedaphic index values ranged from 1.02 in Marion Lake to 61.4 in Lucille Lake, while summer values ranged from 0.49 in Marion Lake to 34.44 in Walby Lake. The greatest numerical differences between winter and summer values occurred in shallow, naturally fertile lakes in the Matanuska Valley.

Survival estimates for Age I Swanson strain rainbow trout, *Salmo gairdneri* Richardson stocked as 2-gram fingerlings at 200 fish per surface acre in chemically rehabilitated Junction, Knik, and Matanuska Lakes ranged from 8 percent to 41 percent and averaged 32 percent. Rainbow trout fingerling planted at densities ranging from 339 to 548 fish per surface acre in Ravine, Reed, Tigger, and Walby Lakes had estimated Age I survivals ranging from 18 percent to 64 percent.

Survival estimates for Age 0+ coho salmon, *Oncorhynchus kisutch* (Walbaum), stocked as 3-gram fingerlings in Echo, Memory, Rocky, and Victor Lakes ranged from 32 percent to 65 percent and averaged 51 percent, while survivals for 7-gram chinook salmon, *Oncorhynchus tshawytscha* (Walbaum), fingerling planted simultaneously with the coho salmon in those lakes could not be estimated because too few fish were captured. Chinook salmon stocked as 9-gram fingerlings in Loon and Prator Lakes had estimated Age 0+ survivals of 17 percent and 1 percent, respectively.

A population estimate of Arctic grayling, *Thymallus arcticus* (Pallas), that had been stocked as sac fry in rehabilitated Johnson Lake indicated a survival of 2.2 percent from time of introduction in May 1985 through August 1985. A survival estimate for Age I Arctic grayling stocked as 2.7-gram fingerlings in Canoe Lake was 59 percent, while the survival for Age I Arctic grayling planted as sac fry could not be estimated because too few fish were captured.

KEY WORDS

Southcentral Alaska, fish stocking, rainbow trout, landlocked salmon, Arctic grayling, population estimates, fish growth.

BACKGROUND

Alaska's lake-stocking program makes an important contribution to recreational fisheries within the State, but it does not always produce desired results. A high cost to the creel often occurs because of poor game-fish survival that, in turn, reduces recreational fishing opportunity.

A study designed to provide information for development of improved lake-stocking practices was initiated in 1973. This study has focused on selected Matanuska-Susitna Valley lakes and is based on identification and analysis of various limnological parameters and their effects on fish populations. Long-range project goals are (1) to develop a lake stocking manual with guidelines for determining optimal sizes, densities, times, species, and strains of fish for various lake types to achieve maximal survival, growth, and harvest potential and (2) to develop methodologies that efficiently sample stocked-fish populations with minimal detriment to harvestable stocks.

The early phase of this project concentrated on detailed collection of physical and chemical data and identification and relative quantification of various planktonic and invertebrate populations in both untreated and treated lakes prior to, during, and after chemical rehabilitation with rotenone. Findings from the initial investigative phase indicate that (1) a morphoedaphic index (MEI, or specific conductance divided by mean depth) can give a gross measure of relative potential productivity and, in most cases, it is easier to determine than statistically comparable plankton, periphyton, and chlorophyll a indicies or definitive water chemistry (Chlupach 1977); (2) lakes chemically treated with rotenone may require between 1 and 2 years to reestablish zooplankton production and 3 years to attain invertebrate production levels of previous dominance and abundance (Chlupach 1977); and (3) a chemical test for the determination of rotenone in water (Post 1955) can give a reasonably accurate measurement of residual rotenone concentrations at or below 0.2 ppm (Kalb 1974).

The second phase of this project has concentrated on determining stocked game-fish survival and growth in lakes of known limnological characteristics, some of which contain competitor or predator species or both.

Findings from this research segment show (1) growth of rainbow trout may be restricted in waters infested with stickleback (Kalb 1975; Havens 1984); (2) rainbow trout survival appears to be greater in waters where stickleback have been eradicated than in waters where these competitors are present; although in a stickleback environment, fish survival increases when relatively larger fish are stocked at lower densities (Chlupach 1978; Havens 1984); (3) coho salmon in landlocked lakes exhibit significantly greater survival than do domestic rainbow trout strains (Chlupach 1978); and (4) the most critical period affecting the survival of rainbow trout fingerlings stocked in lakes may be within a month following introduction and possibly within the first several hours or days following release (Havens 1981).

While collecting survival and growth information in stocked lakes, various capture techniques and sampling gear have been utilized for experimentation purposes. Data from this research indicate (1) minnow traps painted a camouflaged green and brown appear to catch more rainbow trout fingerlings per trap hour than do unpainted silver (galvanized wire) traps, when fished in stocked lakes during ice-free seasons (Havens 1979); (2) fyke nets fished in late summer and fall, when water temperatures are at or below 10°C (50°F), are capable of catching sufficient numbers of Age I+ rainbow trout for marking purposes when performing population estimates (Havens 1980); (3) fyke nets with 3/16-inch-square mesh capture fish in size ranges comparable to those caught by 1/4-inch mesh minnow traps. The catch per unit of effort with the fyke nets can greatly exceed that of minnow traps and, when fished in conjunction with minnow traps, are an effective means for capturing rainbow trout fingerlings for both the mark and recapture portions of a population estimate (Havens 1981); and (4) monofilament gill nets that include a 5/8-inch-square mesh panel in addition to 1/2-, 3/4-, 1-, 1 1/2-, and 2-inch mesh panels may help to reduce error in recording growth and abundance for populations of rainbow trout having a mean length of less than 180 mm as are often found in lakes with low relative productivity or that contain stickleback (Havens 1981).

Another facet of the investigation was the selection of a native strain of rainbow trout from the Swanson River on the Kenai Peninsula as brood stock for Alaska's lake-stocking program. Subsequent to the selection of Swanson strain rainbow trout as brood stock for Alaska's lake-stocking program as part of the long-range goals of this lake-study project, baseline data in the growth and survival of the Swanson strain in all types of stocked lakes are being collected. A large, modern rainbow trout hatchery constructed in the Anchorage area has the capability to hold and rear several brood-stock strains. Candidate brood strains can be examined for hatchery suitability, and then compared with the field performance of the Swanson strain, in the search for rainbow trout strains that can provide the best possible survival, growth, and harvest potential in all lake types when stocked as fry or fingerling.

Table 1 lists all species mentioned in this report. Figure 1 is a map showing the study area.

Table 1. List of Common Names, Scientific Names and Abbreviations.

Common Name	Scientific Name and Author	Abbreviation
Arctic grayling	*Thymallus arcticus* (Pallas)	GR
Chinook salmon	*Oncorhynchus tshawytscha* (Walbaum)	KS
Coho salmon	*Oncorhynchus kisutch* (Walbaum)	SS
Rainbow trout	*Salmo gairdneri* Richardson	RT
Threespine stickleback	*Gasterosteus aculeatus* (Linnaeus)	TS
Ninespine stickleback	*Pungitius pungitius* (Linnaeus)	NS

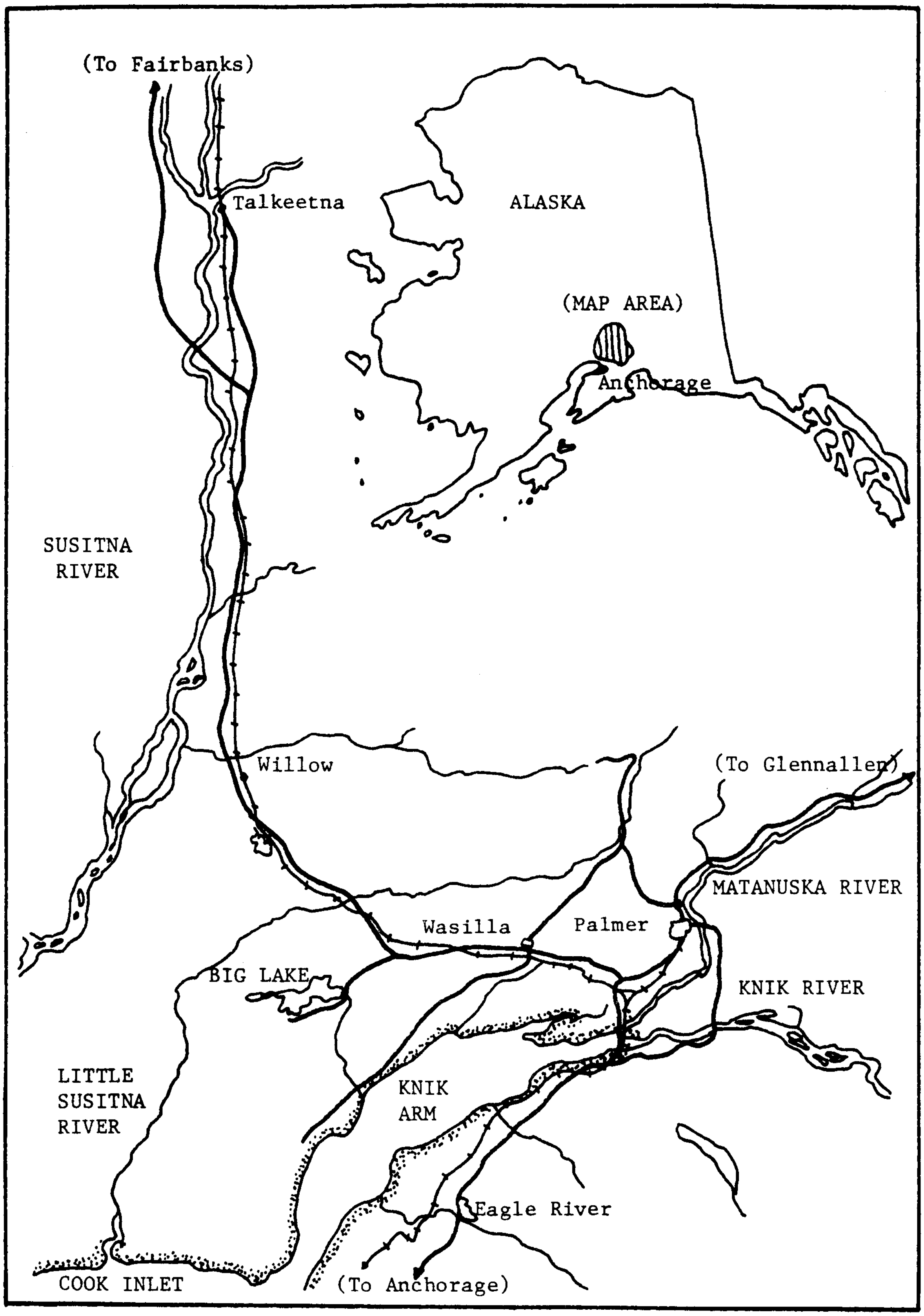

Figure 1. Study Area of the Matanuska-Susitna Valley.

RECOMMENDATIONS

1. Compare relative abundance and mean length of Age I Swanson strain and Big Lake strain rainbow trout stocked as 2-gram fingerling in selected Matanuska-Susitna Valley lakes.

2. Compare relative abundance and mean length of Age I Arctic grayling stocked as fry and as fingerling in selected Matanuska-Susitna Valley lakes.

3. Compare relative abundance and mean length of Age 0+ coho salmon and chinook salmon to be stocked in selected Matanuska-Susitna Valley landlocked lakes.

OBJECTIVES

1. To determine and compare the survival and growth to Age I of Swanson strain rainbow trout stocked as fingerling in Junction, Knik, Matanuska, Ravine, Reed, Tigger and Walby Lakes in 1984.

2. To determine and compare the survival and growth to Age I of Arctic grayling stocked as fry and fingerling in Canoe and Meirs Lakes in 1984.

3. To determine the survival and growth to Age 0+ of Arctic grayling stocked as fry in Johnson Lake in 1985 for comparison with data collected from a similar experiment in 1984.

4. To determine the survival and growth to Age 0+ of chinook salmon and coho salmon stocked as fingerling in Echo, Memory, Rocky and Victor Lakes in 1985 for comparison with data collected from similar experiments in 1984.

5. To compare winter and summer morphoedaphic index values in Crystal, Florence, Honeybee, Junction, Knik, Lynne, Matanuska, Ravine, Reed, Tigger, Walby, "X" and "Y" Lakes.

TECHNIQUES USED

Using Chapman's modification of the Peterson estimator (Ricker 1975), rainbow trout survival estimates were determined in Junction, Matanuska, Knik, Ravine, Reed, Tigger, and Walby Lakes. Chinook salmon estimates in Loon and Prator Lakes, coho salmon estimates in Echo, Memory, Rocky and Victor Lakes, and Arctic grayling estimates in Johnson and Canoe Lakes were also determined.

Fish were captured for population sampling with fyke nets, gill nets, or both. Fyke nets, baited with salmon eggs and used to capture stocked rainbow trout, Arctic grayling, and landlocked salmon, were 9 feet in length, 30 inches in diameter, and included two 3-foot x 20-foot wings, (two square aluminum frames and six steel or aluminum hoops supported the entrance and the body of the fyke net). Internal throats, body, and wings were of 3/16-inch-square mesh knotless nylon. Fyke nets were set parallel to the shoreline. All capture gear was fished approximately 24 hours.

All trout, grayling, and salmon captured for the purpose of estimating populations were held in a tub oxygenated with a portable 20-pound regulated-oxygen bottle and anesthetized with equal parts of MS-222 and Quinate at 0.25 grams of anesthetic per gallon of water. Fish were then enumerated, marked by removal of the adipose fin, and returned to the water.

Rainbow trout, Arctic grayling, and landlocked salmon were later captured using fyke nets, gill nets, or both. Gill nets were 120-foot x 6-foot variable mesh monofilament composed of six square mesh sizes (1/2-inch, 5/8-inch, 3/4-inch, 1-inch, 1-1/2-inch and 2-inch), each in a 20-foot panel.

Rainbow trout, grayling, and landlocked salmon measurements were expressed in fork length to the nearest millimeter.

Water samples were collected in each lake with a Kemmerer water sampler at the 3-foot depth in February or March and July. Specific conductance levels in micromohs/centimeter at 25° C were determined by use of a Cole-Parmer digital conductivity meter. Morphoedaphic-index values in each lake were determined by dividing specific conductance by mean depth.

FINDINGS

Comparison Of Winter and Summer Morphoedaphic Index Values

A lake's morphoedaphic index value (MEI), derived by dividing specific conductance by mean depth, can give a gross measure of potential productivity; this can be related to other lakes within a region that are similar in respect to climate and general nature of the ionic composition of their waters.

The MEI, which represents the inherent ability of a lake to absorb and recycle nutrients within its biotic components, may have the potential to estimate biomass, or production of fish communities in addition to indicating the potential for occurrence of winterkill in southcentral Alaskan lakes. Many lakes that rank high on the MEI scale are located in the rich agricultural area of the Matanuska Valley; several experience low winter dissolved oxygen levels and a few have histories of fish winterkill. These naturally fertile lakes, and their fish communities, would be especially sensitive to the nutrient loading that often accompanies human related development around shorelines.

Water samples were collected during February or March and again in July from 46 Matanuska-Susitna Valley lakes with known morphometric features and analyzed for specific conductance. Both summer and winter morphoedaphic index values are given in Table 2. The greatest numerical differences between summer and winter MEI values occur in shallow lakes; specific conductance is directly related to the concentrations of ionized substances in water, which are highly concentrated during the winter when a portion of the lakes' total water volume is ice.

Rainbow Trout Survival and Growth

Havens (1984) presented data relating the survival and growth of Swanson strain rainbow trout to various fingerling stocking sizes and times, both in stickleback-infested lakes and lakes where stickleback were removed by chemical rehabilitation. Ten survival estimates for fingerlings stocked at 250/lb (approximately 2 grams) in stickleback-infested lakes ranged from 9% to 63% and averaged 36%, while 10 survival estimates for the same size fish in rehabilitated lakes ranged from 20% to 83% and averaged 50%; the overall survival rate for all 20 experiments was 43%. Survival estimates in 1984 (Havens 1985) for Age I Swanson rainbow stocked as 2-gram fingerlings in five rehabilitated lakes ranged from 16% to 61% and averaged 44%, while the estimated survival in one stickleback-infested lake was 47%.

To continue collection of baseline data on Swanson strain rainbow trout for future comparison with other Alaska rainbow trout strains, population sampling was conducted in seven Matanuska-Susitna Valley lakes in 1985.

Junction, Knik, and Matanuska Lakes were rehabilitated in October 1982 to remove threespine stickleback (Havens 1983). In August 1983 the three lakes were stocked with 2-gram fingerlings at 400 fish per surface acre; resulting survivals of Age I fish were comparable to Swanson fingerling survivals prior to rehabilitation, while Age I trout growth surpassed that of fingerlings stocked when the lakes contained stickleback (Havens 1985). Swanson strain 2-gram fingerlings stocked at a density of 200 fish per surface acre in August 1984 had estimated Age I survivals at 8% in Junction Lake, 30% in Matanuska Lake, and 41% in Knik Lake (Table 3). The 30% and 41% survivals in Matanuska and Knik Lakes, respectively, were within the range of past estimated fingerling survivals in rehabilitated lakes, while the 8% survival in Junction Lake was well below average. The low survival in Junction Lake may have been due to an extremely dense cover of aquatic macrophytes in its littoral zone during the summer of 1984 that restricted the movement and feeding capability of newly introduced rainbow fingerlings Age I. Trout mean length measurements in May 1985 were 119.0 mm in Knik Lake, 146.8 mm in Matanuska Lake, and 168.3 mm in Junction Lake (Table 4).

Ravine, Reed, Tigger, and Walby Lakes have been stocked for experimental purposes with Swanson trout at densities of about 200 fish per surface acre each year since 1981 (Havens 1983, 1984, 1985). In 1984 these lakes were stocked with 2-gram fingerlings at densities of approximately 600 fish per littoral acre (water less than 15 feet deep); the increased

Table 2. Winter and Summer Morphoedaphic Index (MEI) Values for Selected Matanuska-Susitna Valley Lakes.

Lake	Mean Depth (ft)	Winter (February or March): Ice Depth (in)	Winter: Specific Conductance (umhos/cm)	Winter: MEI	Winter: MEI Rank	Summer (July): Specific Conductance (umhos/cm)	Summer: MEI	Summer: MEI Rank
Lucille	5.7	28.50	350	61.40	1	145	25.44	4
Walby	5.4	31.25	275	50.93	2	186	34.44	1
Wolf	6.8	31.25	270	39.71	3	138	20.29	7
Sliver	9.6	26.50	335	34.90	4	213	22.19	5
Bradley	11.8	27.25	410	34.75	5	365	30.93	2
Ravine	11.9	36.00	390	32.77	6	347	29.16	3
Canoe	15.3	28.75	380	24.84	7	315	20.59	6
Seymour	7.0	33.50	167	23.86	8	125	17.86	8
Barley	7.2	29.25	151	20.97	9	123	17.08	9
Junction	17.8	26.25	360	20.22	10	268	15.06	12
Echo	19.3	24.75	375	19.43	11	310	16.06	11
Finger	15.5	32.00	297	19.16	12	207	13.35	13
Weiner	20.3	26.75	348	17.14	13	330	16.26	10
Irene	21.3	29.25	350	16.43	14	275	12.91	14
Victor	24.4	27.75	350	14.34	15	253	10.37	19
Knik	15.7	31.50	225	14.33	16	174	11.08	18
Kepler	29.7	25.50	410	13.80	17	365	12.29	15
Dairy	7.8	31.25	100	12.82	18	67	8.59	22
Reed	10.4	32.50	128	12.31	19	85	8.17	23
Memory	7.2	29.50	88	12.22	20	66	9.17	21
Lower Bonnie	20.2	42.00	246	12.18	21	245	12.13	16
Long (K-B)	26.1	27.75	300	11.49	22	254	9.73	20
Long (Mi 86)	44.5	32.50	490	11.01	23	523	11.75	17
Johnson	20.0	29.75	186	9.30	24	157	7.85	24
Matanuska	34.4	25.00	300	8.72	25	225	6.54	26
Kalmback	13.1	32.50	98	7.48	26	88	6.72	25
Rocky	13.0	31.50	75	5.77	27	57	4.38	27
Dawn	8.1	33.75	43	5.31	28	27	3.33	31

Table 2. (Cont.) Winter and Summer Morphoedaphic Index (MEI) Values for Selected Matanuska-Susitna Valley Lakes.

Lake	Mean Depth (ft)	Winter (February or March) Ice Depth (in)	Winter Specific Conductance (umhos/cm)	Winter MEI	Winter MEI Rank	Summer (July) Specific Conductance (umhos/cm)	Summer MEI	Summer MEI Rank
Honeybee	13.5	36.00	65	4.81	29	46	3.41	30
Meirs	36.1	27.75	167	4.63	30	149	4.13	28
Lynne	28.7	35.00	105	3.66	31	92	3.21	32
Seventeenmile	19.5	34.50	64	3.28	32	72	3.69	29
Tigger	14.0	26.00	45	3.21	33	44	3.14	33
Loon	9.5	33.00	27	2.84	34	23	2.42	34
Christiansen	22.0	31.50	54	2.45	35	46	2.09	35
Crystal	11.7	37.00	27	2.31	36	12	1.03	42
"Y"	16.8	32.00	34	2.02	37	32	1.09	41
Bear Paw	9.9	30.75	19	1.92	38	9	0.91	44
"X"	17.0	31.00	32	1.88	39	32	1.88	36
South Rolly	27.0	35.00	48	1.78	40	39	1.44	39
Benka	32.0	27.00	54	1.69	41	47	1.47	37
Little No Luck	13.8	35.50	23	1.67	42	20	1.45	38
Florence	17.6	35.00	27	1.53	43	16	0.91	45
Big No Luck	15.0	36.00	23	1.53	44	19	1.27	40
Prator	11.7	34.50	17	1.45	45	11	0.94	43
Marion	20.6	29.75	21	1.02	46	10	0.49	46

stocking densities were equivalent to 370 and 420 fish per surface acre in stickleback-free Ravine and Reed Lakes, respectively, and 339 and 548 fish per surface acre in stickleback-infested Tigger and Walby Lakes, respectively. Even at the higher stocking densities, estimated Age I survivals of 64% in Ravine Lake, 29% in Reed Lake, 37% in Tigger Lake, and 18% in Walby Lake (Table 3) exceeded the lowest previously estimated survivals for 2-gram fingerlings stocked at 200 fish per surface acre in all but Tigger Lake.

The total number of trout surviving to Age I at the 600 fish per littoral acre stocking density in Ravine, Reed, Tigger, and Walby Lakes ranged from 23% to 70% greater than any previous year although, at Age I+, trout mean lengths averaged 10 mm less than fish stocked at lower densities in 1983 and ranged from 144.0 mm in Walby Lake to 225.1 mm in Reed Lakes (Table 4).

In 1985 hatchery-reared Swanson strain and Big Lake strain rainbow trout fingerlings, both one generation removed from wild parentage, became available for simultaneous stocking. In August 1985 Ravine, Reed, Tigger, and Walby Lakes were each stocked with equal numbers of left-ventral-clipped Swanson and right-ventral-clipped Big Lake fingerlings. During September 1985, when the lakes were sampled to collect length data on Age I+ trout stocked the previous year, all Age 0+ fingerlings captured were enumerated by fin marks (Table 5) to determine a catch ratio between the two strains for future comparison with data to be collected in May 1986. Catch ratios, Swanson strain to Big Lake strain, were 2.68:1 in Walby Lake, 2.27:1 in Ravine Lake, 1:1 in Reed Lake, and 0.87:1 in Tigger Lake. Swanson strain fingerling mean lengths ranged from approximately 63 mm in Walby Lake to 78 mm in Ravine Lake, while Big Lake trout mean lengths ranged from 61 mm in Walby Lake to 77 mm in Ravine Lake.

Landlocked Salmon Survival and Growth

Havens (1985) presented data relating to the relative survival and growth of chinook and coho salmon stocked in landlocked lakes. In May 1984 three lakes were planted with 2-gram chinook salmon fingerlings, five lakes with 2-gram coho salmon fingerlings, and four lakes with equal numbers of 2-gram unmarked coho salmon and right-ventral-clipped chinook salmon fingerling. Sampling in the 12 lakes approximately 4 months later in September and October 1984 revealed fyke-net catch rates for Age 0+ coho ranged from 0.70 fish/hour to 35.28 fish/hour and averaged 11.33 fish/hour, while chinook salmon catch rates ranged from zero to 0.57 fish/hour and averaged 0.15 fish/hour. Coho mean lengths ranged from 101.8 to 126.8 mm and averaged 116.0 mm, while chinook mean lengths ranged from 129.3 to 161.1 mm and averaged 150.1 mm. During population sampling in the four lakes stocked with equal numbers of coho and chinook, fyke nets and gill nets captured 23 chinook and 2,242 coho.

The stocking experiment was repeated in 1985 with 7- to 9-gram chinook fingerlings to determine if larger fish would exhibit higher relative survivals. In May and June two lakes were stocked with coho salmon at about 3 grams each, three lakes with coho salmon at about 0.7 grams each, three lakes with chinook salmon at about 9 grams each, and four

Table 3. Population Estimates for Swanson Strain Rainbow Trout in Selected Matanuska-Susitna Valley Lakes, 1985.

Lake	Date Stocked	Number Stocked	Stocking Size (g)	Stocking Density (fish/ surface acre)	Stocking Density (fish/ littoral* acre)	Sample Date	Population Estimate	Survival	95% Confidence Level Estimate	95% Confidence Level Survival
Junction	8/7/84	2,180	1.92	200	363	6/05/85	184	8%	83-306	4%-14%
Knik	8/7/84	10,075	1.92	200	425	5/29/85	4,146	41%	2,524-6,450	25%-64%
Matanuska	8/7/84	12,285	1.92	200	871	5/30/85	3,637	30%	1,654-6,064	14%-49%
Ravine	8/8/84	4,550	1.98	370	599	6/11/85	2,914	64%	2,081-4,080	46%-90%
Reed	8/8/84	8,190	1.98	420	598	5/31/85	2,383	29%	1,973-2,870	24%-35%
Tigger**	8/6/84	6,400	2.21	339	593	6/06/85	2,356	37%	2,125-2,619	33%-41%
Walby**	8/8/84	29,545	1.98	548	598	6/07/85	5,435	18%	4,705-6,274	16%-21%

* Littoral area is that portion of the lake less than 15 feet deep.

** Tigger and Walby Lakes have populations of threespine stickleback.

Table 4. Length Summaries for Swanson Strain Rainbow Trout in Selected Matanuska-Susitna Valley Lakes, 1985.

Lake	Date Stocked	Number Stocked	Stocking Size (g)	Stocking Density (fish/ surface acre)	Stocking Density (fish/ littoral acre)	Sample Date	Sample Gear*	Number Caught	Mean Length (mm)	Length Range (mm)
Junction	8/7/84	2,180	1.92	200	363	6/05/85	FN	35	168.3	141-189
						7/12/85	GN	26	216.0	185-250
Knik	8/7/84	10,075	1.92	200	425	5/29/85	FN	675	119.0	91-143
						7/15/85	GN	51	169.6	122-233
Matanuska	8/7/84	12,285	1.92	200	871	5/30/85	FN	113	146.8	110-185
						7/16/85	GN	46	200.5	156-248
Ravine	8/8/84	4,550	1.98	370	599	6/11/85	FN	470	114.5	92-135
						9/11/85	FN	151	183.3	144-228
Reed	8/8/84	8,190	1.98	420	598	5/31/85	FN	697	99.3	72-134
						9/10/85	FN	64	225.1	165-258
Tigger**	8/6/84	6,400	2.21	339	593	6/06/85	FN	1,362	104.0	66-141
						9/06/85	FN	149	159.0	119-205
Walby**	8/8/84	29,545	1.98	548	598	6/07/85	FN	1,397	90.2	60-122
						9/13/85	FN	281	144.0	94-196

* FN = fyke net; GN = gill net

** Tigger and Walby Lakes contain populations of threespine stickleback.

Table 5. Stocking and Trap Catch Data for Age 0+ Rainbow Trout in Selected Matanuska-Susitna Valley Lakes, 1985.

Lake	Date Stocked	Strain	Number Stocked	Stocking Size (g)	Sample Date	Number Caught	Catch Ratio Swanson:Big Lake	Mean Length (mm)	Length Range (mm)
Ravine	8/19/85	Swanson	2,273	2.4	9/12/85	84	2.27:1	78.22	66-88
	8/19/85	Big Lake	2,270	2.6	9/12/85	37		76.61	66-82
Reed	8/21/85	Swanson	4,092	2.4	9/11/85	218	1.01:1	71.65	63-83
	8/21/85	Big Lake	4,088	2.6	9/11/85	216		68.58	59-78
Tigger*	8/20/85	Swanson	3,193	2.4	9/06/85	271	0.87:1	66.95	57-83
	8/20/85	Big Lake	3,195	2.6	9/06/85	310		66.79	57-75
Walby*	8/23/85	Swanson	14,706	2.4	9/13/85	338	2.68:1	63.33	49-75
	8/23/85	Big Lake	14,607	2.1	9/13/85	126		61.41	52-72

* Tigger and Walby Lakes contain populations of threespine stickleback.

lakes with equal numbers of unmarked coho salmon at about 3 grams and left-ventral-clipped chinook salmon fingerling at about 7 grams each. Sampling in the 12 lakes in September or October 1985 (Table 6) revealed fyke-net catch rates for Age 0+ coho ranged from 1.88 fish/hour to 8.67 fish/hour and averaged 5.92 fish/hour, while chinook salmon catch rates ranged from zero to 1.60 fish/hour and averaged 0.40 fish/hour. Coho mean lengths ranged from 107.0 mm in Benka Lake to 137.1 mm in Junction Lake, with an overall average of 119.4 mm in all nine lakes. Chinook salmon mean lengths ranged from 149.7 mm in Lucille Lake to 182.0 mm in Loon Lake, and for the four lakes where chinook were caught, mean lengths (Table 6) averaged 168.7 mm.

In addition to fyke-net sampling, population estimates were performed in six lakes (Table 7). In Loon and Prator Lakes, which had been stocked only with chinook salmon, estimated chinook survivals 4 months after stocking were 17% and 1%, respectively. In Echo, Memory, Rocky, and Victor Lakes, which had been planted with equal numbers of coho and chinook salmon, estimated coho survivals 4 months after stocking were 57%, 48%, 32%, and 65%, respectively, and averaged approximately 51%. Chinook survivals could not be estimated because no chinook were captured in Echo, Rocky, and Victor Lakes, and, of the 28 chinook marked and released in Memory Lake, none were recaptured. During population sampling in the four lakes, fyke nets and gill nets captured a total of 56 chinook and 2,648 coho.

Coho salmon comprised 99% of the total catch in the four lakes stocked with equal numbers of 2-gram chinook and 2-gram coho salmon in 1984, and cohos comprised 98% of the total catch in those same lakes stocked with 7-gram chinook and 3-gram coho in the 1985 experiment.

In a further attempt to maximize survival to catchable size, the Alaska Department of Fish and Game, Elmendorf Hatchery has been requested to accelerate the hatching and growth of both species so that chinook can be stocked at about 15 grams and coho at about 5 grams in selected Matanuska-Susitna Valley lakes for further experimentation.

Arctic Grayling Survival and Growth

Canoe and Meirs Lakes were each stocked with 0.014-gram Arctic grayling fry at a density of about 600 fish per surface acre in June 1984 and with 2.7-gram grayling fingerlings at a density of 200 per surface acre in August 1984.

In May 1985 fyke nets and gill nets set overnight in Meirs Lake captured no fish, even though both stocked rainbow trout and grayling had been present in 1984 (Havens 1985). A dissolved-oxygen measurement of 14.8 ppm at the 3-foot depth under 1 inch of snow and 27.75 inches of ice, was recorded on March 25, 1986, indicating a high level of photosynthetic activity; heavy snow cover 3 weeks later may have limited light penetration, causing a die-off of phytoplankton and subsequent depletion of dissolved oxygen leading to a fish "winterkill".

Fyke nets set overnight in Canoe Lake in May 1985 captured a total of 303 grayling and 59 rainbow trout. Thirty-two grayling (mean length

Table 6. Summary of Landlocked Salmon Stocking and Fyke Net Results in Selected Matanuska-Susitna Valley Lakes, 1985.

Lake	Date Stocked	Species	Number Stocked	Stocking Size (g)	Stocking Density (fish/acre)	Sample Date	Number Caught	Mean Length (mm)	Length Range (mm)	Catch/ Net Hr.
Echo*	5/17/85	KS	2,300	7.37	200	9/17/85	0	...	...	0
	5/17/85	SS	2,300	2.79			364	123.8	85-150	4.79
Memory	5/17/85	KS	8,350	7.37	202	9/19/85	28	175.7	167-188	0.37
	5/17/85	SS	8,400	2.92			418	118.3	104-138	5.50
Rocky*	5/17/85	KS	5,900	7.37	201	9/20/85	0	...	...	0
	5/17/85	SS	5,900	2.79			472	110.3	90-135	5.36
Victor	5/17/85	KS	1,400	7.37	207	9/18/85	0	...	...	0
	5/17/85	SS	1,400	2.79			143	135.0	110-160	1.88
Loon*	5/20/85	KS	23,075	8.80	214	9/26/85	172	182.0	172-190	1.60
Lucille*	5/21/85	KS	96,740	8.80	267	9/25/85	47	149.7	110-172	0.44
Prator*	5/20/85	KS	19,870	8.80	203	9/27/85	43	167.4	145-188	0.39
Bear Paw*	5/23/85	SS	9,370	2.70	208	10/16/85	347	121.7	103-158	5.51
Benka*	6/14/85	SS	18,000	0.68	101	10/16/85	390	107.0	76-149	8.67
Christiansen*	6/14/85	SS	33,000	0.68	184	10/16/85	298	108.0	92-130	6.48
Finger*	5/20/85	SS	71,900	3.04	199	9/24/85	858	113.0	86-145	6.98
Junction	6/14/85	SS	4,400	0.68	404	10/05/85	614	137.1	114-166	8.08

* Echo, Rocky, Lucille, Prator, Bear Paw, Benka, Christiansen, and Finger Lakes have populations of threespine stickleback while Loon Lake was recently reinfested and contains a relatively small population of ninespine stickleback.

Table 7. Population Estimates for Coho and Chinook Salmon in Selected Matanuska-Susitna Valley Lakes, 1985.

Lake	Date Stocked	Species	Number Stocked	Sample Date	Population Estimate*	Survival	95% Confidence Level Estimate	95% Confidence Level Survival
Echo**	5/17/85	SS	2,300	9/17/85	1,300	57%	997-1,693	43%-74%
	5/17/85	KS	2,300		...			
Memory	5/17/85	SS	8,400	9/19/85	4,034	48%	2,988-5,378	36%-64%
	5/17/85	KS	8,350		...			
Rocky**	5/17/85	SS	5,900	9/20/85	1,870	32%	1,576-2,213	27%-38%
	5/17/85	KS	5,900		...			
Victor	5/17/85	SS	1,400	9/18/85	912	65%	662-1,250	47%-89%
	5/17/85	KS	1,400		...			
Loon**	5/20/85	KS	23,075	9/26/85	4,010	17%	2,540-6,350	11%-28%
Prator**	5/20/85	KS	19,870	9/27/85	223	1%	129-350	0.7%-1.8%

* Chinook salmon population numbers could not be estimated because no chinook were cpatured for marking purposes in Echo, Rocky and Victor Lakes and of the 28 chinook marked and released in Memory Lake none were recaptured.

** Echo, Rocky, Loon and Prator Lakes contain populations of stickleback.

199.7 mm) that had been stocked as fry in June 1984 and 246 grayling (mean length 134.0 mm) stocked as fingerling in August 1984 were marked with an adipose clip and released. Fyke nets reset 10 days later captured nine grayling from the fry plant (average length 204.9 mm) and 339 grayling (Table 8) from the fingerling plant (average length 148.7 mm). No population estimate could be made for Age I grayling that had been stocked as fry because no marked fish were recaptured, but the estimate for Age I grayling that had been stocked at 2.7-gram fingerling was 2,460, or a 59% survival; the survival range at the 95% confidence level was 42% to 80%.

Havens (1985) reported results of a Johnson Lake stocking experiment, when 64,000 Arctic grayling fry planted in June 1984 had an estimated 1.9% survival 2 months later in August. To repeat that experiment, 36,100 Arctic grayling fry were stocked in Johnson Lake in June 1985. Fyke nets set 2 months later in August 1985 captured 46 Age 0+ grayling (average length 99.2 mm); these fish were adipose-clipped and released. Johnson Lake was sampled again in October 1985 to estimate the Age 0+ grayling population. Fyke nets and gill nets captured 86 grayling having a mean length of 154.5 mm (Table 8). The estimated population was 800 Age 0+ grayling, or a 2.2% survival of the 36,100 fish stocked in June; the survival range at the 95% confidence level was 1.0 to 3.7%.

Arctic grayling fry and fingerling were stocked in Meirs and Canoe Lakes in 1985 for relative survival experiments in 1986, and grayling fingerlings were planted in Sliver and Wolf Lakes in 1985 to evaluate the survival and growth of fingerlings in stickleback-infested lakes.

Table 8. Length Measurements of Arctic Grayling Captured in Canoe and Johnson Lakes, 1985.

Lake	Date Stocked	Number Stocked	Stocking Size (g)	Stocking Density (fish/acre)	Sample Date	Number Caught	Mean Length (mm)	Length Range (mm)
Canoe	6/11/84	10,000	.014	595	5/23/85	32	199.7	179-213
					6/04/85	9	204.9	192-220
	8/30/84	3,400	2.70	202	5/23/85	246	134.0	104-169
					6/04/85	339	148.7	113-180
Johnson	6/12/85	36,100	.017	896	8/14/85	46	99.2	87-109
					10/10/85	86	154.5	136-172

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