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Project Completion Report
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PUT-AND-TAKE TROUT EVALUATIONS
Project 9

Subproject 1. Stocking Guidelines
Subproject 2. Angler Distribution and Knowledge

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PROJECT COMPLETION REPORT

State of: Idaho

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Subproject: 1. Stocking Guidelines

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ABSTRACT

Multiple regression of historic creel census data indicates biologists may have to stock Idaho streams less than 9 m wide and lakes smaller than 50 ha to provide harvest rates of 0.5 fish/h and returns of 40% or better for catchable size (> 15 cm) hatchery rainbow trout *Oncorhynchus mykiss.* Implementation of these guidelines would reduce the number of waters managed as put-and-take trout fisheries. To meet management goals of 40% return and 0.5 fish/h, stocking levels would increase approximately 50% for remaining streams. Most standing waters would be managed as put-grow-and-take fisheries. Lake and reservoir stocking would decrease 10% on a limited number of waters managed for put-and-take fishing. Angler success (fish/h) and returns of stocked fish would increase due to elimination of stocking from areas poorly suited for put-and-take programs. Stocking should be modified as indicated by this analysis and results evaluated to further refine the hatchery program.

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INTRODUCTION

The Idaho Department of Fish and Game (IDFG) stocks approximately 600,000 hatchery rainbow trout *Oncorhynchus mykiss* in streams and 2 million in lakes to provide consumptive put-and-take and put-grow-and-take fisheries (IDFG stocking requests). Allocation is based on previous stocking history, budget constraints, other needs for hatchery fish, and subjective analysis of return to creel. Put-and-take programs are important to provide fishing, particularly where stream harvest opportunity for trout is limited. Many waters in the state support mixed hatchery-wild fisheries where stocking provides a major portion of the harvest.

Hatchery fish are also expensive to raise and stock. In Idaho, a guideline for put-andtake programs of 40% or better return of stocked fish to anglers has been adopted (IDFG 1991). Returns and angler harvest rates (fish/h) provide a basis for stocking guidelines. From review of existing management plans and hatchery trout literature, I suggested consumptive catch rates of 0.5 fish/h to attract the effort necessary to effectively harvest put-and-take trout (Mauser 1994a). Relationships between stocking, effort, and harvest are useful to help define waters where stocking will produce efficient angling returns to the public.

I previously summarized existing harvest, effort, and trout stocking data for Idaho stream fisheries (Mauser 1992). I developed relationships of stocking rates and angling effort (fish/km, fish/h, h/km) to harvest and return rates. These relations provide a general understanding of stocking and effort effects for Idaho streams. Their utility is limited by poor predictive power and statistical problems with the use of ratios and other derived variables (Jackson et al. 1990). Though Rempel and Colby (1991) found certain ratio estimators comparable to multiple regression models, use of a statistically sound approach is preferable. In this report, I use total stocking levels, estimated fishing pressure and harvest, and water size in multiple regressions to develop stocking models.

RESEARCH GOAL

To improve efficiency of put-and-take programs for hatchery rainbow trout in Idaho.

OBJECTIVES

1. To develop stocking guidelines.

2. To evaluate potential effects of guidelines on the statewide stocking program.

METHODS

Fishery data came from IDFG creel census information collected over the last 37 years. Information used for model development consisted of the total number of hatchery rainbow trout stocked just prior to and during the period of time each census was conducted, and estimated fishing pressure and harvest. Stocking data came from IDFG reports and stocking records. I developed separate models from data for flowing and standing waters (Appendices A and B).

Harvest estimates were for the year of stocking. Harvests included holdover fish from stocking in previous years. Information necessary to determine the contribution of each annual stocking was rarely reported. Stocking and harvest levels were generally consistent where year-to-year information was available for a given water (Appendices A and B).

Physical data came from statewide data bases. Hatchery and management personnel provided stream widths and lake surface areas where additional information was needed.

The multiple regression models I developed took two similar forms:

I. Harvest = Stocking - Water Size

II. Effort = Stocking + Water Size.

Use of these variables enabled construction of models without ratios and derived variables. I used natural logarithms to transform variables to meet the underlying assumptions necessary for regression analysis (Kirby 1993). I ran regressions using SYSTAT (Wilkinson 1988) and used F-tests to determine statistical significance ($P < 0.05$).

I predicted return to creel and angler success (fish/h) for various stocking levels by running stocking and water size information through regression formulas. Return rates for various water sizes were calculated as harvest projected from the model divided by the original stocking. Angler success (fish/h) was calculated as the model prediction for harvest (Model I) divided by predicted effort (Model II). I plotted estimated return and harvest rates against total stocking for various water sizes to illustrate results.

To evaluate potential effects of application of the models on existing programs, I applied regression equations to 1994 stocking requests. I then adjusted stocking levels to meet goals of 0.5 fish/h and 40% return on each stocked water. Summaries of these and projected results of existing stocking provided data to assess effects of implementation on statewide programs.

RESULTS

Development of Stocking Guidelines

Stream Stocking Relations

Number of hatchery rainbow trout stocked and stream width are potentially useful predictors of subsequent harvest and angler effort:

$$\text{Log Harvest} = 0.921 \text{ Log Stocking} - 0.375 \text{ Log Width(m)} + 0.654$$

$r^2 = 0.71$
$P < 0.001$ N = 97

$$\text{Log Effort(h)} = 0.554 \text{ Log Stocking} + 0.178 \text{ Log Width(m)} + 3.591$$

$r^2 = 0.44$
$P < 0.001$ N = 97

Predicted harvest levels increased in direct relation with stocking (Figure 1). Harvests declined as stream size increased. Effort also increased with stocking, but the rate of increase declined, and predicted effort increased with increasing stream size (Figure 1).

Predicted harvest rates (fish/h) increased with stocking (Figure 2). Rate of increase declined as stocking increased. Harvest rates declined as stream size increased. Return rates declined with increases in stocking and stream size (Figure 2).

Forecasted ability to meet management objectives declined for larger streams. Stocked streams would have to be less than 9 m wide to provide harvest rates of 0.5 fish/h and 40% return (Figure 2). It would be necessary to stock 9 m streams with approximately 12,500 fish annually to meet both management objectives. Since relationships for return rates were flatter than those for harvest rates, understocking would reduce angler success more than overstocking would reduce returns.

Lake Stocking Relations

Numbers stocked and surface area explained substantial portions of the variability in harvest from standing waters:

$$\text{Log Harvest} = 0.879 \text{ Log Stocking} - 0.138 \text{ Log Area(ha)} + 0.799$$

$r^2 = \mathbf{0.55}$
$P < 0.001$ N = 87

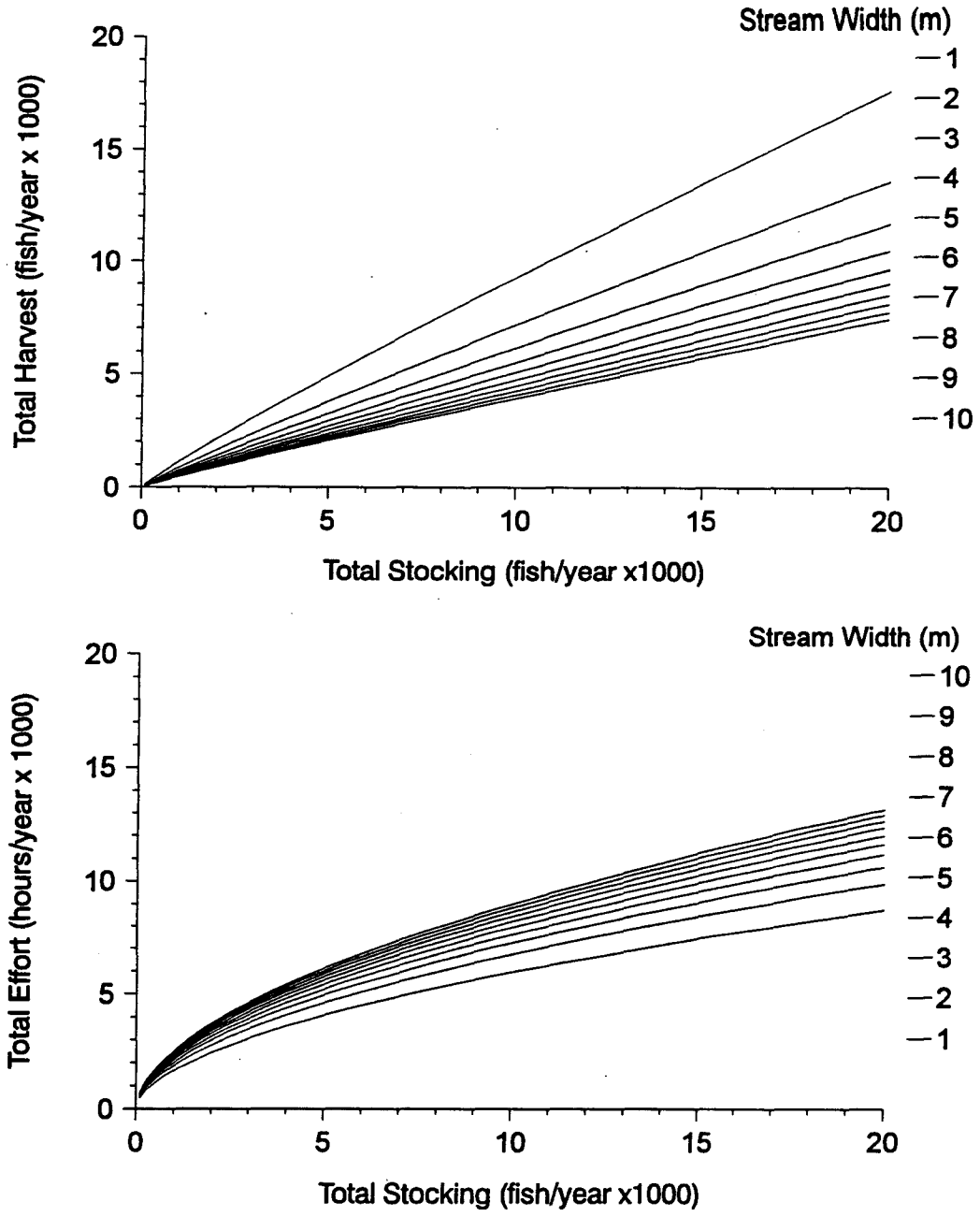

Figure 1. Annual harvest and fishing pressure predicted from the total number of catchable rainbow trout stocked, and width of Idaho streams. Values calculated from multiple regression models: 1) log harvest = 0.921 log stocking - 0.375 log width (m) + 0.654 and 2) log effort = 0.554 log stocking + 0.178 log width (m) + 3.591.

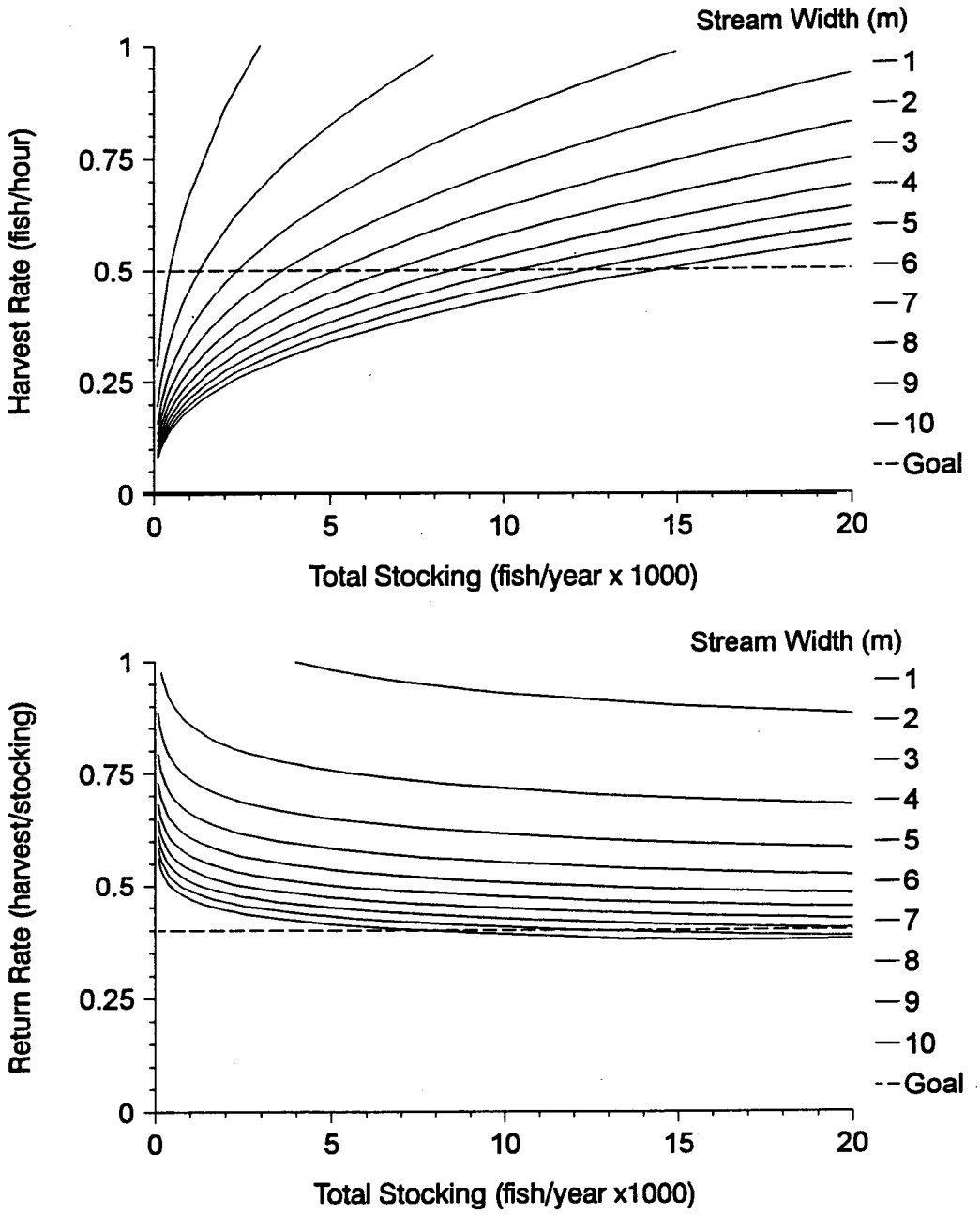

Figure 2. Harvest and return rates calculated for Idaho streams by dividing predicted harvest by predicted effort (fish/hour) and predicted harvest by stocking (return). Values calculated from multiple regression models: 1) log harvest = 0.921 log stocking - 0.375 log width (m) + 0.654 and 2) log effort = 0.554 log stocking + 0.178 log width (m) + 3.591.

Model variables explained more variation in angler effort on lakes than streams:

Log Effort(h) = 0.404 Log Stocking + 0.277 Log Area(ha) + 4.51

r^2 = **0:69**
P < 0.001 N = 87

Basic relations were similar to those for streams (Figures 3 and 4). Stocked waters would have to be smaller than 50 ha to meet management goals. It would be necessary to stock 50 ha lakes with approximately 17,000 fish annually to attain harvest rates of 0.5 fish/h and returns approaching 40% (Figure 4). Smaller waters could support a range of stocking to meet management objectives.

Effects of Guidelines on Programs

Based on the above predictors, 33% of 112 streams or stream segments currently stocked cannot meet put-and-take management guidelines of 40% return and angler success of 0.5 fish/h and should be eliminated from stocking. To meet guidlines for the remaining 75 streams, stocking would increase from 211,850 to 435,640 fish annually (Table 1). Statewide stream stocking would decline 27% from the present 595,875 fish.

For standing water, guidelines would define 114 of 167 waters now stocked as put-and-take fisheries. Stocking levels for waters that could meet management objectives would decrease from 581,850 to 523,536 fish annually (Table 2). The remaining 53 waters would not meet put-and-take management objectives according to the projections. These areas presently receive 1,608,477 catchable size rainbow trout annually.

DISCUSSION

Stocking models developed here indicate streams nine or more meters wide should no longer be managed as put-and-take trout fisheries. Large streams should be targeted for immediate evaluation to determine if the results of stocking are as poor as projected. If so, stocking presently allocated to these waters should be used to provide fishing opportunity where anglers can better harvest stocked fish. According to this analysis, existing hatchery production will be needed to increase stream stocking levels and improve fishing in areas where put-and-take trout can meet management objectives. These areas should also be evaluated to determine if guidelines will produce fishing as indicated. Refinements involving more or fewer fish will be necessary to meet requirements of individual waters.

Regression analysis of historical information may underestimate benefits of stocking. Forecasted stream stocking levels represent a two-fold increase over existing statewide programs on waters that should meet put-and-take objectives. Anglers in the Lost and Wood River drainages harvested hatchery rainbow trout at almost twice predicted harvest rates (fish/h) in 1994 (Table 3). It appears that stocking could be reduced, or effort increased, for additional improvement in return rates at the expense of angler success on those waters. Alternately, as long as returns meet objectives, harvest rates that exceed 0.5 fish/h could be adopted as management goals for waters that will support them with reasonable stocking.

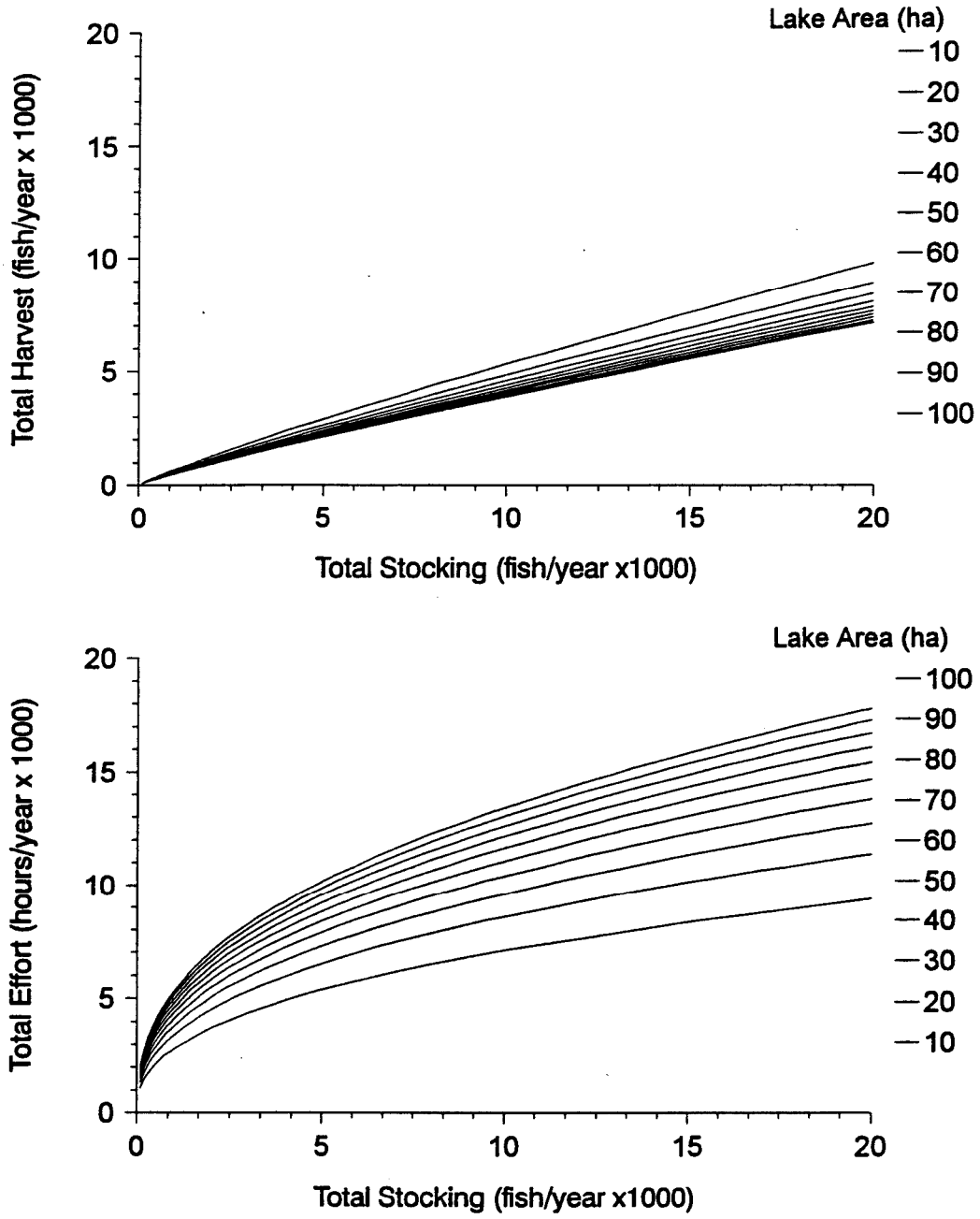

Figure 3. Annual harvest and fishing pressure predicted from the total number of catchable rainbow trout stocked, and surface area of Idaho lakes, reservoirs, and ponds. Values calculated from multiple regression models: 1) log harvest = 0.879 log stocking - 0.138 log area (ha) + 0.799 and 2) log effort = 0.404 log stocking + 0.277 log area (ha) + 4.51.

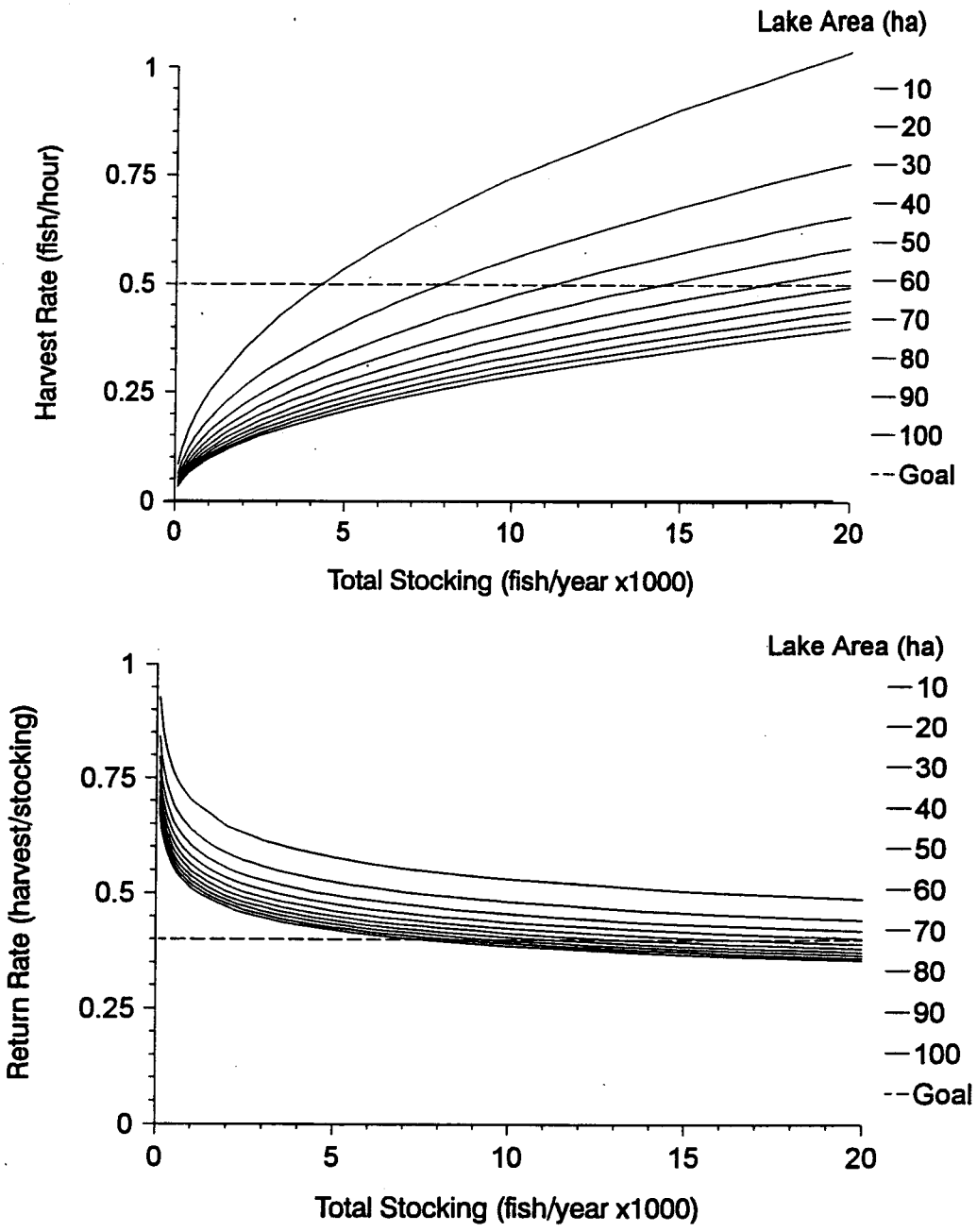

Figure 4. Harvest and return rates calculated for Idaho lakes, reservoirs, and ponds by dividing predicted harvest by predicted effort (fish/hour) and predicted harvest by stocking (return). Values calculated from multiple regression models: 1) log harvest = 0.879 log stocking - 0.138 log area (ha) + 0.799 and 2) log effort = 0.404 log stocking + 0.277 log area (ha) + 4.51.

Table 1. Comparison of existing and suggested statewide stream stocking of catchable rainbow trout based on 1994 requests, and multiple regression with 0.5 fish/h and 40% return goals.

Program	Number of fish	Number of waters
1994 Requests	595,875	112
Stocking to meet goals	435,640	75
Statewide reduction	160,235	37
Stocking to meet goals	435,640	75
Present program on streams capable of meeting goals	211,850	75
Increase for put-and-take streams	223,790	75

Table 2. Comparison of existing and suggested statewide lake and reservoir stocking of catchable rainbow trout based on 1994 requests, and multiple regression with 0.5 fish/h and 40% return goals.

Program	Number of fish	Number of waters
1994 Requests	2,132,013	167
Stocking to meet goals	523,536	114
Statewide reduction (or management as put-grow-and-take)	1,608,477	53
Stocking to meet goals	523,536	1,144
Present program on waters capable of meeting goals	581,850	114
Decrease for put-and-take Waters	58,314	114

For standing waters, designation of smaller systems as put-and-take fisheries will not result in discontinuation of stocking of rainbow trout larger than 15 cm in lakes and reservoirs more than 50 hectares in size. Many waters that do not meet put-and-take targets are managed as put-grow-and-take fisheries. Put-grow-and-take guidelines call for 100% or better return by weight (IDFG 1991). Returns in representative put-grow-and-take fisheries are currently being evaluated (Dillon and Jurcik 1994). Waters that meet put-grow-and-take or putand-take objectives will be stocked regardless of size. Some leeway will also be given for stocking dependent fisheries where alternative fisheries are not available. Though criteria may vary, periodic evaluation will be needed to guarantee stocking produces acceptable results.

A number of conditions limit the data used in this approach. The information is dated and as such only applies to conditions at the time the evaluations were conducted. This is true of any model built on existing data. Differences in hatchery trout stocks, their size, quality, and management could account for discrepancies between predicted and actual harvest rates.

Since stocking was used to estimate harvest, calculation of return to creel as harvest/stocking, and graphical representation of return versus stocking could produce misleading results. The approach taken was necessary to avoid more serious problems with the underlying regressions. Since harvest data are calculated in creel census reports from estimated fishing pressure, I separated harvest and effort in two equations to avoid spurious correlations. As a result, the equations necessarily rely on stocking as the major predictor. The direct use of resulting harvest and effort is sound. The desire to evaluate programs based on angler success and percentages of stocked fish that are harvested introduces potential statistical anomalies. Caution is advised in the application of these results.

Development of models that predict harvest from parameters other than stocking could avoid the problem. Examples include indirect measures of fishing effort such as distance from population centers. In the meantime, return and harvest rates predicted from these models may be the best we can do with historical census data. I recommend we use and evaluate these models in adaptive management programs until they are tested and refined.

The regression approach was also somewhat simplistic. It has the advantage of minimal data requirements, but obviously does not account for all factors that determine harvest and effort in hatchery trout fisheries. Neither the harvest model for lakes ($r^2 = 0.55$) nor the effort model for streams ($r^2 = 0.44$) were particularly effective in accounting for variability.

Variability not accounted for by these regressions will result in differences in predicted and actual values on individual waters. This becomes obvious when modeled harvests exceed numbers stocked at low stocking levels on very small waters. Since most census data has been collected on larger systems, stocking refinements will be necessary for these waters in particular. An effort should be made to collect the information necessary to improve guidelines for small waters since they have the greatest potential to produce stocking benefits.

Forecasted stocking levels may have to be reduced if larger fish are used in future put-and-take programs. Experimental stocking of 30 cm hatchery rainbow trout in Idaho streams has resulted in 1.1- to 1.5-fold increases in return rates compared to 24 cm fish (Mauser 1994b). Since hatcheries can only produce roughly half as many 30 cm fish, total harvests would presumably decline if only larger fish were stocked. A switch to larger fish should be conducted in phases and evaluated to be certain anticipated benefits offset the required reduction in numbers.

Table 3. Comparison of measured and predicted harvest rates for selected Idaho streams in 1994. Measured values from angler interviews, predictions from regression analysis of put-and-take stocking and stream widths.

Stream	Width (ft)	Width (m)	1994 Stocking	Harvest rates (fish/h) Predicted harvest	Predicted effort(h)	Estimated[a]	Measured[b]
Warm Springs	31	9.4	13,000	5,096	10,287	0.50	0.89
Trail Creek	20	6.1	6,750	3,284	6,618	0.50	0.61
Wood River	38	11.6	16,500	5,880	12,173	0.48	0.99
Drainage totals/averages			36,250	14,260	9,078	0.49	0.88
North Fork/ Lost River	22	6.7	5,012	2,409	5,708	0.42	0.68
Wildhorse Creek	25	7.6	4,909	2,253	5,772	0.39	0.97
West Fork/ Lost River	18	**5.5**	2,506	1,372	3,751	0.37	0.99
East Fork/ Lost River	12	3.7	3,005	1,888	3,859	0.49	0.80
Drainage totals/averages			15,432	7,921	19,091	0.41	0.88
Grand totals			51,682	22,181	48,169	0.46	0.87

[a] Predicted harvest/predicted effort.
[b] Harvest/hours fished for individual anglers (Job 2).

This stocking analysis should initiate future refinements in hatchery trout management. A comprehensive evaluation program, with systematic information collection and application of results, will be needed to complete the process.

RECOMMENDATIONS

1. Use stocking relations to characterize waters where return to creel may be prohibitively low.

2. Designate waters that meet guidelines as put-and-take fisheries and concentrate management efforts on them.

3. Do not stock streams larger than 9 m wide and lakes larger than 50 ha or return and harvest rates may fall below target levels.

4. Adjust stocking densities to those suggested by stocking relations and evaluate results.

ACKNOWLEDGEMENTS

I would like to thank hatchery and management personnel throughout the State for providing stream widths and surface areas of standing waters stocked with put-and-take rainbow trout.

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APPENDICES

Appendix A. Data used to construct stream stocking relationships for put-and-take rainbow trout.

Stream	Number year	Estimated stocked	Angling harvest	Effort(h)	Width(m)
Moyie River	1975	14,585	3,878	5,144	6.9
Lightning Creek	1970	4,560	1,636	2,700	9.9
Coeur d'Alene River	1973	15,095	8,755	18,828	32.4
	1992	12,025	1,855	12,736	32.9
Teepee Creek	1973	4,386	921	2,196	4.6
North Fork Coeur d'Alene River	1973	9,222	4,703	10,356	14.8
	1992	4,045	1,058	2,585	12.6
St. Joe River	1972	14,075	9,576	18,866	38.6
	1973	9,815	4,347	20,949	38.6
	1975	4,510	363	5,336	42.4
Clearwater River	1955	11,840	2,311	20,665	96.9
	1956	23,477	2,034	22,197	96.9
	1956	10,132	1,864	8,411	91.4
North Fork Clearwater River	1955	18,765	5,082	15,166	108.2
	1969	7,200	1,643	10,129	108.2
	1970	12,335	2,595	14,177	108.2
Selway River	1956	10,308	1,600	12,901	81.6
Lochsa River	1956	16,791	6,795	23,498	48.6
	1966	34,305	15,844	34,884	44.3
	1976	12,640	2,557	13,679	44.3
	1977	11,785	4,021	8,785	54.3
	1978	9,810	2,919	7,278	54.3
	1979	7,980	2,127	5,878	54.3
	1980	9,440	2,735	7,302	54.3
	1981	10,218	2,175	5,984	54.3
Payette River	1959	18,000	6,286	3,522	12.2
	1961	22,500	6,951	11,080	12.2
	1970	14,920	4,398	4,405	12.2
Lower Salmon River	1952	6,000	2,223	21,500	14.0
	1953	8,400	4,867	22,810	14.0
	1967	8,899	3,952	17,282	13.7
Boise River	1986	20,859	18,018	50,984	41.9
Middle Fork Boise River	1988	2,625	856	5,450	38.1
	1988	3,500	1,091	3,299	38.1
	1989	9,000	1,759	5,749	38.1
	1990	9,600	1,415	4,621	38.1
	1990	3,200	677	3,178	38.1
South Fork Boise River	1974	14,500	8,448	25,277	12.2
	1988	21,000	4,509	8,185	9.1
Big Wood River	1986	2,000	1,030	4,222	18.1
	1986	1,400	671	1,954	19.0
	1986	800	565	3,919	18.5
	1986	600	235	2,769	16.0
	1986	2,000	1,443	4,205	14.8
	1986	3,000	1,789	3,484	14.8
	1986	8,000	2,366	5,035	12.2
	1987	900	568	3,943	15.8
	1987	500	395	5,446	16.2

Appendix A. (Continued).

Stream	Number year	Estimated stocked	Angling harvest	Effort(h)	Width(m)
Big Wood River	1987	200	127	4,255	13.9
	1987	500	332	1,469	12.8
Silver Creek	1977	7,948	6,469	13,593	13.2
Rock Creek	1991	6,592	3,271	6,182	2.4
Portneuf River	1979	8,000	4,184	17,286	12.9
	1986	10,570	3,851	10,999	12.9
Snake River	1987	18,478	1,456	11,412	246.4
	1990	6,000	766	20,233	243.9
Willow Creek	1984	13,160	11,371	39,212	4.6
South Fork Snake River	1979	4,200	430	16,411	121.9
Teton River	1980	9,040	4,044	27,841	30.5
	1980	13,037	3,507	27,870	18.3
Henrys Fork Snake River	1973	12,200	1,012	11,563	100.6
	1973	25,600	8,259	25,278	100.6
	1973	32,050	3,144	26,013	61.0
	1973	31,400	4,605	95,632	61.0
	1973	21,000	2,275	95,634	55.0
	1976	13,000	378	12,529	100.6
	1976	14,450	2,534	21,864	100.6
	1976	20,645	1,943	16,675	61.0
	1976	34,740	3,969	64,326	61.0
	1976	28,200	8,838	54,586	55.0
	1977	23,900	5,536	24,571	55.0
	1977	16,150	7,377	27,328	55.0
	1980	7,050	876	9,834	100.6
	1980	11,000	967	19,165	100.6
	1980	600	123	9,813	61.0
Warm River	1984	9,455	1,826	4,988	15.2
Medicine Lodge Creek	1963	6,710	4,229	11,156	6.1
	1982	3,750	1,194	5,323	6.1
Birch Creek	1982	20,085	11,475	23,444	8.2
Big Lost River	1986	3,000	405	1,547	12.2
	1986	6,006	2,638	4,670	6.7
	1986	7,011	1,809	2,717	5.5
	1986	8,951	3,205	9,871	3.7
	1986	4,011	1,382	5,562	7.6
Salmon River	1959	5,000	114	580	45.7
	1959	6,000	828	4,030	45.7
	1959	6,000	1,596	5,698	45.7
	1959	10,000	1,860	2,820	35.4
	1959	3,000	520	1,909	16.5
	1988	13,484	2,964	14,341	45.7
	1988	34,659	9,413	23,475	27.9
	1991	8,020	1,633	6,588	24.7
	1991	10,120	3,500	5,297	35.4
	1991	23,320	11,109	16,848	45.7
	1991	5,000	990	3,938	45.7
South Fork Salmon River	1984	4,800	2,789	6,553	14.4
	1985	4,800	1,578	11,635	14.4

Appendix B. Data used to construct lake stocking relationships for put-and-take rainbow trout.

Lake	Year	Number stocked	Estimated harvest	Angling effort(h)	Surface area(m)
Spirit Lake	1968	11,790	4,538	37,192	526
	1981	8,000	4,370	9,880	526
	1992	7,000	448	28,194	526
Hauser Lake	1992	9,000	2,004	31,174	223
Hayden Lake	1968	15,120	5,955	15,690	1,538
Cd'Alene Lake	1967	11,430	572	169,908	10,147
Dworshak Lake	72-75	187,437	55,704	102,655	6,475
	1979	313,088	7,809	57,864	6,475
Spring V Lake	1988	43,183	36,895	39,735	21
Winchester Lake	1976	12,700	10,805	57,870	28
	1988	53,328	32,456	51,042	28
	1993	32,208	22,868	37,042	28
Waha Lake	1976	11,280	9,926	11,261	38
Manns Lake	1976	13,530	8,161	15,198	59
Upper Payette	1971	12,600	5,141	7,725	81
	1972	6,432	6,363	5,795	81
	1988	20,092	11,797	15,803	81
Payette Lake	1971	21,660	4,501	17,618	405
	1972	30,040	6,306	16,934	405
	1987	17,184	2,554	13,114	405
	1988	21,000	1,861	27,754	405
Horsethief Lake	1968	10,400	5,551	9,743	111
Cascade Lake	1968	51,510	13,244	59,795	11,453
	1969	49,980	15,511	66,694	11,453
	1970	50,000	15,083	78,175	11,453
	1971	50,000	20,256	84,864	11,453
	1972	59,240	30,485	128,730	11,453
	1973	52,320	9,597	121,110	11,453
	1974	48,400	9,465	131,595	11,453
	1975	58,560	11,410	158,422	11,453
	1991	150,000	9,698	171,905	11,453
	1992	115,800	13,667	295,493	11,453
Lower Valley Lake	1987	117,320	25,017	59,323	324
Lower Camas Lake	1975	9,000	3,613	68,422	506
	1976	25,000	6,429	55,362	506
Strike Lake	1992	7,875	1,802	236,730	3,035
Anderson Ranch Lake	1968	35,862	6,067	29,638	2,024
	1969	12,726	5,982	27,046	2,024
	1970	12,000	3,193	29,613	2,024
	1973	15,000	2,241	41,933	2,024
Magic Lake	1992	201,400	9,363	218,400	728

Appendix B. (Continued).

Lake	Year	Number stocked	Estimated harvest	Angling effort(h)	Surface area(m
Lower Wood Lake	1992	7,600	2,400	14,949	60
	1993	10,000	6,395	18,074	243
Crystal Lake	1990	19,685	14,188	20,563	3
Salmon FC Lake	1975	12,300	2,022	97,123	1,423
	1983	33,800	1,325	39,300	1,423
American Falls Lake	1981	155,455	33,763	148,735	22,663
	1982	105,857	9,876	94,609	22,663
Deep Creek Lake	1965	15,593	8,112	18,848	73
24-Mile Lake	1989	4,950	3,593	13,725	18
Twin Lake	1992	11,067	1,446	13,639	180
Winder Lake	1992	13,187	7,997	13,295	38
Treasureton Lake	1992	15,960	5,823	11,085	58
Springfield Lake	1992	6,754	747	3,444	27
Chesterfield Lake	1984	15,400	8,272	22,174	643
	1992	40,000	1,430	5,903	643
Roseworth Lake	1975	7,400	2,798	63,965	486
Montpelier Lake	1972	5,200	3,100	7,428	51
Wood Canyon Lake	1972	3,000	1,522	844	1
Mackay Lake	1960	10,004	6,343	22,932	405
	1961	10,000	6,378	19,333	405
	1983	36,600	10,364	35,071	405
Ashton Lake	1985	8,250	3,403	12,631	162
	1986	22,000	5,873	15,223	162
Blue Creek Lake	1981	2,835	1,816	3,743	3
Sand 1 Lake	1979	2,150	592	2,154	6
	1981	1,155	572	1,507	6
Sand 2 Lake	1981	2,740	2,019	4,193	7
Sand 3 Lake	1981	2,740	1,015	2,901	16
Sand 4 Lake	1981	6,130	2,972	9,180	32
Island Park Lake	1965	50,000	24,547	107,789	3,388
	1967	100,000	43,482	92,949	3,388
Stanley Lake	1958	8,000	5,133	7,400	74
	1959	10,000	9,500	8,600	74
	1986	13,250	4,408	11,326	74
Redfish Lake	1965	33,000	8,213	11,272	608
	1986	30,105	5,173	15,449	608
	1987	21,363	4,699	12,523	608
Alturas Lake	1959	15,250	13,438	13,900	339
	1963	31,500	18,083	31,713	339
	1986	20,050	7,790	12,557	339
	1987	14,417	3,158	10,126	339

JOB PERFORMANCE REPORT

State of: Jdaho

Grant No.: F-73-R-17. Fishery Research

Project: ;9

Title: Put-and-take Trout Evaluations

Subproject: 2. Angler Distribution and Knowledge

Period Covered: April 1. 1993 to March 31. 1994

ABSTRACT

Angler distribution and stocking matched closely along portions of seven streams managed as put-and-take trout fisheries in the Big Wood and Big Lost river drainages of south-central Idaho in 1994. Additional publicity may be required to increase hatchery trout harvests from other Idaho streams, but was not indicated by the distribution of anglers and stocking in this area. General knowledge about stocking may have been more widely circulated than the norm because of a large number of local outfitter and guide services.

Despite the close correspondence between percentages of hatchery rainbow trout *Oncorhynchus mykiss* stocked at individual sites and anglers fishing the same vicinity, relatively few anglers knew specific stocking sites. Since anglers found hatchery fish, or hatchery crews effectively stocked the most frequently fished sites, lack of such detailed knowledge apparently was not a problem.

Anglers rated fishing quality high on all streams. Number and size of fish were rated 8-10 on a scale where 1 was worst and 10 best. Higher ratings in the Lost River drainage could have been related to 3 cm larger fish stocked there.

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Senior Fishery Research Biologist

INTRODUCTION

Hatchery personnel stock sites along Idaho streams based on access and evidence of use. Since accessible areas generally receive moderate to heavy fishing pressure, harvests should be acceptable provided adequate numbers of put-and-take rainbow trout *Oncorhynchus mykiss* remain in the vicinity of stocking sites, and the fish are catchable. Information collected from popular hatchery trout fisheries in the Wood River drainage in 1993 indicated a potential need to stock sites according to distinct angler distribution patterns (Mauser 1994). It appeared anglers concentrated at the first streamside access on the lower portions of study streams. We wanted to see how closely stocking matched the physical distribution of effort on those streams in 1994.

Two approaches could be used to maximize return to creel by coordinating stocking and effort. Idaho Department of Fish and Game (IDFG) could influence angler distribution with stocking and publicity. It is not known whether stocking publicity can modify choices of fishing sites. Use of publicity for this purpose would require that anglers have information detailed enough to allow them to find concentrations of stocked fish. Since 1992, signs depicting the release of hatchery fish have been provided to fishery managers to post Idaho streams. In 1994, hatchery managers were directed to sign all streams stocked with put-and-take trout. How widespread and effective this program has been in directing anglers to stocking sites is unknown.

Conversely, biologists and hatchery managers could adjust stocking to match the observed distribution of effort along each stream. Matching stocking to angler use would require data collection, interpretation and follow-up to achieve results. Much of the information needed could be collected on routine stocking trips, officer patrols, and angler checks. Benefits in the form of better returns of stocked fish, would have to exceed the additional costs of mapping angler use for such an approach to be useful.

To evaluate angler use versus fish stocking, I compared the distribution of anglers to numbers of hatchery rainbow trout stocked in streams of the Wood and Lost River drainages in 1994. I also evaluated angler knowledge of the stocking program including location of individual stocking sites.

RESEARCH GOAL

To improve return to creel of hatchery rainbow trout in Idaho streams.

OBJECTIVES

1. To evaluate stocking distribution (number/site) in relation to angler distribution.

2. To assess existing levels of angler knowledge concerning stocking programs.

METHODS

We mapped fishing locations and interviewed anglers along streams in two adjacent Idaho drainages stocked with catchable rainbow trout. Streams in the Big Wood River drainage included Warm Springs Creek, Trail Creek, and the Big Wood River upstream of its confluence with the North Fork of the Big Wood River. All three streams flow south through the town of Ketchum, Idaho (Figure 1). Study streams in the Big Lost River drainage included the North Fork of the Lost River, Wildhorse Creek, the West Fork of the Lost River, and the East Fork of the Lost River (Figure 2). These streams are located about 16 km east of Ketchum.

Census clerks conducted a count-interview census of fishermen from June 7 to October 2, 1994 on Wood River streams and from June 19 to September 18, 1994 on Lost River streams. Clerks recorded angler locations according to sequential numbers on USGS Quadrangle maps of each stream. Figures 1 and 2 show the range and approximate distribution of the numbering system used to record locations. Fishing sites were mapped on count days selected randomly within two-week intervals at an average frequency of one weekday and one weekend day per week. Starting times for counts were selected at random within three roughly equal time periods based on daylight hours. I used an IDFG creel census program to schedule counts (McArthur 1993). Extra counts were made infrequently as time permitted.

Clerks counted anglers primarily by driving drainage roads. Most sections of study streams could be viewed from streamside roads. In areas where streams were not readily visible, anglers were located by hiking the stream. Time constraints limited this practice principally to times when the presence of parked cars indicated possible fishing activity in the immediate vicinity. Anglers were interviewed whenever possible, primarily on non-count days. During interviews census clerks requested information on fish caught and hours fished. Clerks asked questions concerning angler knowledge of the stocking program, and familiarity with putand-take signs. Anglers were also asked to rate fishing quality on the day of the interview (Appendix A).

Anglers gave separate ratings for the number and size of fish caught. We requested responses on a 1-10 scale with 1 being worst and 10 being best (Matlock et al. 1991). Responses to questions about stocking and signing programs were recorded as negative or positive, correct or incorrect (Appendix A). Anglers were allowed considerable leeway on questions involving detailed knowledge about streams and sites stocked. Census clerks recorded responses as correct if anglers were able to identify two or more streams or sites stocked.

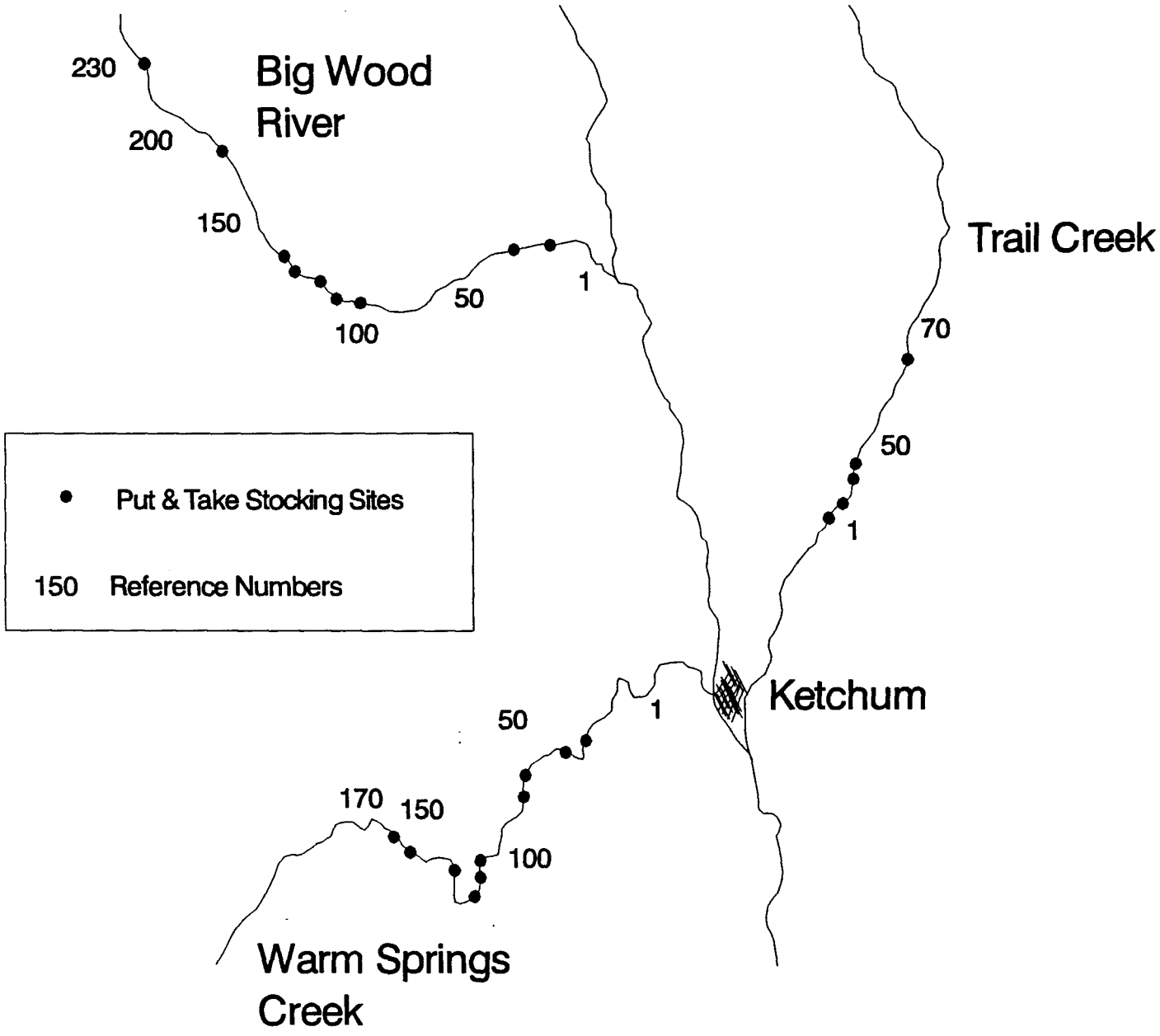


Figure 1. Map of the Big Wood River drainage near Ketchum, Idaho showing sites stocked with hatchery rainbow trout, and the system of reference points used to compare locations of anglers and stocking on study streams in 1994.

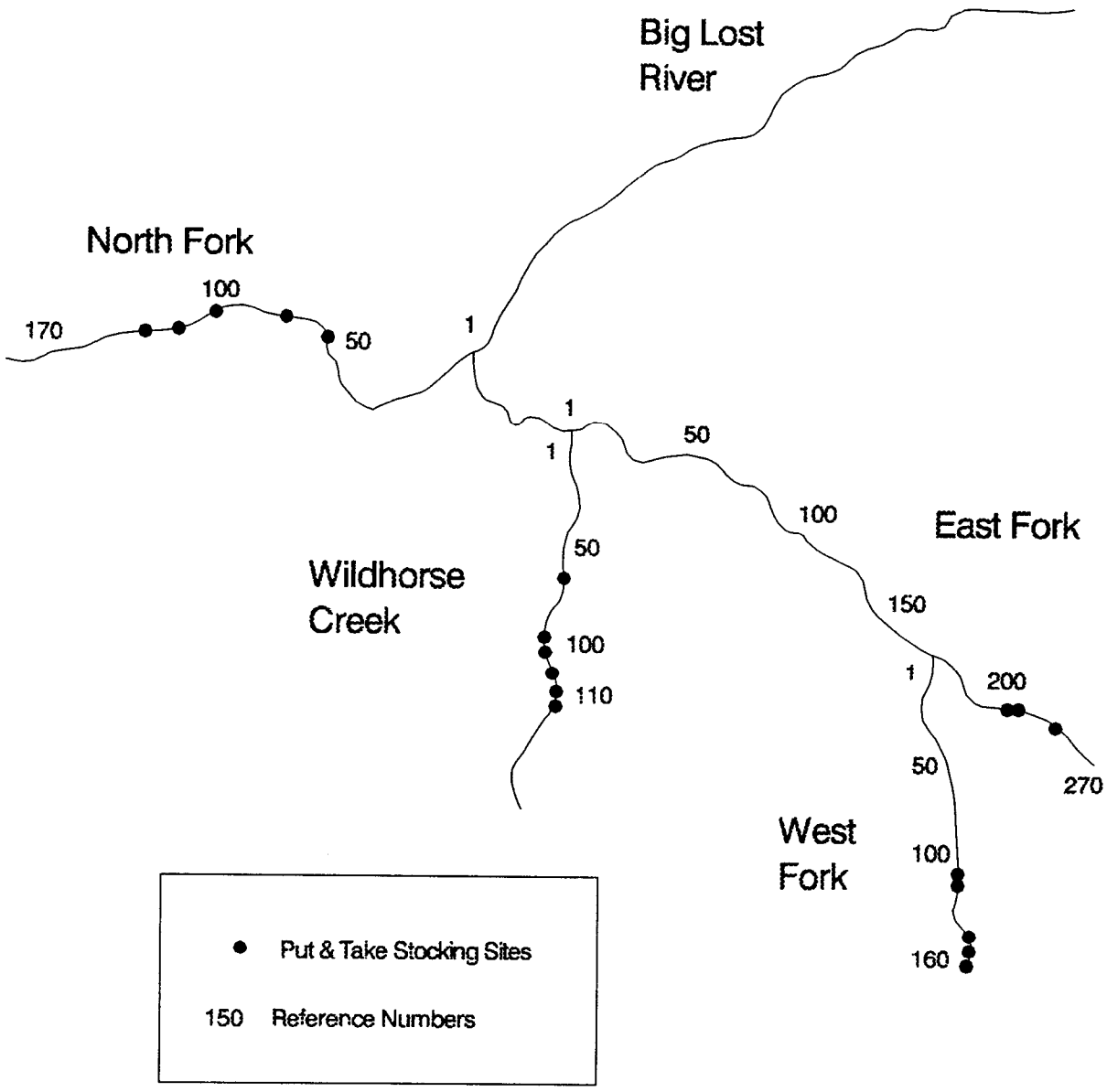


Figure 2. Map of the Big Lost River drainage near Mackay, Idaho showing sites stocked with hatchery rainbow trout, and the system of reference points used to compare locations of anglers and stocking on study streams in 1994.

Hatchery personnel stocked study streams with catchable rainbow trout every one to three weeks from late May to September (Appendices B and C). Fish stocked in Wood River streams were reared and originated from the rainbow trout broodstock at the Hayspur Fish Hatchery located south and west of Bellevue, Idaho. Fish stocked in Lost River streams were reared at Mackay Fish Hatchery located north and west of Mackay, Idaho. In 1994, Mackay Hatchery fish were Arlee, Montana strain. Based on pound count conversions, fish stocked by Hayspur Hatchery averaged 26 cm, whereas Mackay fish averaged 29 cm (Appendices B and C).

Hatcheries used pound counts and water displacement to determine total numbers transported and stocked. On July 28, and 29, August 24 and 26, and September 1 and 2, Hayspur Hatchery and project personnel counted fish stocked at each site on Wood River study streams. On July 21 and August 4 and 18, Mackay Hatchery and project personnel counted fish at each site in the Lost River drainage. On July 21, 28, and 29, these numbers were estimated from average number/net and number of netfuls per site. On subsequent dates, fish were physically counted out of dip nets or plastic garbage cans. Fish counts were conducted at each site except those where transport tanks were emptied (three sites total). Due to difficulty separating fish from relatively large water volumes, counts at these locations were approximated by subtracting previous counts from the estimate of the number of fish transported.

For each stream I used location reference numbers to graph and compare the distribution of anglers throughout the season to the distribution of trout on the dates fish were counted. In doing so, I assumed the stocking distributions we recorded were representative of remaining hatchery releases. I compared combined angler ratings of fishing quality for Wood River versus Lost River streams with two-sample Kolmogorov-Schmirnov tests of the frequency distributions in SYSTAT (Wilkinson 1990). I tested for associations between stocking program knowledge and drainages (Wood v Lost) with Chi-square (Kirby 1993) or Fisher Exact tests depending on the number of cells and samples per cell (Zar 1984). I reported significant differences only where I was able to determine that cells within each test were statistically similar (Zar 1984). I used $P < 0.05$ for all tests.

RESULTS

Angler Distribution versus Stocking

Anglers generally fished near locations, and at frequencies, that mirrored stocking distributions (Figures 3 to 9). Areas where transport trucks were emptied at the end of stocking trips, and some lightly fished sites, were minor exceptions to stocking and effort that matched quite closely. Exceptions tended to be overstocked in relation to the distribution of angling effort.

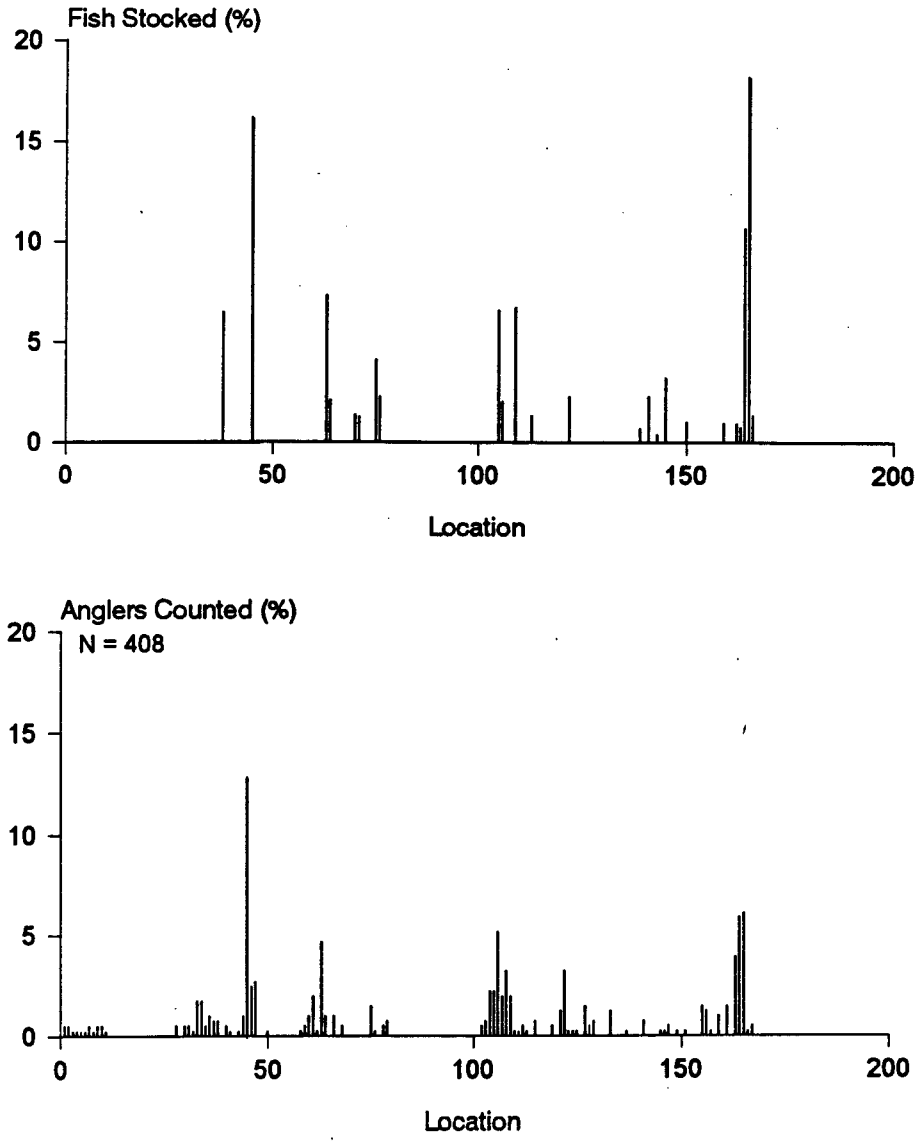


Figure 3. Stocking and angler distributions on Warm Springs Creek in 1994.

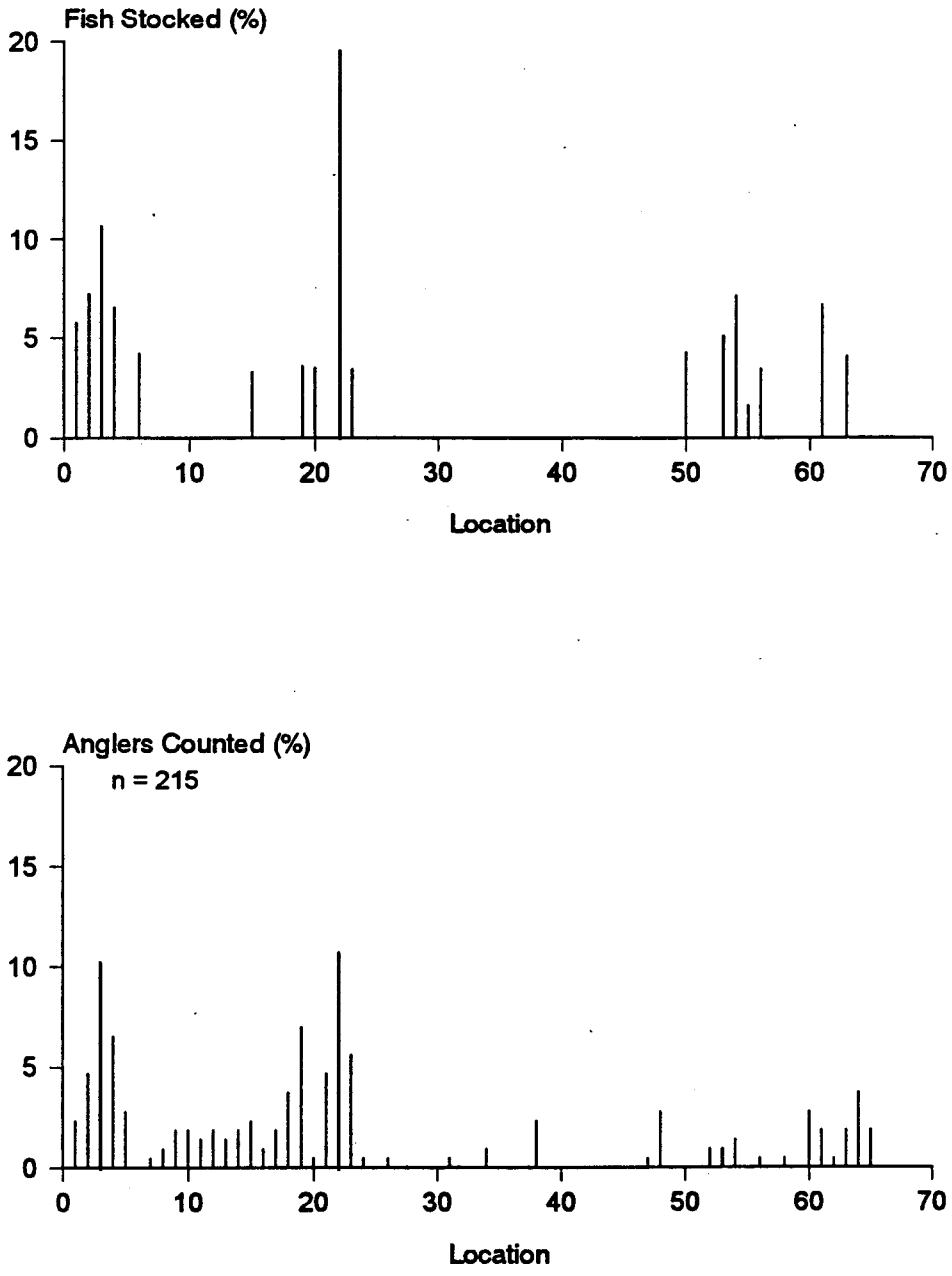
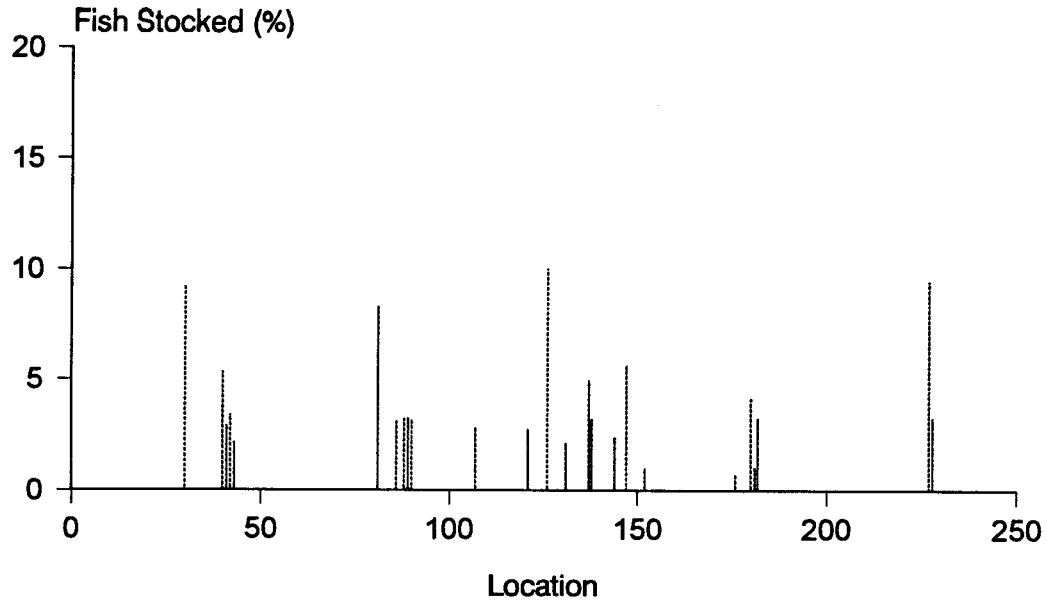


Figure 4. Stocking and angler distributions on Trail Creek in 1994.



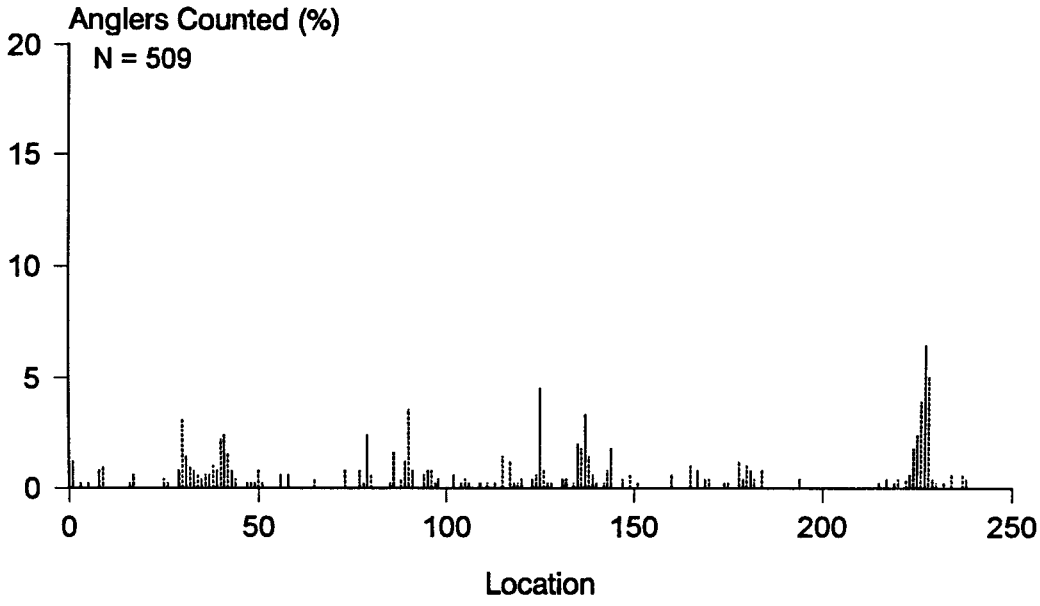
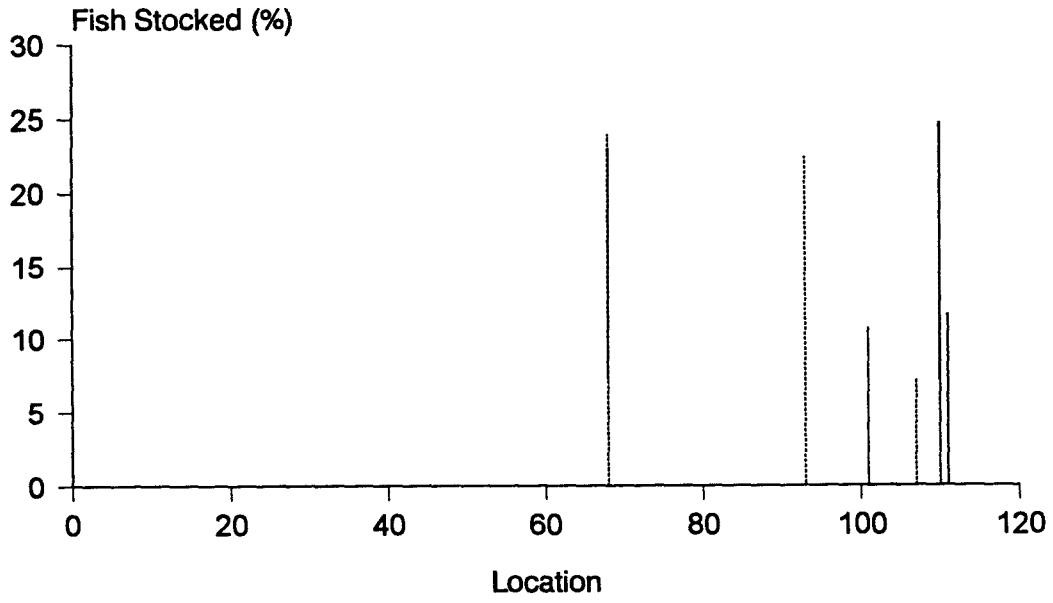


Figure 5. Stocking and angler distributions on the upper Big Wood River in 1994.



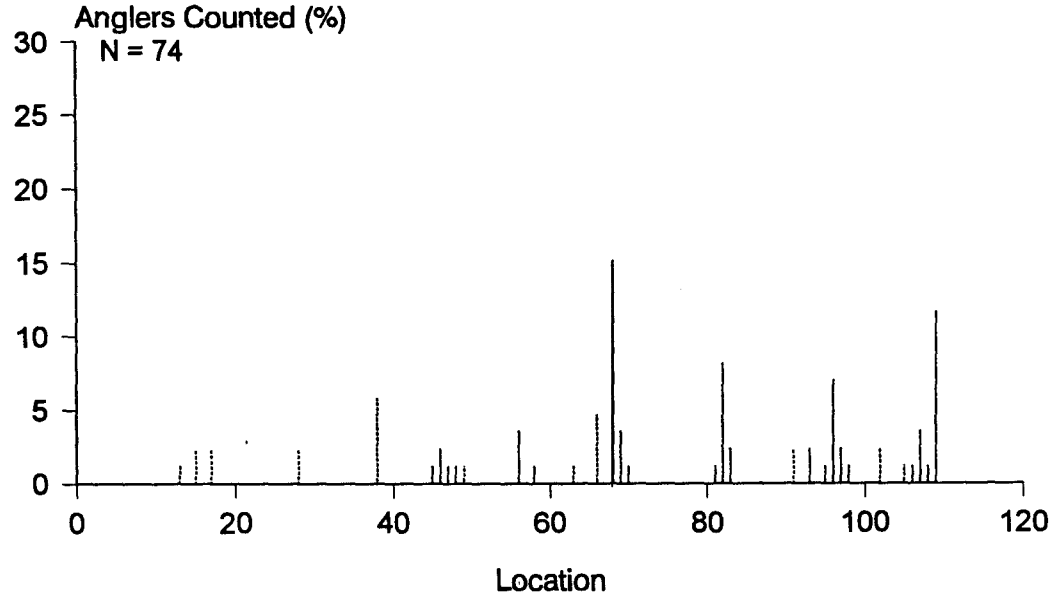
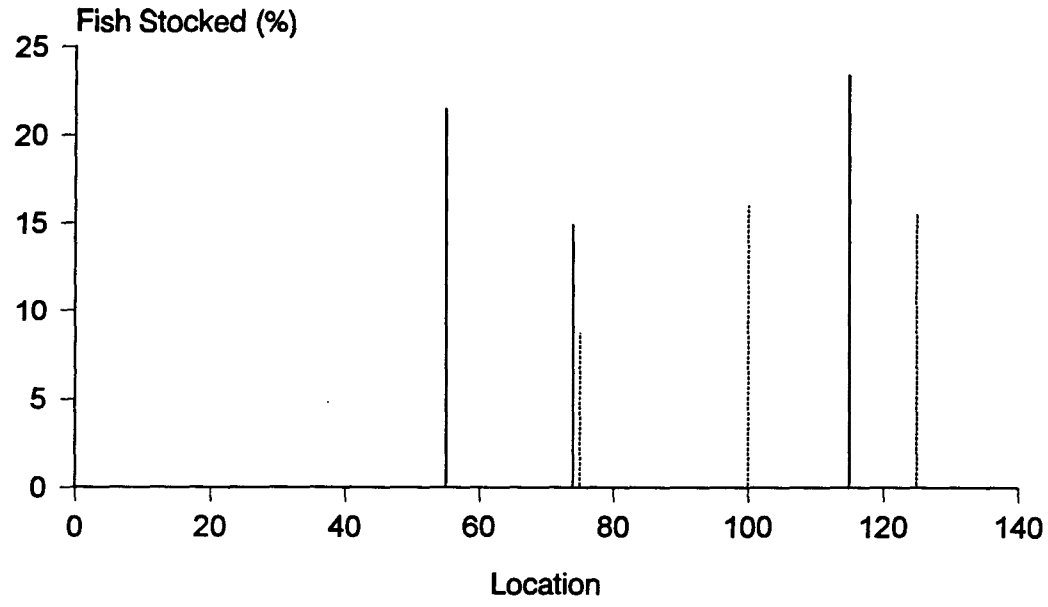


Figure 6. Stocking and angler distributions on the North Fork of the Big Lost River in 1994.



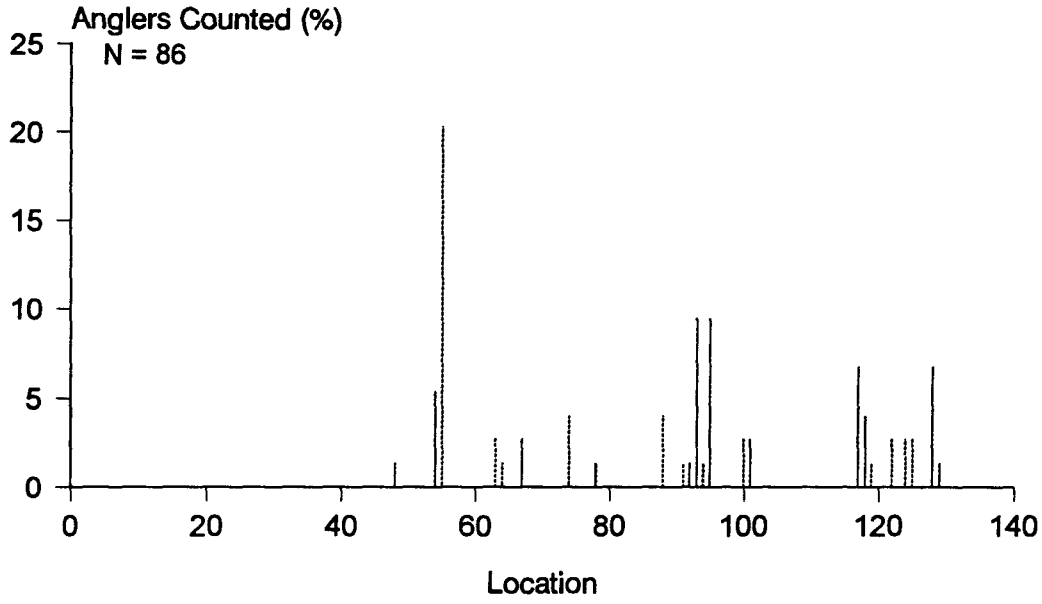
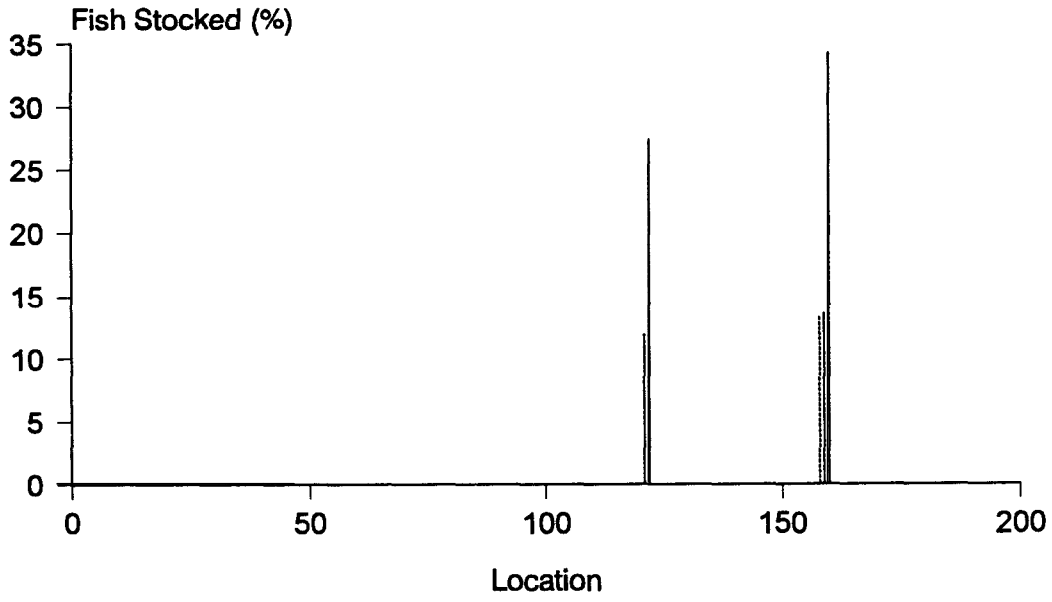


Figure 7. Stocking and angler distributions on Wildhorse Creek in 1994.



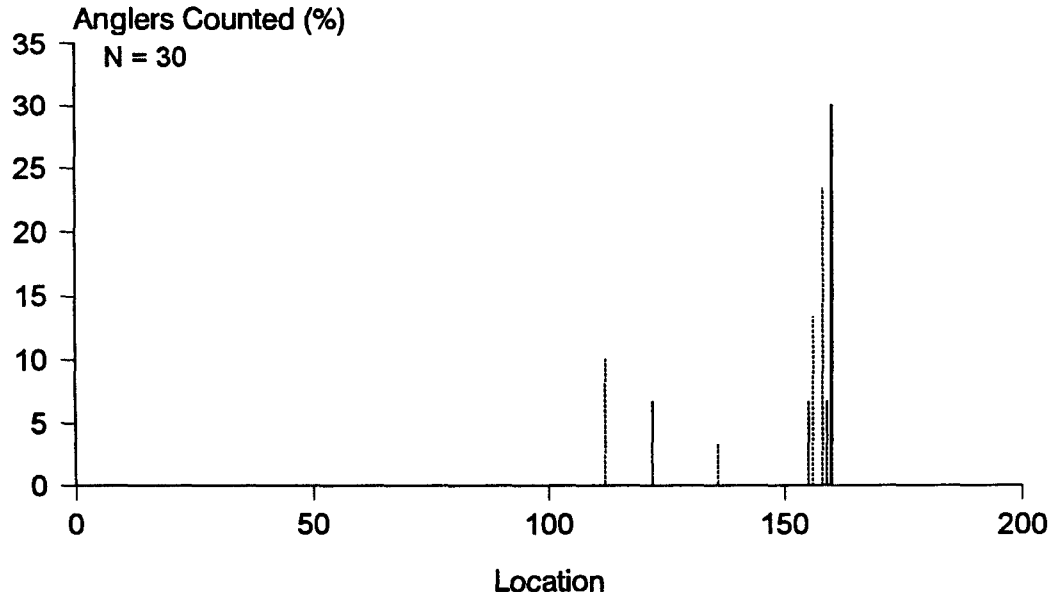
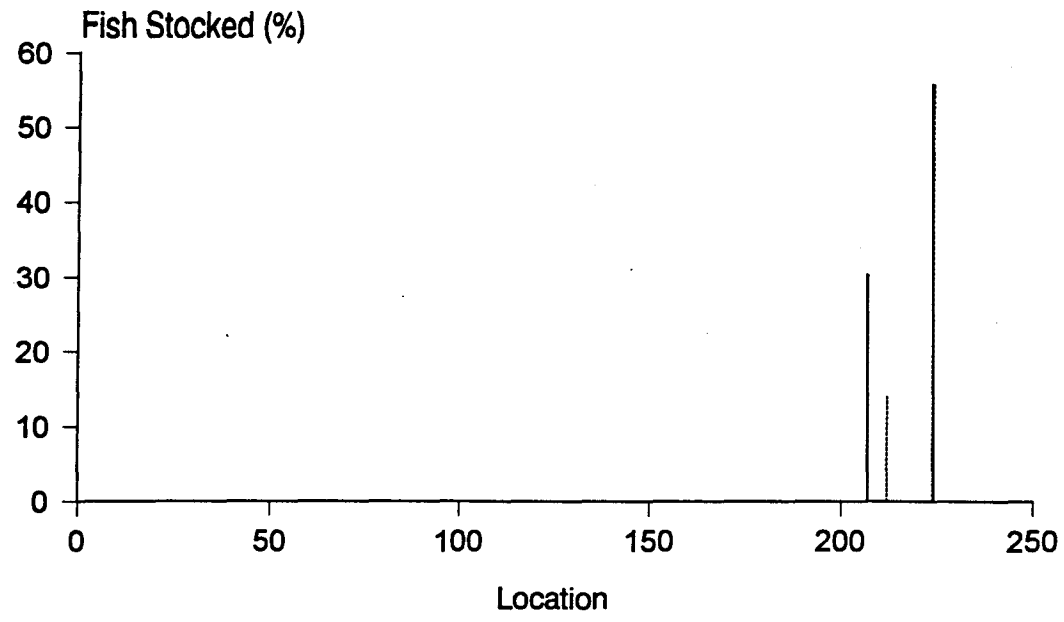


Figure 8. Stocking and angler distributions on the West Fork of the Big Lost River in 1994.



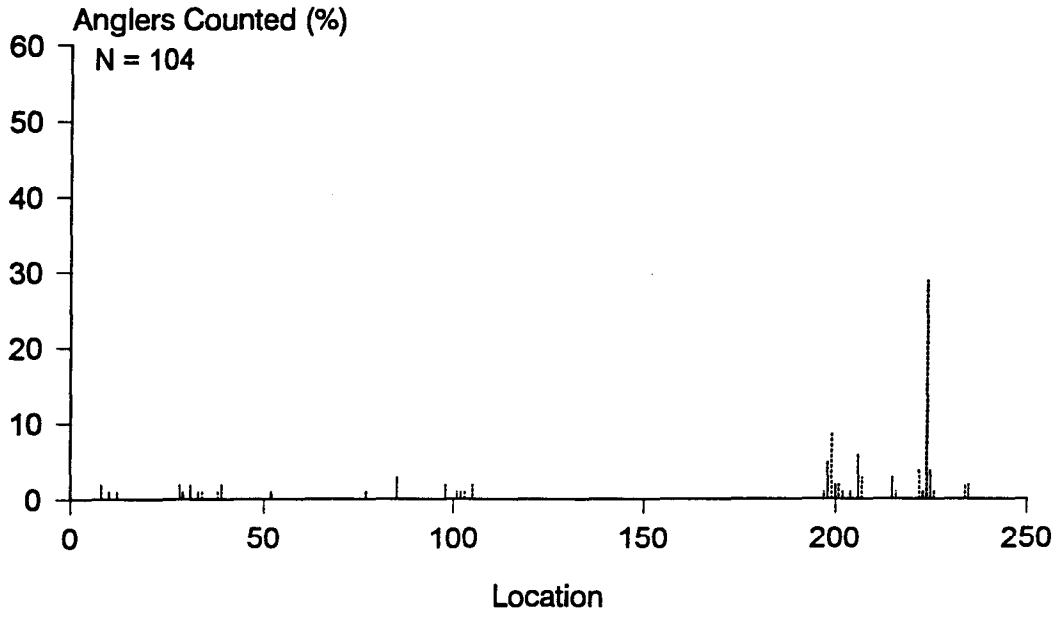


Figure 9. Stocking and angler distributions on the East Fork of the Big Lost River in 1994.

Angler Knowledge of Stocking

Question 1 - Stocking Program

Fifty-six percent of all anglers interviewed in the Wood and Lost river drainages indicated they were familiar with the stocking program. Seventy percent said they were familiar with the program on Wood River streams compared to 28% in the Lost River drainage. This difference was highly significant ($P < 0.001$, $N = 430$).

Question 2 - Streams Stocked

Overall, 36% of interviewed anglers were able to correctly list stocked streams within the drainage they were fishing. In the Wood River drainage, 33% of interviewed anglers could do so. In the Lost River drainage; 52% of interviewed anglers correctly identified streams that were stocked. Responses differed among Wood River streams ($P = 0.013$). Thirty-seven percent of anglers fishing Warm Springs Creek were able to list stocked streams compared to 45% on Trail Creek and 25% on the upper Wood River (Appendix D). In the Lost River drainage, cells with fewer than five responses limit the data (Appendix E).

Question 3 - Stocking Sites

Overall, few fishermen in both drainages indicated they knew which sites were stocked on the stream they were fishing. Nine percent said they were familiar with stocking sites on Wood River streams compared to 29% in the Lost River drainage. Responses were similar among Wood River streams (Appendix D). Small sample sizes limit the data for individual streams in the Lost River drainage, but 23% to 40% of anglers indicated they were familiar with stocking sites on individual streams (Appendix E).

Question 4 - List Sites

Overall, 11% of interviewed anglers were able to list stocking sites. Seven percent could in the Wood River drainage compared to 42% in the Lost River drainage.

Question 5 - Stocking Information

Word-of-mouth was the most commonly cited source of information (22%) about the stocking program in the Wood River drainage ($N = 228$), followed closely by outfitters and guides (21 %) (Figure 10). Next most important were contacts with IDFG (14%), stocking signs (14%), news sources (13%), direct experience with the fishery (11%), and fishing regulations (2%). Responses were similar among streams, however guides and Department contacts may have been slightly more important on the upper Wood River and Trail Creek compared to Warm Springs Creek (Appendix D). In the Lost River drainage IDFG sources (primarily hatchery crews on stocking trips) were most prominent (32%), followed by word-of-mouth (30%) (Figure 10). Other sources of information were relatively minor, though small sample sizes limit the data ($N = 37$).

Question 6 - Fishing due to Stocking

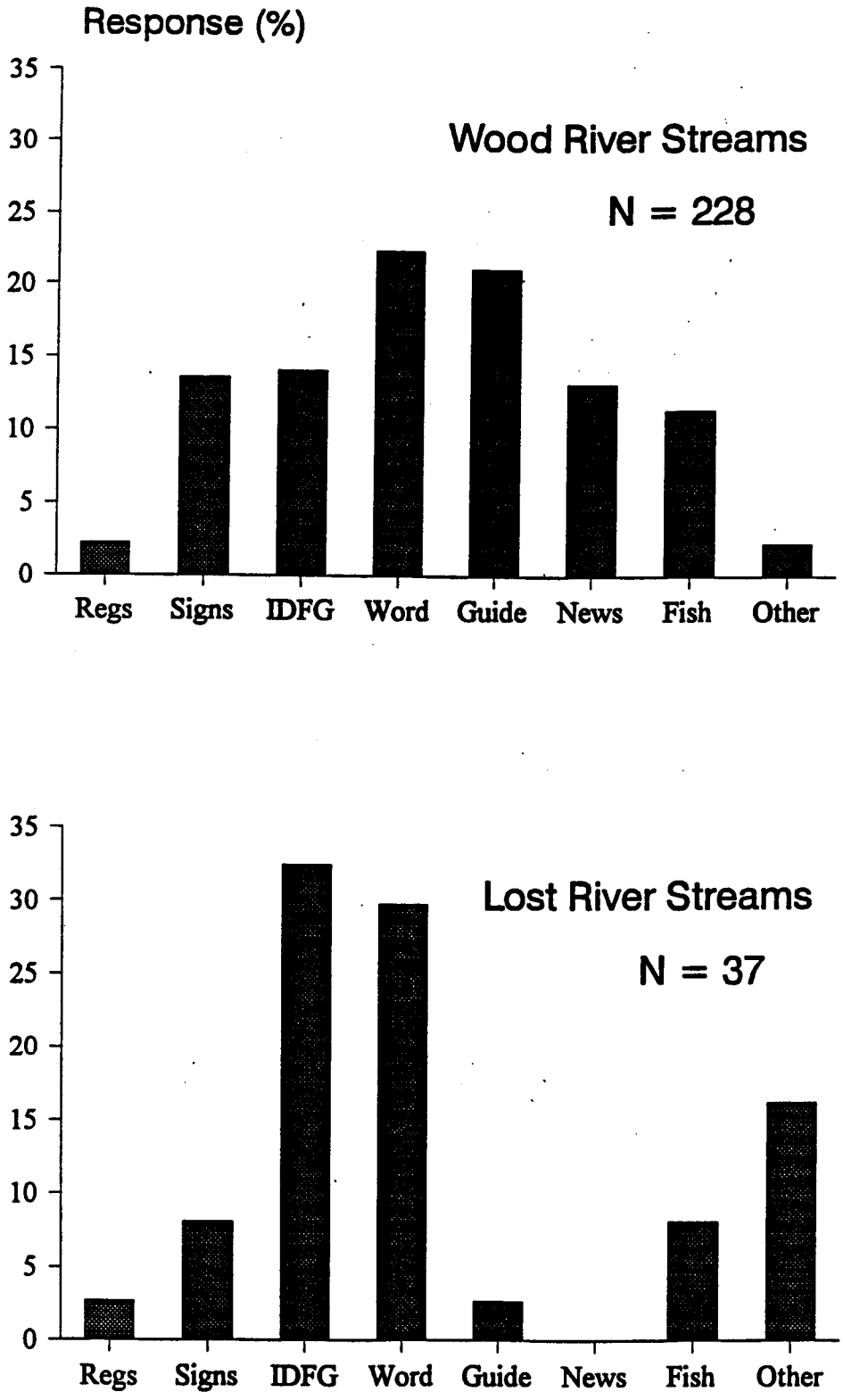


Figure 10. Stocking information sources listed by anglers fishing study streams in the Big Wood and Big Lost river drainages in 1994.

Slightly less than half of all anglers interviewed (46%) said they fished streams in the Wood and Lost river drainages because they were stocked (N = 337). Fifty percent said they were fishing Wood River streams due to stocking compared to 28% in the Lost River drainage.

Fishing Quality

Number and Size of Fish

Anglers rated fishing quality high on all streams. Since distributions were similar regardless of whether anglers had hatchery rainbow trout in possession, I used combined samples. Anglers rated the number of fish caught on Wood River streams most frequently at 10, with size of fish given an 8 most often. Lost River anglers rated both number and size of fish at 10 most often. Number (Figure 11) and size (Figure 12) distributions both differed between drainages with higher ratings for Lost River streams than those in the Wood River drainage ($P = 0.001$ number, $P < 0.001$ size).

DISCUSSION

Despite the apparent low level of knowledge anglers expressed concerning stream stocking sites in the Wood and Lost river drainages in 1994, fishing effort was closely associated with stocking. Vehicle access to streams may control stocking and use of stocked sites. The best areas for stocking and fishing are adjacent to roads and turnouts. Put-and-take fishing success probably does not increase with distance from roads.

Additional information about the stocking program may still be useful to increase its effectiveness. I recommend IDFG publish brochures that describe the hatchery program and distribute them to vendors in each geographical area stocked with put-and-take trout. These could direct anglers to stream sections stocked with hatchery fish and explain that fishing will generally be best in the vicinity of areas marked by stocking signs. Stocking information signs need to be prominently placed along major roads to be noticed.

Compared to 1993, effort appeared to be less concentrated at the first access sites encountered by anglers driving to streams in the Wood River drainage (Mauser 1994). Use of angler interviews rather than counts to record fishing sites in 1993 probably accounts for this difference. In the 1993 census, clerks may have interviewed more fishermen on the lower portions of streams skewing the distribution of use in relation to stocking sites.

In 1994, anglers fishing Lost River streams concentrated on the upper reaches where campgrounds were located. These areas were stocked with hatchery fish. Downstream sections of these streams were managed for wild trout with a two-fish limit in 1994. Less restrictive regulations and trout stocking may attract people to the headwaters of these streams or higher use may have occurred there historically.

An alternate explanation for the close association of anglers with stocked sites is that hatchery crews adjust stocking to match effort. Since most hatcheries report they make

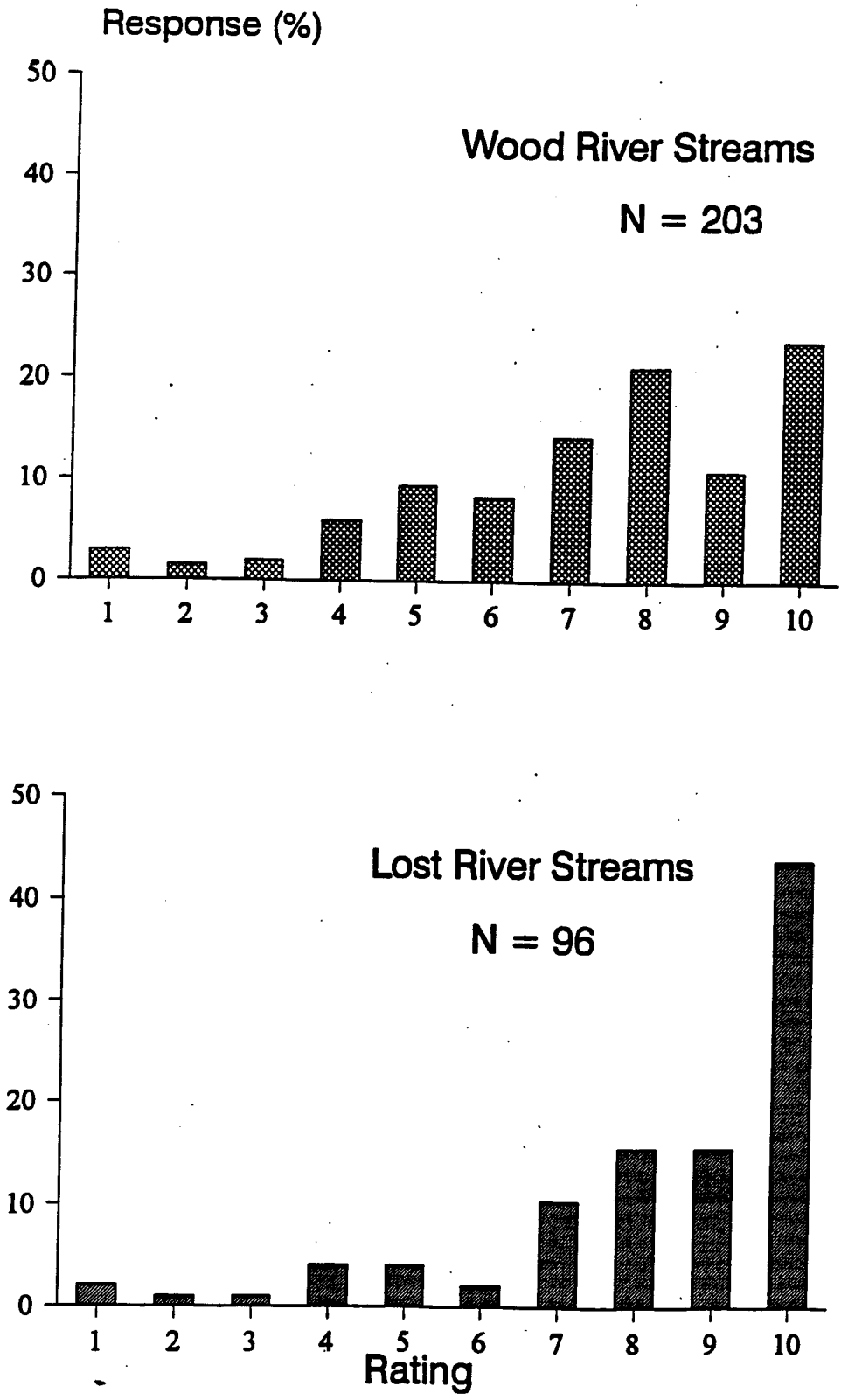


Figure 11. Angler ratings for the number of fish caught on the day of interviews on study streams in the Big Wood and Big Lost drainages in 1994.

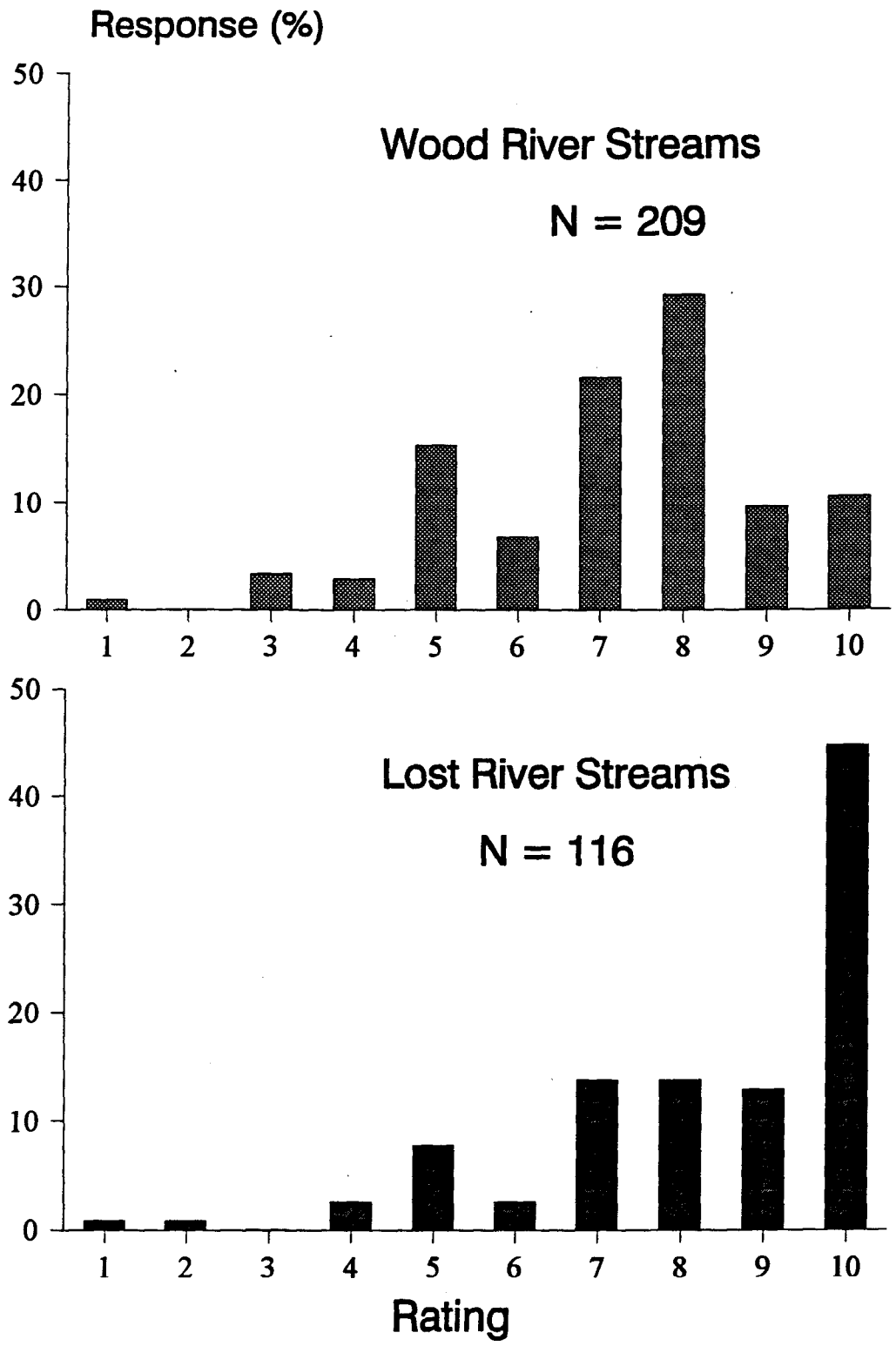


Figure 12. Angler ratings for the size of fish caught on the day of interviews on study streams in the Big Wood and Big Lost drainages in 1994.

stocking trips during the week without seeing many fishermen, the technique is necessarily indirect. Hatchery crews rely on access and evidence of angler use to allocate fish to different areas of streams. If the drainages we examined are representative of the rest of the state, further refinements may not be necessary. It may however be worthwhile to document the basis for fish distribution so successful programs can be replicated.

Even our liberalized criteria for angler knowledge may have been too restrictive. Anglers had to list two or more specific sites to demonstrate knowledge sufficient to be recorded as positive responses. Some anglers may have been familiar enough with stocked areas, or otherwise able to locate fish, but could not identify sites stocked. Many anglers indicated they located hatchery fish simply by observing them in the stream. Practical ability to find and harvest fish may generally exceed the impression left by our survey.

The extent of knowledge demonstrated by anglers in these drainages may be considerably better than in most areas of the state where guide services are uncommon. Guided trips and the resultant dissemination of information probably increase harvests over what they would be in the absence of that knowledge. It may be useful to evaluate the extent to which anglers know about stocking, and to what degree they fish stocked sites in other areas of the state.

High catch rates and quality ratings may indicate study streams were stocked at levels greater than necessary. The higher ratings for Lost River streams compared to those in the Wood Rive drainage could be related to 3 cm larger fish stocked in the Lost River drainage. Conclusions cannot be drawn from one test in two drainages where results could have been influenced by other factors. Stocking programs involving larger fish should be evaluated as opportunity allows for effects on angler satisfaction and harvest.

Quality indices may provide additional worthwhile information, but are probably not adequate in lieu of catch rate and fish size data. They do offer a more direct link to angler satisfaction, but are perhaps not as sensitive to differences in fish size and abundance. Size differences are detected more readily by anglers than differences in abundance (Parkinson et al. 1988).

RECOMMENDATIONS

1. Idaho Department of Fish and Game managers should map angler distribution during routine census and compare with stocking distributions to learn if stocking and fishing pressure match on Idaho streams managed for put-and-take trout. Such an approach would not cost any additional money and may identify areas on individual waters where angler use and stocking levels are not in concordance.

2. Publish stocking information brochures to complement and explain put-and-take stocking signs in areas where additional information about stocking programs is needed to increase hatchery trout harvest.

ACKNOWLEDGEMENTS

I would like to thank personnel at Hayspur and Mackay hatcheries for their cooperation and assistance with stocking evaluations. Bioaides Bob McKie, Craig Panarisi, Kevin Cramer, and Jay Fulcher conducted angler counts and interviews. Aileen Goetsch entered and proofed data.

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APPENDICES

Appendix A. Questions concerning angler knowledge of stocking and signing programs in the Big Wood and Big Lost River drainages in 1994.

1. Are you familiar with the stream stocking program for this area?

   1. Yes 2. No

2. If so, what streams are stocked?

   1. Know 2. Don't know

3. Do you know which locations are stocked on this stream?

   1. Yes 2. No

4. What are they?

   1. Know 2. Don't know

5. How did you learn about stocking?

   1. Fishing Regulations
   2. Put & Take Signs
   3. Contact with Fish and Game Department
   4. Word of Mouth, Friends, Relatives
   5. Guides, Outfitters, Vendors
   6. Newspaper, Radio, TV
   7. By Fishing, observing Stocked Fish
   8. Other

6. Are you fishing this stream because it is stocked?

   1. Yes 2. No

7. Have you seen the put-and-take stocking signs?

   1. Yes 2. No

8. What is your understanding of what they mean?

   1. Know 2. Don't know

Appendix A. Continued.

9. How did you find out?

    1. Fishing Regulations
    2. Put & Take Signs
    3. Contact with Fish and Game Department
    4. Word of Mouth, Friends, Relatives
    5. Guides, Outfitters, Vendors
    6. Newspaper, Radio, TV
    7. Common Sense

    8. Other

10. How would you rate the number of fish you caught today on a 1-10 scale with 1 being worst and 10 being best?

11. How would you rate the size of fish you caught today?

Appendix B. Stocking schedule for hatchery rainbow trout in Warm Springs Creek, Trail Creek, and the upper portion of the Big Wood River in 1994.

	Number stocked			Total		
Date	Warm Springs	Trail	Wood	Number	Pounds	Length(cm)
May 26	1,500	750		2,250	1,359	28.0
May 27			2,500	2,500	929	23.8
June 9	1,500	750		2,250	1,165	26.6
June 10			2,000	2,000	1,010	26.4
June 12			500	500	248	26.3
June 24	1,500	750		2,250	978	25.1
June 30			2,500	2,500	1,050	25.2
July 1	1,500	750		2,250	910	24.5
July 14	1,500	750		2,250	858	24.0
July 15			2,500	2,500	1,608	28.6
July 28	1,500	750		2,250	853	23.9
July 29			2,500	2,500	936	23.9
August 11	1,500	750		2,250	921	24.5
August 12			2,000	2,000	809	24.5
August 24	1,500	750		2,250	829	23.8
August 26			2,000	2,000	800	24.4
September 1	1,000	750		1,750	694	24.4
Totals	13,000	6,750	16,500	36,250	15,957	25.5

Appendix C. Stocking schedule for hatchery rainbow trout in the North Fork,. Wildhorse Creek, the West Fork, and the East Fork of the Big Lost River in 1994.

Date	North Fork	Number stocked wildhorse	West Fork	East Fork	Number	Total pounds	Length (cm)
May 25	625			750	1,375	825	29.1
June 9	625	750	400	400	2,175	1,325	29.2
June 30	630	756	351	351	2,088	1,160	28.4
July 7	680	680	500	375	2,235	1,320	28.9
July 21	702	711	504	378	2,295	1,275	28.3
August 4	875	1,004	375	375	2,629	1,460	28.3
August 18	875	1,008	376	376	2,635	1,550	28.9
TOTALS	5,012	4,909	2,506	3,005	15,432	8,915	28.7

Appendix D. Angler responses to questions concerning stocking, signing, and fishing quality for study streams in the Big Wood River drainage in 1994 (see Appendix A for questions).

		Stream							
		Warm Springs Creek		Trail Creek		tiPper Wood River		Total	
Question	Response	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Program	Yes	58	69.88	48	69.57	92	71.32	198	70.46
	No	25	30.12	21	30.43	37	28.68	83	29.54
	Total	83	100.00	69	100.00	129	100.00	281	100.00
Streams	Correct	29	36.71	30	**45.45**	30	24.79	89	33.46
	Incorrect	50	63.29	36	**54.55**	91	75.21	177	66.54
	Total	79	100.00	66	100.00	121	100.00	266	100.00
Sites	Yes	8	10.13	5	7.58	10	8.13	23	8.58
	No	71	89.87	61	92.42	113	91.87	245	91.42
	Total	79	100.00	66	100.00	123	100.00	268	100.00
List	Correct	7	9.21	5	7.94	5	4.13	17	6.54
	Incorrect	69	90.79	58	92.06	116	95.87	243	93.46
	Total	76	100.00	63	100.00	121	100.00	260	100.00
Source	Regs	1	1.54	3	5.26	1	0.94	5	2.19
	Signs	13	20.00	5	8.77	13	12.26	31	13.60
	IDFG	6	9.23	6	10.53	20	18.87	32	14.04
	Word	17	26.15	15	26.32	19	17.92	51	22.37
	Guides	8	12.31	12	21.05	28	26.42	48	21.05
	News	11	16.92	9	15.79	10	9.43	30	13.16
	Fishing	8	12.31	5	8.77	13	12.26	26	11.40
	Other	1	1.54	2	3.51	2	1.89	5	2.19
	Total	65	100.00	57	100.00	106	100.00	228	100.00
Stocked	Yes	37	46.25	42	61.76	57	45.60	136	49.82
	No	43	53.75	26	38.24	68	54.40	137	50.18
	Total	80	100.00	68	100.00	125	100.00	273	100.00
Signs	Yes	41	49.40	23	33.33	59	46.09	123	43.93
	No	42	50.60	46	66.67	69	53.91	157	56.07
	Total	83	100.00	69	100.00	128	100.00	280	100.00
Mean	Correct	29	39.19	19	35.19	45	39.82	93	38.59
	Incorrect	45	60.81	35	64.81	68	60.18	148	61.41
	Total	74	100.00	54	100.00	113	100.00	241	100.00

Appendix D. (Continued).

		Stream							
		Warm Springs Creek		Trail Creek		Upper Wood River		Total	
Question	Response	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Source	Regs	0	0.00	2	10.00	0	0.00	2	1.85
	Signs	5	14.71	5	25.00	13	24.07	23	21.30
	IDFG	2	5.88	0	0.00	4	7.41	6	5.56
	Word	4	11.76	0	0.00	2	3.70	6	5.56
	Guides	1	2.94	3	15.00	4	7.41	8	7.41
	News	0	0.00	0	0.00	0	0.00	0	0.00
	Sense	22	64.71	10	50.00	31	57.41	63	58.33
	Other	0	0.00	0	0.00	0	0.00	0	0.00
	Total	34	100.00	20	100.00	54	100.00	108	100.00
Number	1	2	3.39	0	0.00	4	4.04	6	2.96
	2	0	0.00	1	2.22	2	2.02	3	1.48
	3	1	1.69	1	2.22	2	2.02	4	1.97
	4	2	3.39	1	2.22	9	9.09	12	5.91
	5	5	8.47	6	13.33	8	8.08	19	9.36
	6	5	8.47	0	0.00	12	12.12	17	8.37
	7	10	16.95	12	26.67	7	7.07	29	14.29
	8	16	27.12	11	24.44	16	16.16	43	21.18
	9	6	10.17	2	4.44	14	14.14	22	10.84
	10	12	20.34	11	24.44	25	25.25	48	23.65
	Total	59	100.00	45	100.00	99	100.00	203	100.00
Size	1	0	0.00	2	4.17	0	0.00	2	0.96
	2	0	0.00	0	0.00	0	0.00	0	0.00
	3	2	3.23	1	2.08	4	4.04	7	3.35
	4	2	3.23	3	6.25	1	1.01	6	2.87
	5	8	12.90	7	14.58	17	17.17	32	15.31
	6	5	8.06	2	4.17	7	7.07	14	6.70
	7	14	22.58	7	14.58	24	24.24	45	21.53
	8	23	37.10	13	27.08	25	25.25	61	29.19
	9	4	6.45	5	10.42	11	11.11	20	9.57
	10	4	6.45	8	16.67	10	10.10	22	10.53
	Total	62	100.00	48	100.00	99	100.00	209	100.00

Appendix E. Angler responses to questions concerning stocking, signing, and fishing quality for study streams in the Big Lost River drainage in 1994 (see Appendix A for questions).

		Stream									
		North Fork		Wildhorse Creek		West Fork		East Fork		Total	
Question	Resoonse	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Program	Yes	16	43.24	12	20.34	4	25.00	10	27.03	42	28.19
	No	21	56.76	47	79.66	12	75.00	27	72.97	107	71.00
	Total	37	100.00	59	100.00	16	100.00	37	100.00	149	100.00
Streams	Correct	9	50.00	8	57.14	3	60.00	6	46.15	26	52.00
	Incorrect	9	50.00	6	42.86	2	40.00	7	53.85	24	48.00
	Total	18	100.00	14	100.00	5	100.00	13	100.00	50	100.00
Sites	Yes	4	28.57	4	30.77	2	40.00	3	23.08	13	28.89
	No	10	71.43	9	69.23	3	60.00	10	76.92	32	71.11
	Total	14	100.00	13	100.00	5	100.00	13	100.00	45	100.00
List	Correct	4	40.00	6	46.15	2	40.00	3	37.50	15	41.67
	Incorrect	6	60.00	7	53.85	3	60.00	5	62.50	21	58.33
	Total	10	100.00	13	100.00	5	100.00	8	100.00	36	100.00
Source	Regs	1	7.69	0	0.00	0	0.00	0	0.00	1	2.70
	Signs	0	0.00	3	23.08	0	0.00	0	0.00	3	8.11
	IDFG	6	46.15	2	15.38	3	60.00	1	16.67	12	32.43
	Word	4	30.77	3	23.08	2	40.00	2	33.33	11	29.73
	Guides	0	0.00	0	0.00	0	0.00	1	16.67	1	2.70
	News	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	Fishing	0	0.00	3	23.08	0	0.00	0	0.00	3	8.11
	Other	2	15.38	2	15.38	0	0.00	2	33.33	6	16.22
	Total	13	100.00	13	100.00	5	100.00	6	100.00	37	100.00
Stocked	Yes	5	23.81	6	35.29	1	12.50	6	33.33	18	28.13
	No	16	76.19	11	64.70	7	87.50	12	66.67	46	71.88
	Total	21	100.00	17	100.00	8	100.00	18	100.00	64	100.00
Signs	Yes	12	32.43	11	18.97	2	12.50	7	20.00	32	21.92
	No	25	67.59	47	81.03	14	87.50	28	80.00	114	78.08
	Total	37	100.00	58	100.00	16	100.00	35	100.00	146	100.00
Mean	Correct	5	31.25	9	60.00	0	0.00	3	30.00	17	37.78
	Incorrect	11	68.75	6	40.00	4	100.00	7	70.00	28	62.22
	Total	16	100.00	15	100.00	4	100.00	10	100.00	45	100.00
Source	Regs	2	40.00	6	66.67	0	0.00	3	60.00	11	52.38
	Signs	0	0.00	0	0.00	2	100.00	2	40.00	4	19.05
	IDFG	1	20.00	1	11.11	0	0.00	0	0.00	2	9.52
	Word	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	Guides	2	40.00	0	0.00	0	0.00	0	0.00	2	9.52
	News	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	Sense	0	0.00	2	22.22	0	0.00	0	0.00	2	9.52
	Other	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	Total	5	100.00	9	100.00	2	100.00	5	100.00	21	100.00

Appendix E. (Continued).

Question	Resnonse	Stream: North Fnrk Number	North Fnrk Percent	Wildhorse Creek Number	Wildhorse Creek Percent	West Fork Number	West Fork Percent	East Fork Number	East Fork Percent	Total Number	Total Percent
Number	1	2	8.33	0	0.00	0	0.00	0	0.00	2	2.08
	2	1	4.17	0	0.00	0	0.00	0	0.00	1	1.04
	3	0	0.00	0	0.00	1	10.00	0	0.00	1	1.04
	4	1	4.17	2	4.55	0	0.00	1	5.56	4	4.17
	5	4	16.67	0	0.00	0	0.00	0	0.00	4	4.17
	6	1	4.17	1	2.27	0	0.00	0	0.00	2	2.08
	7	4	16.67	2	4.55	0	0.00	4	22.22	10	10.42
	8	4	16.67	2	4.55	3	30.00	6	33.33	15	15.63
	9	3	12.50	9	20.45	2	20.00	1	5.56	15	15.63
	10	4	16.67	28	63.64	4	40.00	6	33.33	42	43.75
	Total	24	100.00	44	100.00	10	100.00	18	100.00	96	100.00
Size	1	0	0.00	0	0.00	0	0.00	1	4.17	1	0.86
	2	0	0.00	0	0.00	0	0.00	1	4.17	1	0.86
	3	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	4	2	6.90	0	0.00	0	0.00	1	4.17	3	2.59
	5	3	10.34	6	12.24	0	0.00	0	0.00	9	7.76
	6	1	3.45	0	0.00	1	7.14	1	4.17	3	2.59
	7	5	17.24	3	6.12	3	21.43	5	20.83	16	13.79
	8	6	20.69	3	6.12	3	21.43	4	16.67	16	13.79
	9	5	17.24	5	10.20	2	14.29	3	12.5	15	12.93
	10	7	24.14	32	65.31	5	35.71	8	33.33	52	44.83
	Total	29	100.00	49	100.00	14	100.00	24	100.00	116	100.00

Submitted by:

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IDAHO DEPARTMENT OF FISH AND GAME

Steven M. Huffaker, Chief
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