

Upper North Fork Feather River Project (FERC License No. 2105)

Fish Species Composition and Abundance in Upper North Fork Feather River Project Streams and Reservoirs, 2000, 2001 and 2002



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CONTENTS

FISH SPECIES COMPOSITION AND ABUNDANCE IN UPPER NORTH FORK FEATHER RIVER PROJECT STREAMS AND RESERVOIRS, 2000, 2001, AND 2002

1.0 INTRODUCTION	1
1.1 Project Background.....	1
1.2 Objectives.....	3
2.0 METHODS	4
2.1 Stream Backpack Electrofishing and Snorkeling.....	5
2.1.1 Physical Data Collection.....	5
2.1.2 Fish Data Collection.....	5
2.1.3 Data Analysis	10
2.2 Reservoir Gill Netting.....	11
2.2.1 Physical Data Collection.....	11
2.3 Reservoir Boat Electrofishing.....	13
2.3.1 Physical/Fish Data Collection.....	13
3.0 SPECIES COMPOSTION AND ABUNDANCE RESULTS	13
3.1 Physical Data Collection.....	13
3.1.1 Water Quality and Physical Habitat Summary	13
3.2 Stream Backpack Electrofishing and Snorkel Surveys.....	18
3.2.1 Stream Electrofishing Study Sites: Habitat.....	18
3.2.2 Stream Electrofishing Site – Fish Data	26
3.2.3 Snorkel Survey Results	71
4.0 SPECIES POPULATION ESTIMATES	77
4.1 Seneca Reach Population Estimates	80
4.1.1 Rainbow Trout Population and Age Estimates	90
4.1.2 Brown Trout Population and Age Estimates.....	94
4.2 Belden Reach Population Estimates	102

4.2.1 Rainbow Trout Population and Age Estimates	104
4.3 Mainstem Population Estimates	107
4.3.1 Rainbow Trout Population and Age Estimates	107
4.4 Upper Butt Creek Population Estimates	109
4.4.1 Rainbow Trout Population and Age Estimates	109
4.4.2 Brown Trout Population and Age Estimates.....	110
4.5 Lower Butt Creek Population Estimates	110
4.5.1 Rainbow Trout Population and Age Estimates	112
4.6 Mosquito Creek Population Estimates	112
4.6.1 Rainbow Trout Population and Age Estimates	112
5.0 AGE AND GROWTH	113
5.1 Rainbow Trout Age and Growth.....	113
5.1.1 Rainbow Trout Condition Factor	121
5.2 Brown Trout Age and Growth	122
5.2.1 Brown Trout Condition Factor.....	125
5.3 Other Species Age and Growth.....	127
5.3.1 Sacramento Sucker and Sculpin Species.....	127
5.3.2 Condition Factor.....	134
6.0 RESERVOIR STUDIES	135
6.1 Gillnet Surveys.....	135
6.2 Reservoir Boat Electrofishing.....	135
7.0 DISCUSSION	142
7.1 Species Summaries by Reach	142
7.2 Reservoir Species Summaries	146
7.3 Comparisons with other California Trout Streams	148
8.0 REFERENCES.....	152

LIST OF TABLES

Table 1 –	Water Quality and Physical Characteristics for UNFFR Project Electrofishing Sites, Fall 2000.	14
Table 2 –	Water Quality and Physical Characteristics for UNFFR Project Electrofishing Sites, Fall 2001.	15
Table 3 –	Water Quality and Physical Characteristics for UNFFR Project Electrofishing Sites, Fall 2002.	16
Table 4 –	Physical Habitat Summary Table for the UNFFR Project, Fall 2000, 2001, and 2002.	17
Table 5 –	Lake Almanor Gill Net Site Summaries, UNFFR Project, August 8-11, 2001.	19
Table 6 –	Fish Species Collected at the UNFFR Project Electrofishing Sites, Fall 2000.	27
Table 7 –	Biomass Estimates by Species at UNFFR Project Electrofishing Sites, Fall 2000.	29
Table 8 –	Fish Species Collected at UNFFR Project Electrofishing Sites, Fall 2001.	32
Table 9 –	Biomass Estimates by Species at UNFFR Project Electrofishing Sites, Fall 2001.	34
Table 10 –	Fish Species Collected at the UNFFR Project Electrofishing Sites, Fall 2002.	36
Table 11 –	Biomass Estimates by Species at UNFFR Project Electrofishing Sites, Fall 2002.	38
Table 12 –	Observational Data Summary for the UNFFR Project Snorkel Survey Sites, Fall 2000.	73
Table 13 –	Length Frequency by Species and Site for the UNFFR Project Snorkel Surveys Sites, Fall 2000.	74
Table 14 –	Observational Data Summary for the UNFFR Project Snorkel Survey Sites, Fall 2001.	75
Table 15 –	Length Frequency by Species and Site for the UNFFR Project Snorkel Survey Sites, Fall 2001.	76
Table 16 –	Observational Data Summary for the UNFFR Project Snorkel Survey Sites, Fall 2002.	78

Table 17 –	Length Frequency by Species and Site for the UNFFR Project Snorkel Survey Sites, Fall 2002.	79
Table 18 –	Total Fish Population Estimates by Species for the UNFFR Project Electrofishing Sites, Fall 2000.	81
Table 19 –	Total Fish Population Estimates by Species at the UNFFR Project Electrofishing Sites, Fall 2001.	82
Table 20 –	Total Fish Population Estimates by Species at the UNFFR Project Electrofishing Sites, Fall 2002.	83
Table 21 –	Rainbow Trout Population Age Structure for the UNFFR Project Electrofishing Sites, Fall 2000.	91
Table 22 –	Rainbow Trout Population Age Structure for the UNFFR Project Electrofishing Sites, Fall 2001.	92
Table 23 –	Rainbow Trout Population Age Structure for the UNFFR Project Electrofishing Sites, Fall 2002.	93
Table 24 –	Age Specific Rainbow Trout Population Estimates for the UNFFR Project Electrofishing Sites, Fall 2000, 2001, and 2002.	95
Table 25 –	Brown Trout Population Age Structure for the UNFFR Project Electrofishing Sites, Fall 2000.	98
Table 26 –	Brown Trout Population Age Structure for the UNFFR Project Electrofishing Sites, Fall 2001.	99
Table 27 –	Brown Trout Population Age Structure for the UNFFR Project Electrofishing Sites, Fall 2002.	100
Table 28 –	Age-Specific Brown Trout Population Estimates for the UNFFR Project Electrofishing Sites, Fall 2000, 2001, and 2002.	101
Table 29 –	Sacramento Sucker Population Summary Statistics for the UNFFR Project Electrofishing Sites, Fall 2000, 2001, and 2002.	128
Table 30 –	Sculpin Population Summary Statistics for the UNFFR Project Electrofishing Sites, Fall 2000, 2001, and 2002.	129
Table 31 –	Catch Summary for 6 Lake Almanor Gill Netting Sites, UNFFR Project, August 8 to 10, 2000.	136

Table 32 –	Catch Summary for 29 Boat Electrofishing Sites, Lake Almanor, UNFFR Project, August 1 to 3, 2000.....	136
Table 33 –	Catch Summary for 3 Boat Electrofishing Sites, Belden Forebay, UNFFR Project, August 7, 2000.....	136
Table 34 –	Adult Trout Population Estimates (Fish/Mile) for 2000, 2001, and 2002 at UNFFR Project Electrofishing Sites.	149

LIST OF FIGURES

Figure 1 –	Vicinity Map with Study Reach Locations.	2
Figure 2 –	Seneca Reach – Site Locations.	6
Figure 3 –	Belden Reach and Belden Forebay – Site Locations.	7
Figure 4 –	Upper Butt Creek and Lower Butt Creek – Site Locations.....	8
Figure 5 –	Lake Almanor – Site Locations.....	12
Figure 6 –	Total Species Composition and Relative Abundance for All Sites, NFFR, Fall 2000.	28
Figure 7 –	Total Species Biomass for All Sites, NFFR, Fall 2000.....	28
Figure 8 –	Total Species Composition and Relative Abundance for All Sites, NFFR, Fall 2001	33
Figure 9 –	Total Species Biomass for All Sites, NFFR, Fall 2001.....	33
Figure 10 –	Total Species Composition and Relative Abundance for All Sites, NFFR, Fall 2002	37
Figure 11 –	Total Species Biomass for All Sites, NFFR, Fall 2002.....	37
Figure 12 –	Species Composition and Relative Abundance for Seneca Reach, NFFR, Fall 2000	41
Figure 13 –	Species Biomass for Seneca Reach, NFFR, Fall 2000.....	41
Figure 14 –	Species Composition and Relative Abundance for Seneca Reach, NFFR, Fall 2001.	41
Figure 15 –	Species Biomass for Seneca Reach, NFFR, Fall 2001.....	41
Figure 16 –	Species Composition and Relative Abundance for Seneca Reach, NFFR, Fall 2002.	41

Figure 17 –	Species Biomass for Seneca Reach, NFFR, Fall 2002.....	41
Figure 18 –	Species Composition and Relative Abundance for Belden Reach, NFFR, Fall 2000.	53
Figure 19 –	Species Biomass for Belden Reach, NFFR, Fall 2000.....	53
Figure 20 –	Species Composition and Relative Abundance for Belden Reach, NFFR, Fall 2001.	53
Figure 21 –	Species Biomass for Belden Reach, NFFR, Fall 2001.....	53
Figure 22 –	Species Composition and Relative Abundance for Belden Reach, NFFR, Fall 2002.	53
Figure 23 –	Species Biomass for Belden Reach, NFFR, Fall 2002.....	53
Figure 24 –	Species Composition and Relative Abundance for Mainstem (Site 112), NFFR, Fall 2000.	63
Figure 25 –	Species Biomass for Mainstem (Site 112), NFFR, Fall 2000.....	63
Figure 26 –	Species Composition and Relative Abundance for Mainstem (Site 112), NFFR, Fall 2001.	63
Figure 27 –	Species Biomass for Mainstem (Site 112), NFFR, Fall 2001.....	63
Figure 28 –	Species Composition and Relative Abundance for Mainstem (Site 112), NFFR, Fall 2002.	63
Figure 29 –	Species Biomass for Mainstem (Site 112), NFFR, Fall 2002.....	63
Figure 30 –	Species Composition and Relative Abundance for Upper Butt Creek, NFFR, Fall 2000.	65
Figure 31 –	Species Biomass for Upper Butt Creek, NFFR, Fall 2000.	65
Figure 32 –	Species Composition and Relative Abundance for Upper Butt Creek, NFFR, Fall 2001.	65
Figure 33 –	Species Biomass for Upper Butt Creek, NFFR, Fall 2001.	65
Figure 34 –	Species Composition and Relative Abundance for Upper Butt Creek, NFFR, Fall 2002.	65
Figure 35 –	Species Biomass for Upper Butt Creek, NFFR, Fall 2002.	65
Figure 36 –	Species Composition and Relative Abundance for Lower Butt Creek, NFFR, Fall 2000.	68
Figure 37 –	Species Biomass for Lower Butt Creek, NFFR, Fall 2000.....	68

Figure 38 –	Species Composition and Relative Abundance for Lower Butt Creek, NFFR, Fall 2001.	68
Figure 39 –	Species Biomass for Lower Butt Creek, NFFR, Fall 2001.	68
Figure 40 –	Species Composition and Relative Abundance for Lower Butt Creek, NFFR, Fall 2002.	68
Figure 41 –	Species Biomass for Lower Butt Creek, NFFR, Fall 2002.	68
Figure 42 –	Species Composition and Relative Abundance for Mosquito Creek, NFFR, Fall 2001.	70
Figure 43 –	Species Biomass for Mosquito Creek, NFFR, Fall 2001.	70
Figure 44 –	Species Composition and Relative Abundance for Mosquito Creek, NFFR, Fall 2002.	70
Figure 45 –	Species Biomass for Mosquito Creek, NFFR, Fall 2002.	70
Figure 46 –	Rainbow Trout Total Population Estimates, Seneca Reach Sites, Fall 2000, 2001, and 2002.	84
Figure 47 –	Rainbow Trout Total Population Estimates, Belden Reach Sites, Fall 2000, 2001, and 2002.	84
Figure 48 –	Rainbow Trout Population Estimates, Mainstem, Upper Butt Creek, Lower Butt Creek, and Mosquito Creek Sites, Fall 2000, 2001, and 2002.	84
Figure 49 –	Brown Trout Total Population Estimates, Seneca Reach, Fall 2000, 2001, and 2002.	85
Figure 50 –	Brown Trout Total Population Estimates, Mainstem, Upper Butt Creek, Lower Butt Creek, and Mosquito Creek Sites, Fall 2000, 2001, and 2002.	85
Figure 51 –	Sacramento Sucker Total Population Estimates, Seneca Reach Sites, Fall 2000, 2001, and 2002.	86
Figure 52 –	Sacramento Sucker Total Population Estimates, Belden Reach Sites, Fall 2000, 2001, and 2002.	86
Figure 53 –	Sacramento Sucker Total Population Estimates, Mainstem, Upper Butt Creek, Lower Butt Creek, and Mosquito Creek Sites, Fall 2000, 2001, and 2002.	86
Figure 54 –	Sculpin Total Population Estimates, Seneca Reach Sites, Fall 2000, 2001, and 2002.	87

Figure 55 –	Sculpin Total Population Estimates, Belden Reach Sites, Fall 2000, 2001, and 2002.....	87
Figure 56 –	Sculpin Total Population Estimates, Mainstem, Upper Butt Creek, Lower Butt Creek, and Mosquito Creek Sites, Fall 2000, 2001, and 2002.....	87
Figure 57 –	Sacramento Pikeminnow Total Population Estimates, Belden Reach Sites, Fall 2000, 2001, and 2002.....	88
Figure 58 –	Sacramento Pikeminnow Total Population Estimates, Mainstem, Upper Butt Creek, Lower Butt Creek, and Mosquito Creek Sites, Fall 2000, 2001, and 2002.....	88
Figure 59 –	Rainbow Trout Population Estimates, Total and Age Class Specific, for Seneca Reach Sites, Fall 2000, 2001, and 2002.....	96
Figure 60 –	Brown Trout Population Estimates, Total and Age Class Specific, for Seneca Reach Sites, Fall 2000, 2001, and 2002.....	97
Figure 61 –	Rainbow Trout Population Estimates, Total and Age Class Specific, for Belden Reach Sites, Fall 2000, 2001, and 2002.....	106
Figure 62 –	Rainbow Trout Population Estimates, Total and Age Class Specific, for Mainstem, Upper Butt Creek, Lower Butt Creek, and Mosquito Creek Sites, Fall 2000, 2001, and 2002.....	108
Figure 63 –	Brown Trout Population Estimates, Total and Age Class Specific, for Mainstem, Upper Butt Creek, Lower Butt Creek, and Mosquito Creek Sites, Fall 2000, 2001, and 2002.....	111
Figure 64 –	Rainbow Trout Mean Lengths by Age for Seneca Reach Sites, NFFR, Fall 2000.....	114
Figure 65 –	Rainbow Trout Mean Lengths by Age for Seneca Reach Sites, NFFR, Fall 2001.....	114
Figure 66 –	Rainbow Trout Mean Lengths by Age for Seneca Reach Sites, NFFR, Fall 2002.....	114
Figure 67 –	Rainbow Trout Length Frequency Histogram for Seneca Reach, NFFR, Fall 2000, 2001, and 2002.....	115
Figure 68 –	Rainbow Trout Length Frequency Histogram for Belden Reach, NFFR, Fall 2000, 2001, and 2002.....	115

Figure 69 –	Rainbow Trout Length Frequency Histogram for Mainstem, NFFR, Fall 2000, 2001, and 2002.....	115
Figure 70 –	Rainbow Trout Mean Length by Age for Belden Reach Sites, NFFR, Fall 2000.....	117
Figure 71 –	Rainbow Trout Mean Length by Age for Belden Reach Sites, NFFR, Fall 2001.....	117
Figure 72 –	Rainbow Trout Mean Length by Age for Belden Reach Sites, NFFR, Fall 2002.....	117
Figure 73 –	Rainbow Trout Length Frequency Histogram for Upper Butt Creek, NFFR, Fall 2000, 2001, 2002.	119
Figure 74 –	Rainbow Trout Length Frequency Histogram for Lower Butt Creek, NFFR, Fall 2000, 2001, 2002.	119
Figure 75 –	Rainbow Trout Length Frequency Histogram for Mosquito Creek, NFFR, Fall 2000, 2001, 2002.	119
Figure 76 –	Rainbow Trout Mean Lengths by Age for Mainstem, NFFR, Fall 2000, 2001, and 2002.....	120
Figure 77 –	Rainbow Trout Mean Lengths by Age for Upper Butt Creek, NFFR, Fall 2000, 2001, and 2002.....	120
Figure 78 –	Rainbow Trout Mean Lengths by Age for Lower Butt Creek, NFFR, Fall 2000, 2001, and 2002.....	120
Figure 79 –	Rainbow Trout Mean Lengths by Age for Mosquito Creek, NFFR, Fall 2000, 2001, and 2002.....	120
Figure 80 –	Brown Trout Mean Lengths by Age for Seneca Reach Sites, NFFR, Fall 2000.....	123
Figure 81 –	Brown Trout Mean Lengths by Age for Seneca Reach Sites, NFFR, Fall 2001.....	123
Figure 82 –	Brown Trout Mean Lengths by Age for Seneca Reach Sites, NFFR, Fall 2002.....	123
Figure 83 –	Brown Trout Length Frequency Histogram for Seneca Reach, NFFR, Fall 2000, 2001, and 2002.....	124

Figure 84 –	Brown Trout Length Frequency Histogram for Upper Butt Creek, NFFR, Fall 2000, 2001, and 2002.....	124
Figure 85 –	Brown Trout Mean Length by Age for Upper Butt Creek, NFFR, Fall 2000, 2001, and 2002.	126
Figure 86 –	Sacramento Sucker Mean Lengths for Seneca Reach Sites, NFFR, Fall 2000, 2001, and 2002.	130
Figure 87 –	Sacramento Sucker Mean Lengths for Belden Reach Sites, NFFR, Fall 2000, 2001, and 2002.	130
Figure 88 –	Sacramento Sucker Length Frequency Histogram for Seneca Reach, NFFR, Fall 2000, 2001, and 2002.....	131
Figure 89 –	Sacramento Sucker Length Frequency Histogram for Belden Reach, NFFR, Fall 2000, 2001, and 2002.....	131
Figure 90 –	Sacramento Sucker Length Frequency Histogram for Upper Butt Creek, NFFR, Fall 2000, 2001, and 2002.....	131
Figure 91 –	Sacramento Sucker Mean Lengths for Mainstem, NFFR, Fall 2000, 2001, and 2002.....	132
Figure 92 –	Sacramento Sucker Mean Lengths for Upper Butt Creek, NFFR, Fall 2000, 2001, and 2002.....	132
Figure 93 –	Percent of Total Catch by Site, Lake Almanor Gill Netting, August 2000.	137
Figure 94 –	Total Catch, by Species, Lake Almanor Gill Netting, August 2000.....	137
Figure 95 –	Length Frequencies of all Species, all Sites Combined, Lake Almanor Gill net Survey, August 8-10, 2000.....	138
Figure 96 –	Total Catch, by Species for Lake Almanor Boat Electrofishing, August 2000.....	140
Figure 97 –	Rainbow Trout Length Frequency Histogram for Lake Almanor, August 2000.....	140
Figure 98 –	Smallmouth Bass Length Frequency Histogram for Lake Almanor, August 2000.....	140
Figure 99 –	Largemouth Bass Length Frequency Histogram for Lake Almanor, August 2000.....	140

Figure 100 – Total Catch, by Species for Belden Forebay Boat Electrofishing, August 2000.....	141
Figure 101 – Rainbow Trout Length Frequency Histogram for Belden Forebay, August 2000.....	141
Figure 102 – Smallmouth Bass Length Frequency Histogram for Belden Forebay, August 2000.....	141
Figure 103 – Sacramento Sucker Trout Length Frequency Histogram for Belden Forebay, August 2000.	141

LIST OF APPENDICES

Appendix A – Catch Summaries

Table A-1 – Stream Electrofishing Catch Summary, UNFFR Project, Fall 2000.

Table A-2 – Stream Electrofishing Catch Summary, UNFFR Project, Fall 2001.

Table A-3 – First Pass Electrofishing Catch Summary Comparing Data From Canyon Dam Weir-Upstream With Other Seneca Reach Sampling Sites, Fall 2001.

Table A-4 – Stream Electrofishing Catch Summary, UNFFR Project, Fall 2002.

Appendix B – Biomass Histograms

Figure B-1 – Rainbow Trout Biomass – Seneca Reach, UNFFR Project, Fall 2000, 2001, and 2002.

Figure B-2 – Rainbow Trout Biomass – Belden Reach, UNFFR Project, Fall 2000, 2001, and 2002.

Figure B-3 – Rainbow Trout Biomass – Mainstem, Upper and Lower Butt Creek, and Mosquito Creek, UNFFR Project Fall 2000, 2001, and 2002.

Figure B-4 – Brown Trout Biomass – Seneca Reach, UNFFR Project, Fall 2000, 2001, and 2002.

Figure B-5 – Brown Trout Biomass – Mainstem, Lower and Upper Butt Creek, and Mosquito Creek, UNFFR Project, Fall 2000, 2001, and 2002.

Appendix C – Electrofishing and Snorkel Sites by Year, UNFFR Project, Fall 2000, 2001, and 2002.

Appendix D – Catch Summary from Lake Almanor Gill Netting Sites, August 8-10, 2000.

Appendix E – Site-Specific Gill Netting Results, August 8-10, 2000.

- Figure E-1 – Catch Composition at Bailey Creek Site, Lake Almanor Gill Netting, August 2000.
- Figure E-2 – Catch Composition at Goose Island Site, Lake Almanor Gill Netting, August 2000.
- Figure E-3 – Catch Composition at SE Shore Site, Lake Almanor Gill Netting, August 2000.
- Figure E-4 – Catch Composition at Canyon Dam Site, Lake Almanor Gill Netting, August 2000.
- Figure E-5 – Catch Composition at Hamilton Branch Site, Lake Almanor Gill Netting, August 2000.
- Figure E-6 – Catch Composition at Prattville Intake Site, Lake Almanor Gill Netting, August 2000.
- Figure E-7 – Smallmouth Bass Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-8 – Sacramento Pikeminnow Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-9 – Brown Bullhead Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-10 – Sacramento Sucker Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-11 – Rainbow Trout Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

Figure E-12 – Sacramento Perch Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

Figure E-13 – Brown Trout Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

Figure E-14 – Carp Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

Appendix F – Historical Catch Data

Table F-1 – Seneca and Belden Reaches – Historical CDFG Station Locations.

Table F-2 – Seneca and Belden Reaches – Historical CDFG Fish Data.

Table F-3 – Fish Species Reported to Occur in the Upper North Fork Feather River Project Area.

Table F-4 – Fish Species Reported to Occur in Lake Almanor.

Table F-5 – Fish Species Reported to Occur in the Butt Valley Reservoir.

1.0 INTRODUCTION

The Upper North Fork Feather River (UNFFR) Project, Federal Energy Regulatory Commission (FERC) License No. 2105 is located in Plumas County on lands owned by Pacific Gas and Electric Company (PG&E) and administrated by the U.S. Forest Service (USFS). The UNFFR Project is operated by PG&E to provide hydroelectric power. ECORP Consulting, Inc. (ECORP) was contracted, beginning in July 2000, to conduct fish species composition and abundance surveys in UNFFR project streams and reservoirs. These studies were conducted to satisfy requirements of the FERC, U.S. Fish and Wildlife Service (USFWS), USFS, and California Department of Fish and Game (CDFG), pursuant to project relicensing.

1.1 Project Background

The UNFFR Project consists of three dams and reservoirs (Lake Almanor, Butt Valley Reservoir, and Belden Forebay) and five powerhouses (Butt Valley, Caribou 1, Caribou 2, Oak Flat, and Belden Powerhouses) all within Plumas County, California (Figure 1). Conveyance systems (tunnel, pipeline and penstock) connect the various project components. Lake Almanor is the largest and upper most FERC licensed project reservoir (1,142,000 ac-ft at an elevation of 4,494 ft, PG&E datum). Two discharge outlets located at Prattville and Canyon Dam provide for generation and bypass flow releases. The Prattville outlet (or inlet to hydroelectric powerhouse) provides discharge of up to 2100 cubic feet per second (cfs) for electrical generation through the Butt Valley Powerhouse into Butt Valley Reservoir. Canyon Dam outlet provides for a year-round release of 35 cfs into the Seneca Reach of the North Fork Feather River (NFFR). Additional accretion flows of about 40 cfs result in a flow of about 75 cfs at its lower end in the summer and fall period. Butt Valley Reservoir (approximate elevation 4,140 ft) has two outlet towers, which provide flow to the Caribou 1 (up to 1,070 cfs) and Caribou 2 (up to 1,480 cfs) powerhouses. There is no downstream release to Butt Creek from this reservoir. However, dam leakage and springs collectively make-up the approximately 15 to 20 cfs of flow in Lower Butt Creek (as measured at the confluence with the NFFR). Belden Forebay receives discharge from Caribou 1 and Caribou 2 powerhouses, and inflow from the NFFR (Seneca Reach). The forebay

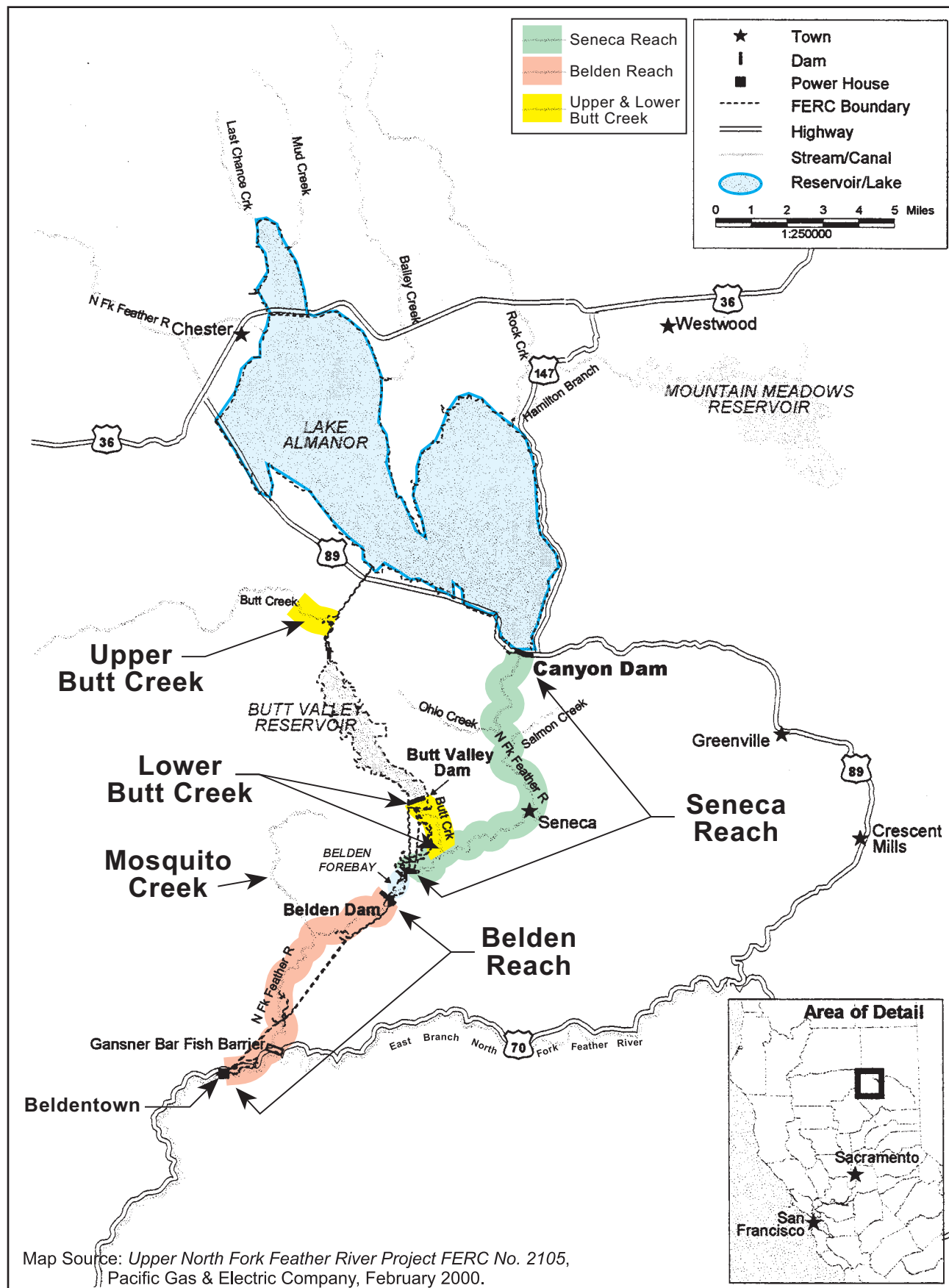


FIGURE 1. Vicinity Map with Study Reach Locations.

contains an intake that provides flows to the Belden Powerhouse (up to 2,410 cfs). In addition, a low level outlet provides a 140 cfs release (from the last Saturday in April through Labor Day; 60 cfs the remainder of the year) through Oak Flat Powerhouse into the Belden Reach of the NFFR.

In addition to project reservoirs, there are two main river reaches and two main tributaries within the project area. The upper 11.0-mile reach of the NFFR (downstream from Lake Almanor/Canyon Dam) is called the Seneca Reach, which extends downstream to the point where discharge through Caribou 1 and Caribou 2 powerhouses enter Belden Forebay. Upper Butt Creek, which provides important spawning and rearing habitat, is a tributary to Butt Valley Reservoir and its flows are unaffected by project operation. Lower Butt Creek is about 1.8 miles long and enters the NFFR in the Seneca Reach about 1.4 miles upstream of the forebay. The Belden Reach extends 8.8 miles downstream from Belden Forebay Dam to the Belden Powerhouse, which discharges flow diverted from Belden Forebay to Yellow Creek at the confluence with the mainstem NFFR. Mosquito Creek, an important spawning and rearing tributary, enters the NFFR in the Belden Reach about 3.0 miles downstream of the forebay.

1.2 Objectives

The specific objectives of the fish species composition and abundance studies in project streams (i.e., Seneca Reach, Belden Reach, Upper Butt Creek, Lower Butt Creek, and Mosquito Creek) were to:

- determine the composition and relative abundance of fish species within, and among project streams;
- estimate the population of various fish species at selected stream sites; and
- collect length, biomass, age, and growth information on fish present in project streams.

The specific objectives of the fish species composition and abundance studies in project reservoirs (i.e., Lake Almanor, Butt Valley Reservoir and Belden Forebay) were to:

- determine the composition and relative abundance of fish species within project reservoirs, and

- collect length information on fish present in project reservoirs.

2.0 METHODS

All river miles listed in this report are based on a system developed by the Environmental Protection Agency (<http://www.streamnet.org/pnwr/pnwrhome.html>). This system assigns a unique segment number by river drainage to each river length between major tributaries, for example, the mainstem NFFR reach between Yellow Creek and the East Branch North Fork Feather River (EBNFFR) has been designated as Segment 12 and each segment is then further subdivided into miles, beginning at 0.0 miles at the downstream confluence and proceeding upstream in 1 mile increments to the next tributary.

The NFFR in the project area consists of two main river segments: Segment 12, the 1.5 mile section of the mainstem NFFR between Yellow Creek and its confluence with the EBNFFR; and Segment 13, the 19.1 mile section of the NFFR between the confluence with the EBNFFR and Canyon Dam. Three additional tributary segments are identified: Yellow Creek (Segment 25); Mosquito Creek (Segment 43); and Butt Creek (Segment 504). To help minimize redundancy when discussing the location of multiple project features or sampling sites within the same river reach or segment, the segment number generally will be referenced the first time in any discussion, with all further references by river mile (RM).

Methods used for fish sampling included stream backpack electrofishing and snorkeling, lake gill netting, and lake boat electrofishing and are described in the following section.

2.1 Stream Backpack Electrofishing and Snorkeling

2.1.1 Physical Data Collection

Stream flow data were collected using standard field methods (USGS transect methodology) at each stream electrofishing site. Water quality data collected included temperature, dissolved oxygen, and conductivity. Dissolved oxygen was determined with a YSI Model 57 DO meter, and conductivity with a YSI Model 33 S-C-T meter. Instantaneous water and air temperatures were also measured using pocket thermometers for comparison against meter readings. All instruments were calibrated before each sampling event according to manufacturer's instructions.

Measurements of several physical and chemical factors were collected at each sampling site to characterize fish habitat including substrate composition, percent instream cover, canopy cover, and habitat composition (percent of area represented by pools, riffles, and runs). Site characteristics were also recorded at the time of the sampling such as stream width, site length and average depth. Stream widths, with associated water depths, were measured along transects at 10-m intervals throughout each station.

2.1.2 Fish Data Collection

Fish population data were collected at 14 electrofishing sites in 2000, 16 sites in 2001, and 15 sites in 2002 (Figures 2, 3, and 4). One site sampled only in 2001, site 116 *Canyon Dam Weir-Upstream*, was sampled as a single pass station using a single backpack electroshocker. Data collection occurred between September 6 and September 29 in 2000, between September 11 and October 3 in 2001, and September 16 to October 9, 2002. Stream fish sampling was conducted using two methodologies: backpack electrofishing (multi-pass depletion method, with the exception of site 116 *Canyon Dam Weir-Upstream*) and direct observation through snorkel surveys. Electrofishing was the primary collection technique. Direct observation techniques were used to augment the electrofishing data for pools and other habitats that could not be quantitatively sampled using electrofishing gear.

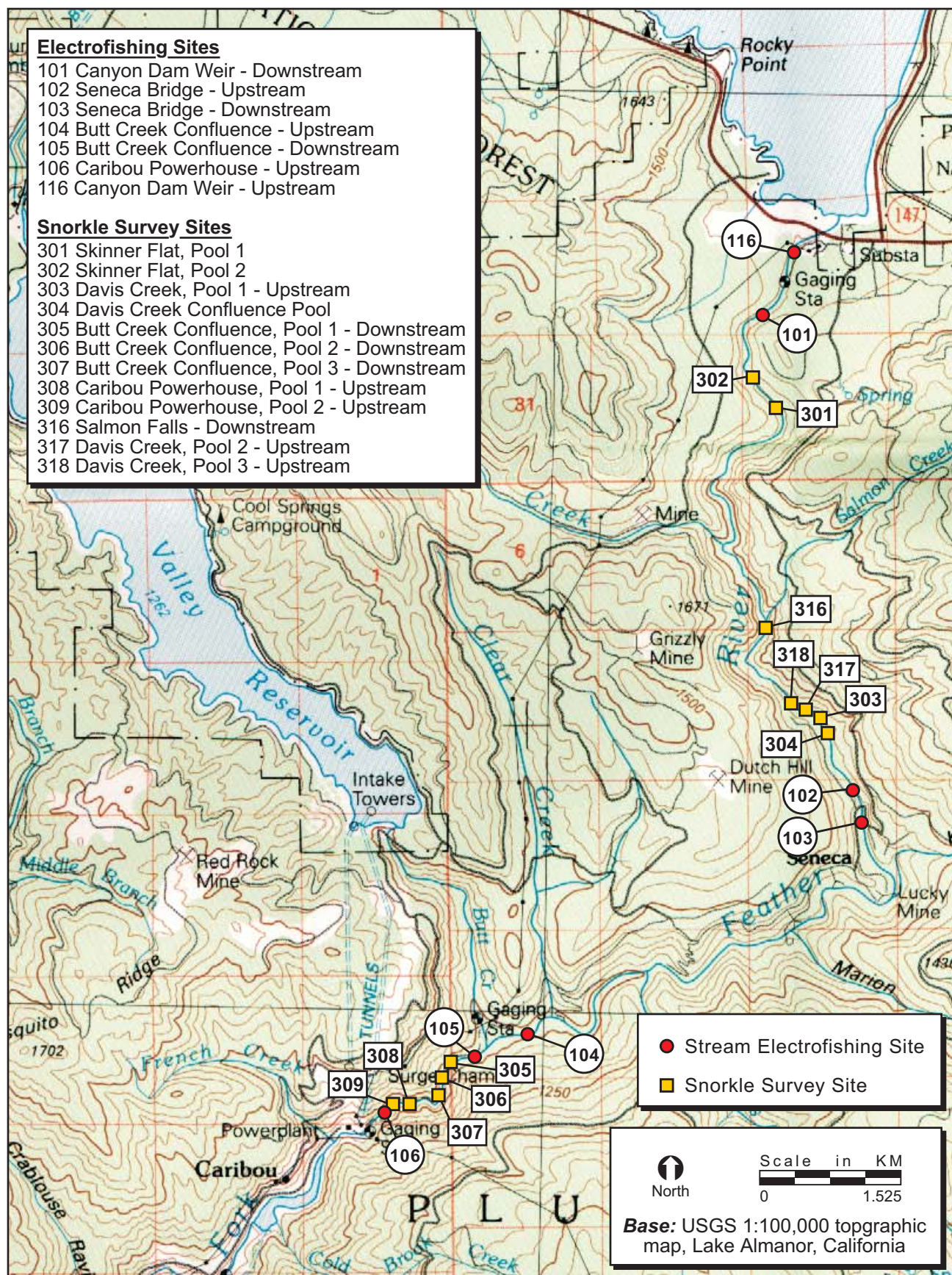


FIGURE 2. Seneca Reach - Site Locations.

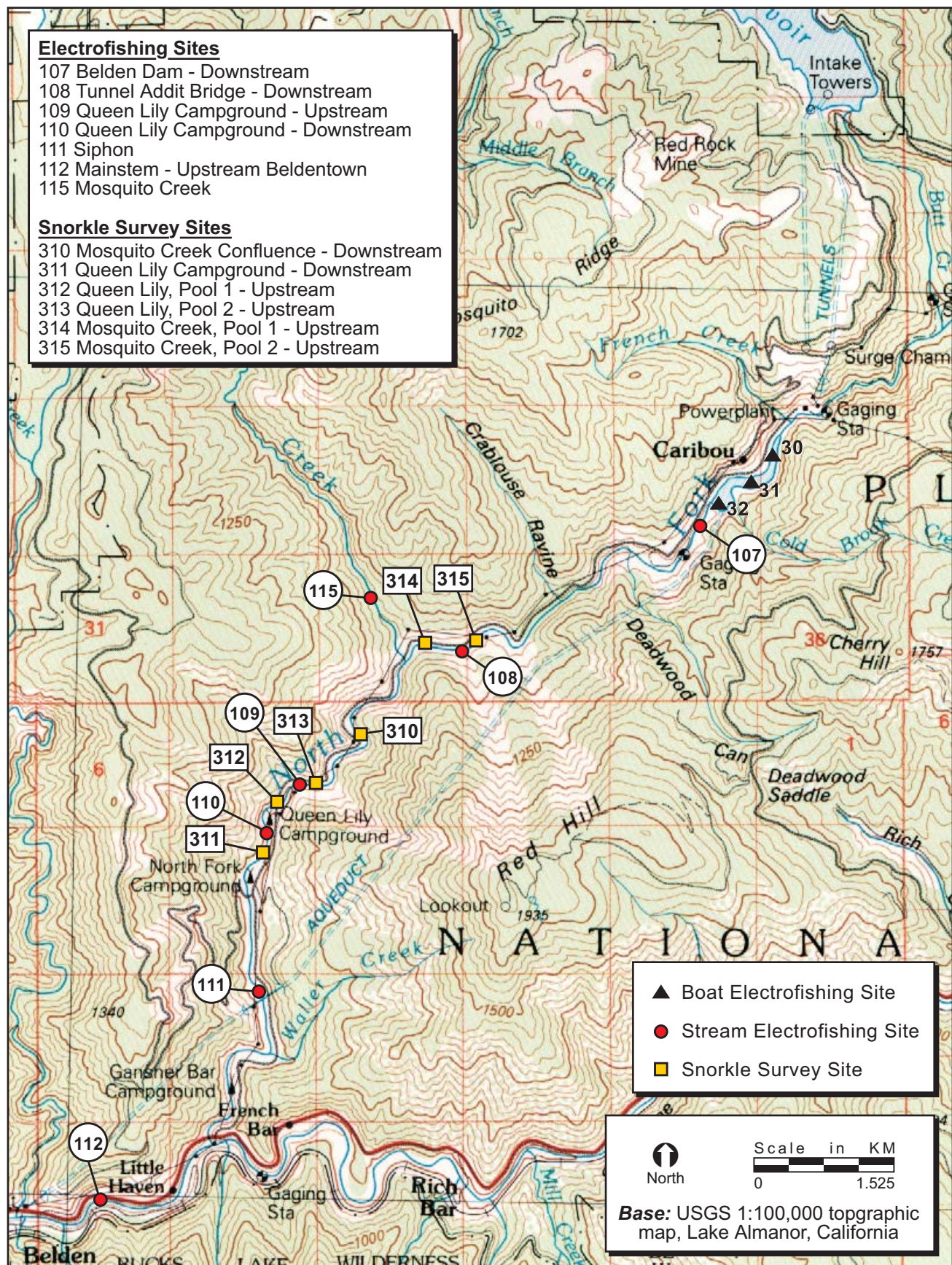


FIGURE 3. Belden Reach and Belden Forebay - Site Locations.

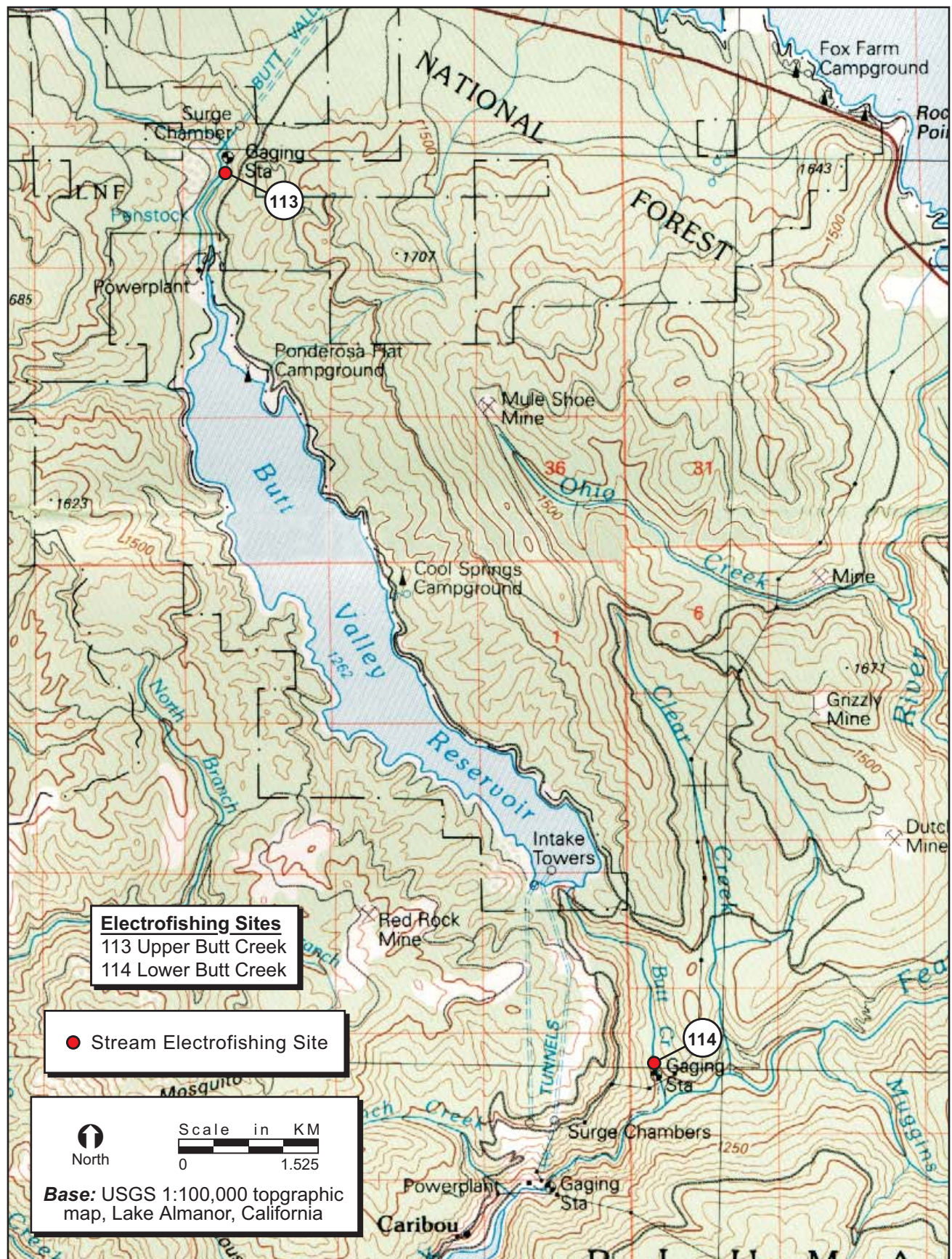


FIGURE 4. Upper Butt Creek and Lower Butt Creek - Site Locations.

All electrofishing stations were sited to begin and end at natural habitat unit boundaries. Most electrofishing stations were 100 meters in length. However, the river morphology sometimes prevented a suitable end point at precisely 100 meters, resulting in some stations being greater or less than 100 meters. Whenever possible, electrofishing stations were located in historic CDFG sampling areas. Block nets were placed at the beginning and end of each station to prevent fish movement into or out of the study site during sampling. Net locations were flagged with surveyor's tape on both sides of the stream for site identification purposes.

Three electroshockers (Smith-Root 12-B backpack electroshockers) were used simultaneously in pulsed DC mode to increase capture efficiency. Fish were collected during multiple (at least three) passes throughout each study site. An exception to this occurred in 2000, when 2 passes were conducted at the mainstem site because very few trout were present. An additional fourth pass was sometimes necessary to minimize population estimation error. The objective was to estimate population size by species and lifestage, and to minimize the standard error of measurements. After each pass, collected fish were processed and placed in a live car outside the electrofishing station. All collected fish were returned to the stream and redistributed throughout the sampled area after fish collected during the final pass were processed.

The fork length of each fish was measured to the nearest millimeter. During the first year of sampling, the weight of each fish was estimated using the volumetric method. This method involved placing a fish in a graduated cylinder with a known volume of water. One ml of water displaced was assumed to equal one gram of fish biomass. When large numbers of small, non-salmonid fish were captured, they were volumetrically 'weighed' in batches. During the second sampling year, each fish (non-salmonids included) was weighed (to 0.1 gram) with a digital scale.

Fish scale samples were collected during all three years to characterize the annual age structure of the trout population of each site. Scales were removed from the right side of each fish between the dorsal fin and the lateral line. Scales were placed in individual envelopes labeled with species, length, weight, capture date, location, and an identification number.

Direct observation (snorkel survey) of fish was conducted during all three years in selected locations for each reach where electrofishing was unsuitable (e.g., deep pools). Divers identified and counted all observed fish in selected pools. Two divers proceeded in an upstream direction and counted all fish passing beneath them in their respective lanes. All pools were snorkeled twice during each sampling effort. To avoid double counts, only fish passing in a downstream direction were recorded; fish swimming back upstream were not counted after passing the divers. Divers carried plastic slates and ordinary lead pencils to record the species and length class of each fish observed. Following each dive, counts from the dive slates were summed for total fish abundance and size class indexing.

2.1.3 Data Analysis

Fish data were entered into a spreadsheet upon completion of data collection efforts for each of the three field seasons. Error checking procedures were performed as well as data exploration analysis (e.g., SPSS Crosstabs, minimum/maximum values, frequency tables and length/weight plots). Population estimates were computed by species and for each sampling site using maximum likelihood equations (USFS MICROFISH program; Van-Deventner and Platts 1986). Length-frequency histograms were generated and evaluated for determining length range at each age. These histograms were compared against fish scale aging results to more accurately describe length ranges for age 0+, age 1+, and age 2+ (and older) trout. Population estimates were then calculated for age 0+, age 1+, and age 2+ (and older) rainbow trout. The Fulton condition factor of each fish was also calculated, using the following formula (Murphy and Willis 1996).

$$\text{Condition Factor} = \frac{\text{Weight} \times 100,000}{\text{Length}^3}$$

Where length is measured in mm, weight is measured in grams, 100,000 is a unit conversion factor, and condition factor is dimensionless. In general, the closer the ratio is to 1.0, the healthier the fish. This relationship is useful for relative health comparison between medium-sized fish; but it tends to be less applicable for very small and very large fish.

Age-specific population estimates were calculated using two methodologies. The overall population estimate per site was calculated without age groupings. Population estimates for each age class were calculated based on the percentage of each age class in the actual catch. Population estimates were also calculated based upon age-specific catch per pass. In some cases, the separate age-specific grouping estimates are higher than the overall total population estimate based upon variation in depletion numbers. In most cases, the age class 0+ (YOY, or young-of-the-year) estimates increased using depletion by age-specific grouping compared to the percentage of the total site estimates.

2.2 Reservoir Gill Netting

2.2.1 Physical Data Collection

Gill net surveys were conducted in Lake Almanor for three nights, from August 8 through August 10, 2000. Gill net site locations are presented in Figure 5. Gill nets were generally set horizontally, usually with one end set against (perpendicular to) the shoreline. The nets consisted of ultralight monofilament, 100' long by 6' wide, with a variable square mesh of ½" to 2". At sites with a gradual-sloping bottom, the end of the net would often be set where the water depth began to exceed about 2 feet. A limited number of vertical sets were deployed at sites with depths greater than 15 meters. Both horizontal and vertical gill nets were surface set from a pontoon boat. Norwegian buoys were attached to the surface corners, and 12 lb. lead weights were attached to the bottom corners of each net.

Up to three nets were set at each sampling area, each of which was checked hourly over three consecutive hours (a total of three sets per net). This method was modified if no fish were collected in the net, at which point the net would be moved to another location within the sampling area. Due to adverse conditions on the lake, safety considerations, and generally very late night working hours, the target of three sets per each net was not always achieved. At the end of each set, the net was retrieved and captured fish were processed as described in Section 2.1.2, except that fish weight was not measured.

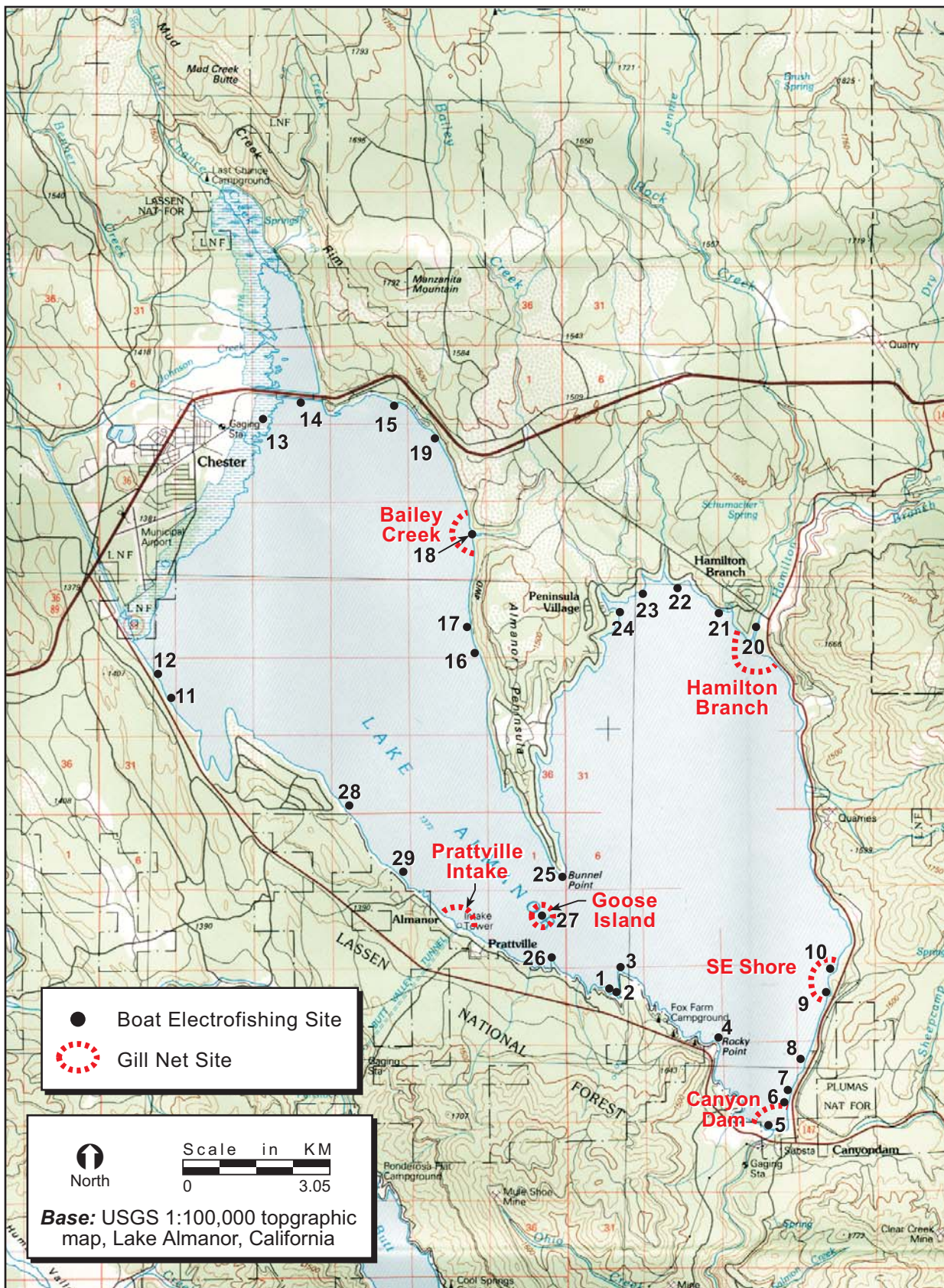


FIGURE 5. Lake Almanor - Site Locations.

2.3 Reservoir Boat Electrofishing

2.3.1 Physical/Fish Data Collection

Boat electrofishing surveys were conducted nightly in Lake Almanor, from August 1 through August 3, 2000. Electrofishing in Belden Forebay occurred on August 7, 2000. All fish were collected using a Smith-Root SR-17 electrofishing boat. Electrofishing was conducted by using the pulsator in the direct current mode, 120 pulses per second, 40 to 50 % of 50-500 voltage range, and 3 to 4 amps. The actual electrofishing time expended per station was recorded from the electrofishing time counter in seconds. Up to ten sites were sampled per night, for a total of 29 shoreline and island sampling sites in Lake Almanor (see Figure 5). Three sites were sampled in Belden Forebay. Sampling consisted of one pass. The electrofishing boat would be slowly positioned in the shoreline sampling site, the electric charge applied, and stunned fish collected with long handled dip nets. The catch would then be processed as described in Section 2.1.2, except that fish weight was not measured.

3.0 SPECIES COMPOSITION AND ABUNDANCE RESULTS

The results of the 2000, 2001, and 2002 stream electrofishing and snorkeling surveys, as well as the 2000 reservoir gill netting and boat electrofishing surveys, are provided in the following section. Additional supplemental information is presented in Appendices A through F.

3.1 Physical Data Collection

3.1.1 Water Quality and Physical Habitat Summary

Water quality data collected at the stream electrofishing sites are presented in Table 1 (Year 2000), Table 2 (Year 2001), and Table 3 (2002), and physical habitat summary data are presented in Table 4 for all three years. No significant changes were noted in any water quality

Table 1. Water Quality and Physical Characteristics for UNFFR Project Electrofishing Sites, Fall 2000.

Site Name			Physical Characteristics				Water Quality		
Reach/Site No.		Date Sampled	Segment Number	River Miles (RM)	Elevation (ft)	Site Length (m)	Water Temp (°C)	Dissolved Oxygen (ppm)	Conductivity (µS)
Seneca									
101	Canyon Dam Weir-Downstream	09/06/00	13	18.6	4,340	100	12.6	9.2	120.0
102	Seneca Bridge-Upstream	09/07/00	13	14.0	3,600	110	10.6	9.5	130.5
103	Seneca Bridge-Downstream	09/08/00	13	13.8	3,590	100	11.0	9.9	128.8
104	Butt Creek Confluence-Upstream	09/10/00	13	9.9	3,180	104	13.8	9.6	165.0
105	Butt Creek Confluence-Downstream	09/09/00	13	9.5	3,140	100	13.8	9.6	162.5
106	Caribou Powerhouse-Upstream	09/11/00	13	8.5	3,020	110	14.9	9.6	167.0
Belden									
107	Belden Dam-Downstream	09/12/00	13	6.8	2,860	95	17.2	9.4	110.0
108	Tunnel Addit Bridge-Downstream	09/25/00	13	4.5	2,800	105	18.1	9.3	118.0
109	Queen Lily Campground-Upstream	09/14/00	13	2.7	2,480	100	20.7	8.8	127.0
110	Queen Lily Campground-Downstream	09/26/00	13	2.4	2,450	95	15.0	9.8	140.2
111	Siphon	09/13/00	13	1.4	2,360	100	16.4	9.8	140.0
Mainstem									
112	Mainstem	09/29/00	12	0.7	2,240	68	16.8	10.0	175.0
Upper Butt Creek									
113	Upper Butt Creek	09/20/00	504	8.4	4,400	100	9.5	10.8	101.0
Lower Butt Creek									
114	Lower Butt Creek	09/21/00	504	0.2	3,240	100	12.0	9.2	109.0

Table 2. Water Quality and Physical Characteristics for UNFFR Project Electrofishing Sites, Fall 2001.

Site Name			Physical Characteristics				Water Quality			
Reach/Site No.		Date Sampled	Segment Number	River Miles (RM)	Elevation (ft)	Site Length (m)	Water Temp (°C)	Air Temp (°C)	Dissolved Oxygen (ppm)	Conductivity (µS)
Seneca										
101	Canyon Dam Weir-Downstream	09/19/01	13	18.7	4,340	100	14.9	9.0	8.4	114.8
102	Seneca Bridge-Upstream	10/02/01	13	14.0	3,600	110	15.0	18.5	10.1	137.0
103	Seneca Bridge-Downstream	09/14/01	13	13.8	3,590	100	14.9	27.1	9.4	132.0
104	Butt Creek Confluence-Upstream	09/18/01	13	9.9	3,180	104	11.0	10.6	9.6	155.8
105	Butt Creek Confluence-Downstream	10/03/01	13	9.5	3,140	100	12.0	12.3	10.5	157.0
106	Caribou Powerhouse-Upstream	09/27/01	13	8.5	3,020	110	12.1	8.5	10.2	194.1
Belden			13							
107	Belden Dam-Downstream	09/11/01	13	6.8	2,860	95	17.5	17.0	8.6	149.4
108	Tunnel Addit Bridge-Downstream	09/26/01	13	4.5	2,800	105	16.8	15.5	8.5	141.0
109	Queen Lily Campground-Upstream	10/01/01	13	2.7	2,480	100	16.3	17.0	10.0	133.0
110	Queen Lily Campground-Downstream	09/13/01	13	2.4	2,450	95	15.7	21.0	10.0	167.1
111	Siphon	09/12/01	13	1.4	2,360	100	18.8	21.5	9.0	165.0
Mainstem										
112	Mainstem	09/25/01	12	0.7	2,240	68	16.9	15.6	8.6	215.5
Upper Butt Creek										
113	Upper Butt Creek	09/16/01	504	8.4	4,400	100	10.7	10.3	10.6	149.7
Lower Butt Creek										
114	Lower Butt Creek	09/15/01	504	0.2	3,240	100	11.6	12.6	10.6	167.2
Mosquito Creek										
115	Mosquito Creek	09/28/01	43	0.2	2,800	100	12.5	13.7	8.7	na

na - not available

Table 3. Water Quality and Physical Characteristics for UNFFR Project Electrofishing Sites, Fall 2002.

			Physical Characteristics				Water Quality		
Reach/Site No.	Site Name	Date Sampled	Segment Number	River Miles (RM)	Elevation (ft)	Site Length (m)	Water Temp (°C)	Dissolved Oxygen (ppm)	Conductivity (µS)
Seneca									
101	Canyon Dam Weir-Downstream	09/30/02	13	18.6	4,340	98	13.5	8.02	97.0
102	Seneca Bridge-Upstream	09/23/02	13	14.0	3,600	106	14.8	9.36	109.5
103	Seneca Bridge-Downstream	10/03/02	13	13.8	3,590	80	12.3	8.96	104.2
104	Butt Creek Confluence-Upstream	10/09/02	13	9.9	3,180	110	13.8	8.62	124.5
105	Butt Creek Confluence-Downstream	10/01/02	13	9.5	3,140	92			
106	Caribou Powerhouse-Upstream	10/08/02	13	8.5	3,020	100	11.1	10.51	130.7
Belden									
107	Belden Dam-Downstream	09/16/02	13	6.8	2,860	88	19.4	4.76	100.0
108	Tunnel Addit Bridge-Downstream	09/18/02	13	4.5	2,800	100	19.7	8.12	115.0
109	Queen Lily Campground-Upstream	09/24/02	13	2.7	2,480	100	18.7	7.83	123.0
110	Queen Lily Campground-Downstream	09/19/02	13	2.4	2,450	94	18.0	7.04	120.0
111	Siphon	09/20/02	13	1.4	2,360	100	17.9	6.22	98.0
Mainstem									
112	Mainstem	09/17/02	12	0.7	2,240	72	16.6	7.61	163.0
Upper Butt Creek									
113	Upper Butt Creek	09/25/02	504	8.4	4,400	100	12.3	9.71	114.1
Lower Butt Creek									
114	Lower Butt Creek	09/26/02	504	0.2	3,240	100	12.8	9.86	133.2
115	Mosquito Creek	09/27/02	43	0.2	2,800	100	11.2	9.95	265.2

Table 4. Physical Habitat Summary Table for the UNFFR Project, Fall 2000, 2001 and 2002.

				Bottom Type Percentages ¹									Habitat Percentages ¹			Cover Type Rating ²				
Site No.	Site Name	Year	clay	silt	sand	gravel	cobble	boulder	bedrock	% canopy	% gradient	pool	riffle	run	surface turbulence	object cover	under cut banks	overhanging vegetation	spawning habitat	
Seneca Reach																				
101	Cayon Dam Weir - Downstream	2000	0	5	7	10	38	35	5	8	na	10	20	70	2	3	1	1	1	
		2001	0	8	7	10	30	40	5	10	1.5	20	30	50	2	2	1	1	1	
		2002	0	10	0	5	30	55	0	20	1.5	20	30	50	2	2	1	1	1	
102	Seneca Bridge - Upstream	2000	0	5	10	20	30	35	0	25	na	25	25	50	2	2	1	1	1	
		2001	0	3	7	18	30	40	2	30	1.5	25	25	50	2	2	1	1	1	
		2002	0	15	10	25	40	10	0	20	2	10	60	30	2	2	1	2	2	
103	Seneca Bridge - Downstream	2000	0	5	10	15	25	40	5	8	na	30	25	45	2	3	1	1	1	
		2001	0	1	2	12	25	60	0	5	2.5	30	20	50	2	3	1	1	1	
		2002	0	3	5	12	20	60	0	20	3	50	30	20	2	2	1	1	1	
104	Butt Creek Confluence - Upstream	2000	0	3	17	15	55	10	0	9	na	10	50	40	1	2	1	1	2	
		2001	0	0	10	15	49	25	1	10	1.5	10	60	30	1	2	1	1	2	
		2002	0	0	15	5	69	10	1	20	1	17	68	15	1	1	1	1	1	
105	Butt Creek Confluence - Downstream	2000	0	5	15	15	20	40	5	8	na	20	40	40	3	3	1	1	1	
		2001	0	4	11	15	30	35	5	6	2.5	20	40	40	2	3	1	1	1	
		2002	0	5	20	15	25	30	5	20	3	40	25	35	2	2	1	1	1	
106	Caribou Powerhouse - Upstream	2000	0	3	17	10	45	20	5	20	na	25	35	40	3	2	1	1	1	
		2001	0	0	15	10	30	35	10	30	3	20	30	50	2	2	1	1	1	
		2002	0	7	18	7	27	31	10	25	2	35	25	40	2	2	1	1	1	
116	Upper Canyon Dam	2000	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
		2001	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	
		2002	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
Belden Reach																				
107	Belden Dam - Downstream	2000	0	8	10	7	35	40	0	6	na	10	40	50	2	2	1	1	1	
		2001	0	2	3	10	50	35	0	10	1	10	40	50	2	2	1	1	1	
		2002	0	2	10	18	40	30	0	35	1	15	55	30	2	2	1	1	1	
108	Tunnel Addit Bridge - Downstream	2000	0	5	10	15	35	35	0	15	na	20	15	65	2	1	1	2	1	
		2001	0	5	10	15	30	40	0	20	2	25	15	60	2	1	1	2	1	
		2002	0	10	8	12	40	30	0	15	2	15	20	65	1	2	1	1	1	
109	Queen Lily Campground - Upstream	2000	0	2	8	10	25	50	5	10	na	15	35	50	3	3	1	1	1	
		2001	0	2	8	15	30	35	10	10	1.8	20	35	45	2	2	1	1	1	
		2002	0	5	5	15	30	45	0	35	4	5	55	40	2	2	1	1	2	
110	Queen Lily Campground - Downstream	2000	0	2	13	10	35	35	5	10	na	25	25	50	2	2	1	1	1	
		2001	0	2	23	10	20	45	0	15	1.5	10	30	60	1	1	1	1	1	
		2002	0	5	14	25	20	35	1	25	3	10	30	60	2	1	1	1	1	
111	Siphon	2000	0	6	9	10	25	50	0	10	na	20	35	45	2	2	1	1	1	
		2001	0	5	10	15	20	50	0	8	1.5	20	40	40	2	2	1	1	1	
		2002	0	8	5	5	30	50	2	40	5	20	35	45	2	2	1	2	1	
Mainstem																				
112	Mainstem	2000	0	2	10	7	50	30	1	1	na	10	50	40	1	1	1	1	1	
		2001	0	7	7	11	60	15	0	1	1	10	45	45	1	1	1	1	1	
		2002	0	5	9	20	45	20	1	5	2	15	50	35	2	1	1	1	1	
Butt Creek																				
113	Upper Butt Creek	2000	0	3	10	17	35	35	0	10	na	45	30	25	2	2	1	2	1	
		2001	0	3	12	15	35	35	0	10	2	35	30	35	2	2	1	2	1	
		2002	0	2	3	5	35	45	10	5	1.5	20	45	35	2	2	1	3	1	
114	Lower Butt Creek	2000	0	5	10	20	30	35	0	40	na	30	10	60	2	2	1	2	1	
		2001	0	5	10	15	30	40	0	45	2	35	15	50	2	2	1	2	1	
		2002	0	5	5	25	30	35	0	80	2	30	40	30	2	2	1	1	1	
Mosquito Creek																				
115	Mosquito Creek	2000	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	
		2001	0	2	5	13	25	45	10	50	3.5	40	20	40	1	3	1	1	1	
		2002	0	5	5	20	25	40	5	80	8	65	30	5	2	2	1	1	1	

¹ Visually estimated each year² Visually estimated each year using the following indices: 1=0 to 9.9%; 2=10 to 19.9%; 3=20 to 29.9%

na - not available

ns - not sampled

or physical parameter data collected among years. Water quality and physical data collected at gill netting sites on Lake Almanor for 2000 are presented in Table 5.

3.2 Stream Backpack Electrofishing and Snorkel Surveys

3.2.1 Stream Electrofishing Study Sites: Habitat

The following site descriptions contain substrate percentages and pool:riffle:run ratios, which were visually estimated for each year. These data are somewhat subjective, resulting in reported annual variances. Physical habitat percentage and ratios presented in the following site descriptions are from 2000 surveys.

Seneca Reach

An additional site in the Seneca Reach (*Site 116, Canyon Dam Weir – Upstream*) was sampled during 2001 at the request of the resource agencies and consisted of a one-pass single electroshocker-sampling event over a 200 m stream length. This site was sampled because of concerns expressed by agency personnel of the potential effect of H₂S on fish. This site is located immediately downstream of Canyon Dam (upstream of the weir) and consists of a large riffle and pool habitat.

Site 101 - Canyon Dam Weir - Downstream

The upper end of this 100-meter site is located on the North Fork Feather River, about 275 meters downstream of the PG&E streamflow gage weir, NF-2, and about 0.8 km below Canyon Dam, in Segment 13 (RM 18.6) (see Figure 2). The site is accessed via the PG&E service road that leads to the gage station below Canyon Dam. Riparian vegetation includes incense cedar (*Calocedrus decurrens*), Douglas fir (*Pseudotsuga menziesii*), and other coniferous tree species. Herbaceous plants are sparsely present in the under-story. Stream substrate within the site is

Table 5. Lake Almanor Gill Net Site Summaries, UNFFR Project, August 8-11, 2000.

Net no.	Set no.	Date	Sample Hours	Depth (m)	Net Position	Location Comments	Water Temperature (°C)	Habitat Type
Bailey Creek								
1	1	08/08/00	19:40-20:40	2.4-2.7	horizontal	Bailey Creek, perpendicular to shoreline	24.4	rock, shoreline, Baily Creek Cove
	2	08/08/00	20:50-21:45	0.5-4.3	horizontal	0.5 km south of Bailey Creek, perpendicular to shoreline	24.4	rock, shoreline, Baily Creek Cove
	3	08/08/00	21:50-22:45	0.5-2.4	horizontal	100 m south of Bailey Creek, perpendicular to shoreline	24.4	rock, shoreline, Baily Creek Cove
2	1	08/08/00	20:00-21:00	3.0-3.7	horizontal	offshore from center of Bailey Creek cove	25.0	rock, shoreline, Baily Creek Cove
	2	08/08/00	21:15-21:55	1.5	horizontal	laterally across mouth of Bailey Creek cove	25.0	rock, shoreline, Baily Creek Cove
	3	08/08/00	22:00-23:00	1.5	horizontal	extended off south point of Bailey Creek cove; lateral across mouth	25.0	rock, shoreline, Baily Creek Cove
3	1	08/08/00	20:10-21:30	0.5-2.4	horizontal	300 m north of Bailey Creek cove	25.0	rock, shoreline, Baily Creek Cove
	2	08/08/00	21:40-22:10	0.5-3.7	horizontal	200 m north of Bailey Creek cove	25.0	rock, shoreline, Baily Creek Cove
	3	08/08/00	22:15-23:00	0.5-4.3	horizontal	400 m north of Bailey Creek cove	25.0	rock, shoreline, Baily Creek Cove
Goose Island								
1	1	08/09/00	00:10-01:20	12.2	vertical	drop-off on north-west side of island	23.3	verticle drop off
	2	-	-	-				
	3	-	-	-				
2	1	08/09/00	00:15-00:55	1.5-3.7	horizontal	south end of island	23.3	rocky, reef-like
	2	08/09/00	01:00-01:35	1.5-3.7	horizontal	south end of island	23.3	rocky, reef-like
	3	-	-	-				rocky, reef-like
3	1	08/09/00	00:25-01:05	1.5-3.7	horizontal	east side of island	23.3	rocky, reef-like
	2	08/09/00	01:10-01:45	1.5-3.7	horizontal	east side of island	23.3	rocky, reef-like
	3	-	-	-				
SE Shore								
1	1	08/09/00	19:35-20:35	0.6-7.6	horizontal	shoreline from Dam, north of Dam	23.8	grad. slope, drop @15'; lg boulders
	2	08/09/00	20:40-21:40	0.6-5.8	horizontal	shoreline from Dam, north of Dam	23.8	rocky shoreline
	3	08/09/00	21:55-23:08	0.6-7.6	horizontal	shoreline from Dam, north of Dam	23.8	rocky, gradual slope
2	1	08/09/00	19:40-20:45	15.2	vertical	200 m west of shoreline (200 m north of Dam)	23.8	channel
	2	08/09/00	20:50-22:00	18.3	vertical	100 m west of shoreline (500 m north of Dam)	23.8	channel
	3	08/09/00	20:50-22:00	16.5	vertical	150 m west of shoreline (1000 m of Dam)	23.8	channel
3	1	08/09/00	19:45-21:05	0.6-6.1	horizontal	shoreline from Dam, north of Dam	23.8	large boulders
	2	08/09/00	21:20-22:20	3.7-9.8	horizontal	shoreline from Dam, north of Dam	23.8	rocky shelf
	3	08/09/00	22:45-23:50	0.6-7.6	horizontal	shoreline from Dam, north of Dam	23.8	cobble, trees, and stumps

Table 5 (cont.). Lake Almanor Gill Net Site Summaries, UNFFR Project, August 8-11, 2000.

Net no.	Set no.	Date	Sample Hours	Depth (m)	Net Position	Location Comments	Water Temperature (°C)	Habitat Type
Canyon Dam								
1	1	08/09/00	23:20-00:20	16.5	vertical	200 m off boat ramp and 100 m off dam tower	23.4	deep water
	2	08/10/00	00:40-01:40	14.9	vertical	200 m off boat ramp and 100 m off dam tower	23.4	deep water
	3	08/10/00	01:05-02:05	14.0	vertical	150 m off boat ramp	23.4	deep water
2	1	08/09/00	23:25-01:40	0.9-9.4	horizontal	75 m off tower in the direction of the ramp along face of dam	23.4	deep water
	2	08/09/00	23:50-01:50	0.9-8.5	horizontal	90 m down from face of dam near previous site	23.4	deep water
	3	-	-	-	-	-	-	-
3	1	08/10/00	00:00-01:00	0-4.6	horizontal	100 m above dam, east of dam	23.3	deep water
	2	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-
Hamilton Branch								
1	1	08/10/00	19:20-20:20	3.0-7.3	Horizontal	Rock Jetty	-	rocky shore; muddy bottom
	2	08/10/00	21:05-22:05	1.2-5.8	Horizontal	100 m along shore from 2-1, away from Hamilton Branch	-	rocky shore; muddy bottom
	3	-	-	-	-	-	-	-
2	1	08/10/00	19:25-20:25	1.2-7.6	Horizontal	Rocky point left of jetty by new twin houses	-	rocky shore; muddy bottom
	2	08/10/00	20:55-22:00	0.9-5.2	Horizontal	100 m along shore from 1-2	-	rocky shore; muddy bottom
	3	-	-	-	-	-	-	-
3	1	08/10/00	19:35-20:40	15.2	Vertical	north of (1.5 km) Hamilton Branch	-	muddy bottom
	2	08/10/00	20:50-21:50	15.2	Vertical	100 m south-east from 3-1; 300 m offshore	-	muddy bottom
	3	-	-	-	-	-	-	-
Prattville Intake								
1	1	08/10/00	22:35-23:35	15.2	Vertical	30 m in front of old tower; left side looking inland	22.0	rocky bottom
	2	8/10-11/00	23:35-00:35	16.5	Vertical	50 m in front of old tower	13.8	rocky bottom
	3	8/10-11/00	00:40-01:40	13.7	Vertical	20 m in front of old tower	22.0	rocky bottom
2	1	08/10/00	22:40-23:40	15.2	Vertical	30 m in front of intake tower	22.0	rocky bottom
	2	8/10-11/00	23:45-00:45	15.2	Vertical	50 m in front of intake tower	13.8	rocky bottom
	3	8/10-11/00	00:45-01:45	17.1	Vertical	25 m in front of intake tower	13.8	rocky bottom
3	1	08/10/00	22:50-23:50	1.2-7.3	Horizontal	45 m away from tower toward dam along shore (point)	22.1	rocky bottom
	2	8/10-11/00	23:50-00:50	1.2-6.1	Horizontal	45 m away from tower toward dam along shore (point)	22.1	rocky bottom
	3	8/10-11/00	01:00-02:00	0.9-2.1	Horizontal	25 m away from intake tower; along float line	22.1	rocky bottom

Water Temperature and Dissolved Oxygen Profiles at Time of Sampling

Depth (ft)	Canyon Dam		Prattville Intake	
	Temperature	D.O. (ppm)	Temperature	D.O. (ppm)
2	23.2	7.3	21.1	6.9
10	23.2	7.3	22.1	7
20	23.2	7.6	22	7
30	18.7	5.6	----	----

comprised primarily of cobble (38 percent of site total) and boulder (35 percent). The pool:riffle:run ratio at the site is 10:20:70. Fish cover is largely present as object cover and surface turbulence.

Site 102 - Seneca Bridge – Upstream

The lower end of this 110-meter site is located about 200 meters upstream of the Seneca Bridge, about 8 km downstream of Canyon Dam, in Segment 13, RM 14.0. Access to this site is via Seneca Road. Riparian vegetation consists of alder (*Alnus spp*), big leaf maple (*Acer macrophyllum*), willow (*Salix spp*), incense cedar, and Douglas fir; under-story plants include blackberry (*Rubus spp*), mint (*Mentha spp*), and grasses. Stream substrate is comprised primarily of boulder (35 percent) and cobble (30 percent). The pool:riffle:run ratio at the site is 25:25:50. Object cover and surface turbulence are the primary cover types.

Site 103 - Seneca Bridge – Downstream

The upper end of this 100-meter site is located immediately downstream of the Seneca Bridge, in Segment 13, RM 13.8. The site is accessed via Forest Service Road 26N23Y, which intersects Seneca Road. Riparian vegetation consists of alder, big leaf maple, willow, incense cedar, Douglas fir; under-story plants include blackberry and grasses. Stream substrate within the site is comprised primarily of boulder (40 percent) and cobble (25 percent). The pool:riffle:run ratio at the site is 30:25:45. Object cover and surface turbulence are primary cover types.

Site 104 - Butt Creek Confluence - Upstream

The lower end of this 104-meter site is located 415 meters upstream of the Butt Creek confluence, in Segment 13, RM 9.9. The site is accessed via Forest Service Road 26N14, off of Seneca Road. Riparian vegetation consists of overhanging grasses, willow, blackberry, Indian rhubarb (*Darmera peltata*), and alder. Canopy cover is seasonally reduced, due to the annual depletion of older foliage. Stream substrate is comprised primarily of cobble (55 percent); sand

and gravel comprise 32 percent of the substrate and provide for good spawning habitat. The pool:riffle:run ratio is 10:50:40. Fish cover is limited as object cover.

Site 105 - Butt Creek Confluence - Downstream

The upper end of this 100-meter site is located 150 meters downstream of the Butt Creek confluence, in Segment 13, RM 9.5. This site is accessed via Forest Service Road 26N14, off of Seneca Road. Riparian vegetation consists of willow, alder, Indian rhubarb, blackberry, and grasses present along the stream banks. Stream substrate is comprised primarily of boulder (40 percent), cobble (20 percent) and gravel (15 percent). The pool:riffle:run ratio at the site is 20:40:40. Object cover is the dominant cover type.

Site 106 - Caribou Powerhouse - Upstream

The lower end of this 110-meter site is located 480 meters upstream from the Caribou Powerhouse, in Segment 13, RM 8.5. The site is accessed via the PG&E Caribou Powerhouse fishing trail, which begins at the powerhouse at the end of Caribou Road. Willow and alder are abundant in the riparian zone; Indian rhubarb, blackberry, and grasses sparsely border the stream bank. Stream substrate is comprised primarily of cobble (45 percent) and boulder (20 percent). The pool:riffle:run ratio at the site is 25:35:40. Fish cover is present as surface turbulence and object cover.

Belden Reach

Site 107 - Belden Dam - Downstream

The lower end of this 95-meter site is located 200 meters upstream of the PG&E stream flow gage station, NF-70, (the top of the site is about 150 meters downstream of the Belden Dam), in Segment 13, RM 6.8 (see Figure 3). This site is accessed via the gage access road off Caribou Road. Alder and blackberry are the most abundant vegetation in the riparian zone; big leaf maple, incense cedar, wild grape (*Vitis* sp.), and grasses are abundant along the stream banks.

Stream substrate within the site is comprised primarily of boulder (40 percent) and cobble (35 percent). The pool:riffle:run ratio at the site is 10:40:50. Fish cover is limited as surface turbulence and object cover.

Site 108 - Tunnel Addit Bridge - Downstream

This 105-meter site is located about 1.1 km meters downstream of the Tunnel Addit Bridge, in Segment 13, RM 4.5. An unnamed tributary is located immediately downstream of the lower end of the site. This site is accessed from Caribou Road. Alder is the most abundant riparian vegetation; dogwood (*Cornus* sp.), black oak (*Quercus kelloggii*), willow, and incense cedar are sparsely present. Blackberry, grape, and grasses are present in the under-story. Stream substrate within the site is composed primarily of boulder (35 percent) and cobble (35 percent). The pool:riffle:run ratio at the site is 20:15:65. Overhanging vegetation is abundant as fish cover.

Site 109 - Queen Lily Campground - Upstream

The lower end of this 100-meter site is located 150 meters upstream of the Queen Lily Campground Bridge, in Segment 13, RM 2.7. This site is accessed via Caribou Road. Alder and willow are the most abundant riparian vegetation species bordering the site; incense cedar, black oak, and Douglas fir are present in upland habitat. Blackberry, grape, mullein (*Verbascum thapsus*), Indian rhubarb and other herbaceous plants comprise the under-story. Stream substrate within the site is composed primarily of boulder (50 percent) and cobble (25 percent). The pool:riffle:run ratio at the site is 15:35:50. Cover is abundant as surface turbulence and object cover.

Site 110 - Queen Lily Campground - Downstream

The upper end of this 95-meter site is located 360 meters downstream of the Queen Lily Campground Bridge, in Segment 13, RM 2.4. This site is accessed via Caribou Road. Along the site, riparian herbaceous vegetation is intermixed among large boulder. The riparian corridor is up to 8 meters wide. Upland vegetation includes alder, willow, black oak, big leaf maple, and

incense cedar. Under-story vegetation includes dense sections of blackberry, and scattered growth of Indian rhubarb and grass. Stream substrate within the site is composed primarily of cobble (35 percent) and boulder (35 percent). The pool:riffle:run ratio at the site is 25:25:50. Fish cover is present largely as object cover.

Site 111- Siphon

The lower end of this 100-meter site is located 10 meters upstream of the Belden Siphon, in Segment 13, RM 1.4. This site is accessed via Caribou Road. The riparian vegetation adjacent to the left bank was burned during the Storrie fire in August 2000; however, alder, big leaf maple, and blackberry are present. The right bank looking upstream of this site is a steep grade of boulder and cobble, blackberry and alder are abundant. Stream substrate within the site is composed primarily of boulder (50 percent) and cobble (25 percent). The pool:riffle:run ratio at the site is 20:35:45. Fish cover is comprised of surface turbulence and object cover.

Mainstem

Site 112 - Mainstem – Upstream Beldentown

The lower end of this 68-meter site is located 950 meters upstream of the Beldentown Bridge over the NFFR, in Segment 12, RM 0.4. This site is accessed via Beldentown Road off of Highway 70. At this site, the left bank riparian corridor is bordered by riprap protecting Highway 70. The floodplain is wide on the right bank with an extensive gravel bar berm. The riparian vegetation includes willow, alder, big leaf maple, oak, blackberry, and grasses. Stream substrate within the site is composed primarily of cobble (50 percent) and boulder (30 percent). The pool:riffle:run ratio at the site is 10:50:40. Fish cover is limited as surface turbulence.

Upper Butt Creek

Site 113 - Upper Butt Creek

The upper end of this 100-meter site is located immediately below the abandoned lower weir on Upper Butt Creek in Segment 504, RM 8.4. The site is accessed via Forest Service Road 27N26, which leads to the Butt Valley Powerhouse (see Figure 4). The bottom of the site is about 1.0 km upstream from the 27N26 bridge. Indian rhubarb is the most abundant riparian vegetation along the boulder and cobble dominated stream banks. Alder, conifers, incense cedar, and grasses are sparsely present. Stream substrate within the site is composed primarily of boulder (35 percent) and cobble (35 percent). The pool:riffle:run ratio at the site is 45:30:25. Fish cover is abundant and diverse (e.g., object cover, surface turbulence, and overhanging vegetation).

Lower Butt Creek

Site 114 - Lower Butt Creek

This 100-meter site is located on Lower Butt Creek (downstream from Butt Valley Reservoir) about 320 meters upstream from the NFFR confluence, in Segment 504, RM 0.2 (see Figure 4). This site is accessed via Forest Service Road 26N14 off of Seneca Road. Blackberry and Indian rhubarb are dense in the understory; oak, alder, and conifers provide dense over-story cover. Stream substrate within the site is composed primarily of boulder (35 percent) and cobble (30 percent). The pool:riffle:run ratio at the site is 30:10:60. Fish cover is abundant and diverse, similar to that found at site 113.

Mosquito Creek

Site 115 - Mosquito Creek

The lower end of this 100-meter site is located about 200 meters upstream from the Caribou Road Bridge in Segment 43, RM 0.2 (see Figure 3). Oak, alder and conifers provide dense over-story cover. The substrate is dominated by boulder (45 percent) and cobble (25 percent). The pool:riffle:run ratio is 40:20:40. Object cover is abundant as fish cover.

3.2.2 Stream Electrofishing Site – Fish Data

Combined Study Site Data

Year 2000

A total of 3,173 fish were collected from the 14-electrofishing sampling locations in 2000 (Table 6 and Appendix A). Prickly sculpin (*Cottus asper*) and riffle sculpin (*C. gulosus*), collectively, accounted for 64 percent of the total catch. Riffle sculpin was the most abundant species of the two. However, sculpin abundance and biomass is presented as a combination of the two species. About twenty-six percent of the total catch was rainbow trout (*Oncorhynchus mykiss*) (Figure 6). Sacramento sucker (*Catostomus occidentalis*) accounted for 8.4 percent of the catch. Brown trout (*Salmo trutta*) and planted rainbow trout hatchery-stock each comprised less than one percent of the catch (0.7 percent and 0.5 percent, respectively). Sacramento pikeminnow (*Ptychocheilus grandis*) were also collected; however, so few were caught that they were considered as incidental in further analyses. Hatchery trout, as a group, are not considered any further in this report.

The total biomass for all sites was 226,811 grams (Table 7 and Appendix B). About 69 percent of the total biomass was Sacramento sucker, followed by rainbow trout (17.5 percent), sculpin (7.4 percent), brown trout (4.4 percent), and Sacramento pikeminnow (0.1 percent) (Figure 7).

Table 6. Fish Species Collected at the UNFFR Project Electrofishing Sites, Fall 2000.

						Numbers Collected						
Reach/Site No.	Site Name	Date Sampled	Site Length (m)	No. Passes	Effort (sec.)	Rainbow trout	Hatchery trout	Brown trout	Sacramento sucker	Sculpin	Sacramento pikeminnow	Total
Seneca												
101	Canyon Dam Weir-Downstream	09/06/00	100	3	13,899	6	0	0	6	164	0	176
102	Seneca Bridge-Upstream	09/07/00	110	3	14,536	143	0	5	0	383	0	531
103	Seneca Bridge-Downstream	09/08/00	100	4	7,859	94	0	3	1	144	0	242
104	Butt Creek Confluence-Upstream	09/10/00	104	3	9,679	58	0	0	3	221	0	282
105	Butt Creek Confluence-Downstream	09/09/00	100	4	13,131	91	0	1	1	104	0	197
106	Caribou Powerhouse-Upstream	09/11/00	110	3	11,480	69	0	0	7	73	0	149
Reach Total						461	0	9	18	1,089	0	1,577
Belden												
107	Belden Dam-Downstream	09/12/00	95	4	8,652	50	0	0	39	86	0	175
108	Tunnel Addit Bridge-Downstream	09/25/00	105	3	9,297	52	0	0	101	111	2	266
109	Queen Lily Campground-Upstream	09/14/00	100	3	8,052	36	0	0	26	73	0	135
110	Queen Lily Campground-Downstream	09/26/00	95	3	8,408	31	0	0	16	136	0	183
111	Siphon	09/13/00	100	4	8,360	50	17	0	14	205	0	286
Reach Total						219	17	0	196	611	2	1,045
Mainstem												
112	Mainstem	09/29/00	68	2	6,445	7	0	0	4	99	2	112
Reach Total						7	0	0	4	99	2	112
Upper Butt Creek												
113	Upper Butt Creek	09/20/00	100	3	9,981	75	0	13	50	125	0	263
Reach Total						75	0	13	50	125	0	263
Lower Butt Creek												
114	Lower Butt Creek	09/21/00	100	4	8,795	61	0	0	0	115	0	176
Reach Total						61	0	0	0	115	0	176
TOTAL						823	17	22	268	2,039	4	3,173

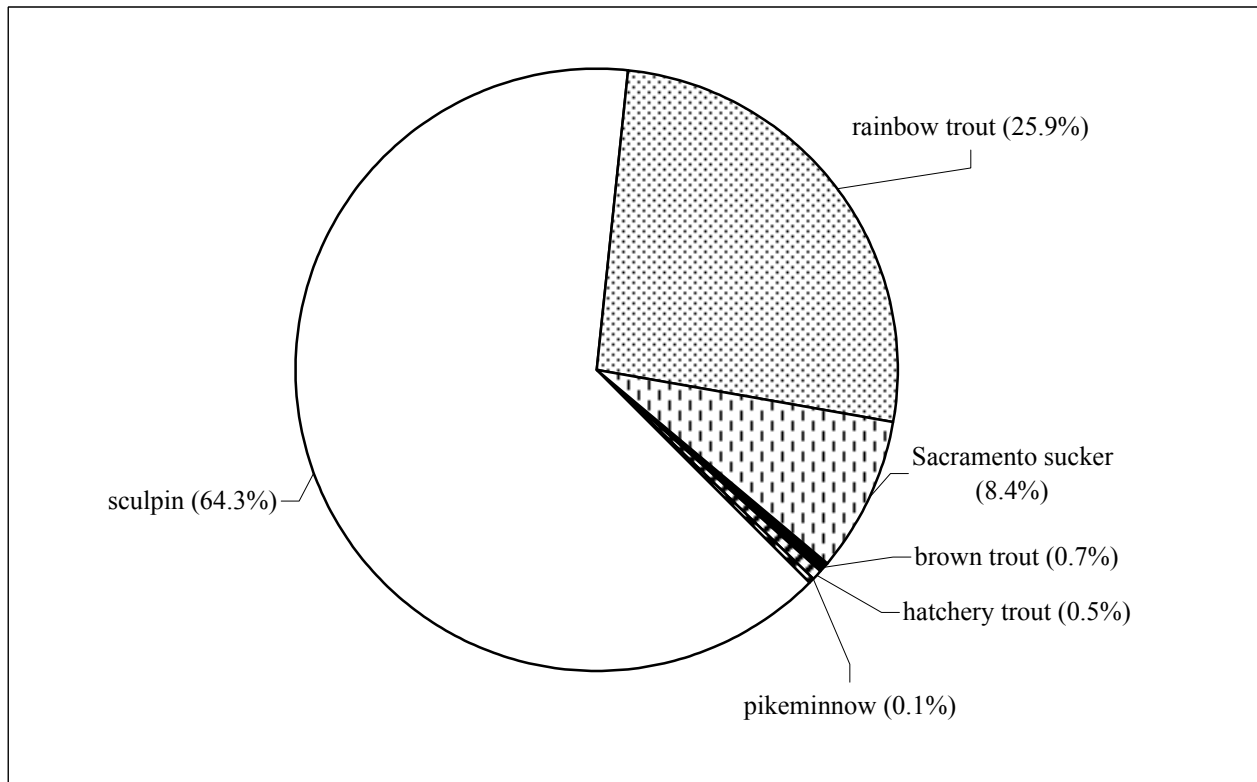


Figure 6. Total Species Composition and Relative Abundance for All Sites, NFFR, Fall 2000.

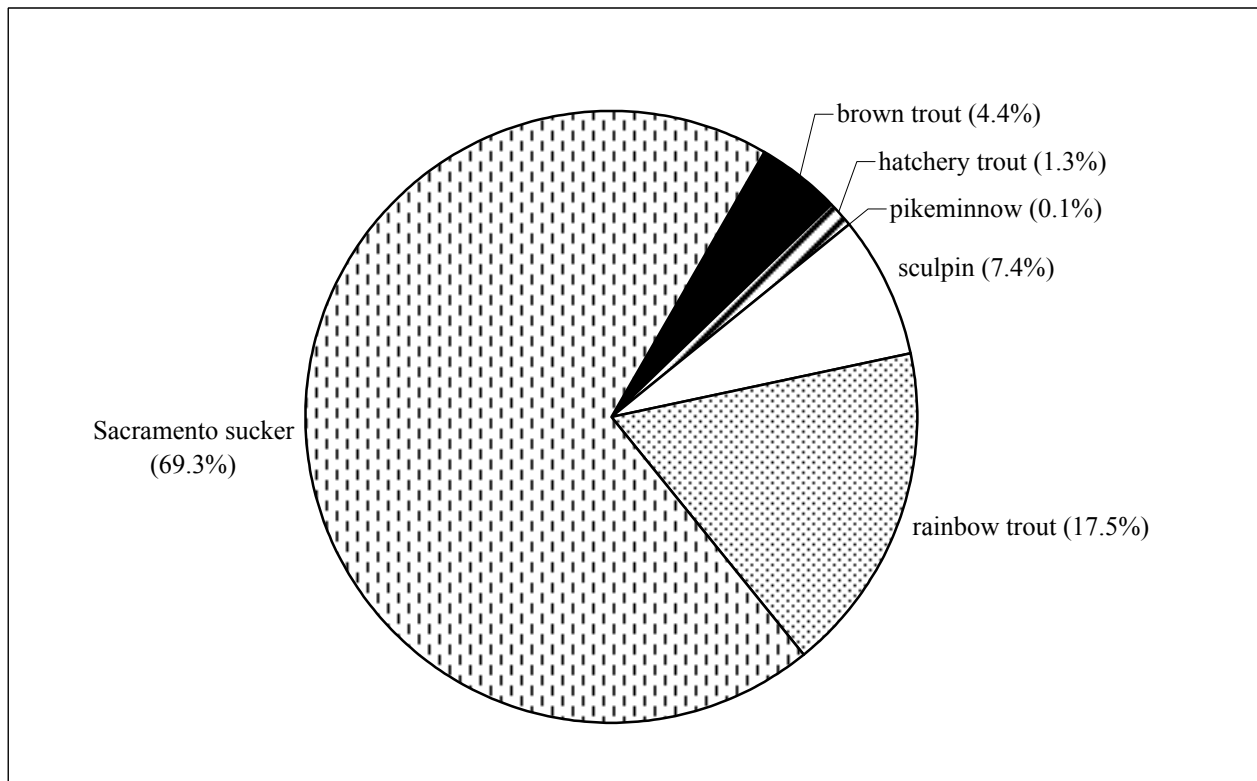


Figure 7. Total Species Biomass for All Sites, NFFR, Fall 2000.

Table 7. Biomass Estimates by Species at UNFFR Project Electrofishing Sites, Fall 2000.

Reach/Site No.	Site Name	Rainbow trout			Brown trout			Sacramento sucker		
		Total Weight (g)	Total No.	Average Weight (g)	Total Weight (g)	Total No.	Average Weight (g)	Total Weight (g)	Total No.	Average Weight (g)
Seneca										
101	Canyon Dam Weir-Downstream	309	6	51.5	0	0	—	3,435	6	572.5
102	Seneca Bridge-Upstream	4,406	143	30.8	885	5	177.0	0	0	—
103	Seneca Bridge-Downstream	5,829	94	62.0	2,031	3	677.0	1	1	1.0
104	Butt Creek Confluence-Upstream	1,197	58	20.6	0	0	—	6	3	2.0
105	Butt Creek Confluence-Downstream	4,378	91	48.1	500	1	500.0	53	1	53.0
106	Caribou Powerhouse-Downstream	1,718	69	24.9	0	0	—	425	7	60.7
Reach Subtotal		17,837	461		3,416	9		3,920	18	
Belden										
107	Belden Dam-Downstream	4,543	50	90.9	0	0	—	6,408	39	164.3
108	Tunnel Addit Bridge-Downstream	3,127	52	60.1	0	0	—	45,146	101	447.0
109	Queen Lily Campground-Upstream	1,676	36	46.6	0	0	—	22,007	26	846.4
110	Queen Lily Campground-Downstream	3,627	31	117.0	0	0	—	7,604	16	475.3
111	Siphon	3,821	50	76.4	0	0	—	4,609	14	329.2
Reach Subtotal		16,794	219		0	0		85,774	196	
Mainstem										
112	Mainstem	511	7	73.0	0	0	—	933	4	233.3
Reach Subtotal		511	7		0	0		933	4	
Upper Butt Creek										
113	Upper Butt Creek	4,039	75	53.9	6,849	13	526.8	68,577	50	1371.5
Reach Subtotal		4,039	75		6,849	13		68,577	50	
Lower Butt Creek										
114	Lower Butt Creek	952	61	15.6	0	0	—	0	0	—
Reach Subtotal		952	61		0	0		0	0	
TOTAL		40,133	823		10,265	22		159,204	268	

Table 7 (cont.). Biomass Estimates by Species at UNFFR Project Electrofishing Sites, Fall 2000.

Reach/Site No.	Site Name	Sculpin			Sacramento pikeminnow			All Species	
		Total Weight (g)	Total No.	Average Weight (g)	Total Weight (g)	Total No.	Average Weight (g)	Total Weight (g)	Percentage of Reach
Seneca									
101	Canyon Dam Weir-Downstream	1,340	164	8.2	0	0	—	5,084	15.3
102	Seneca Bridge-Upstream	3,066	383	8.0	0	0	—	8,358	25.1
103	Seneca Bridge-Downstream	1,313	144	9.1	0	0	—	9,174	27.5
104	Butt Creek Confluence-Upstream	1,029	221	4.7	0	0	—	2,232	6.7
105	Butt Creek Confluence-Downstream	832	104	8.0	0	0	—	5,763	17.3
106	Caribou Powerhouse-Downstream	567	73	7.8	0	0	—	2,709	8.1
Reach Subtotal		8,147	1,089		0	0		33,320	
Belden									
107	Belden Dam-Downstream	1,279	86	14.9	0	0	—	12,230	11.3
108	Tunnel Addit Bridge-Downstream	855	111	7.7	260	2	130.0	49,388	45.7
109	Queen Lily Campground-Upstream	410	73	5.6	0	0	—	24,093	22.3
110	Queen Lily Campground-Downstream	1,094	136	8.0	0	0	—	12,325	11.4
111	Siphon	1,579	205	7.7	0	0	—	10,009	9.3
Reach Subtotal		5,217	611		260	2		108,045	
Mainstem									
112	Mainstem	639	99	6.5	3	2	1.5	2,086	100.0
Reach Subtotal		639	99		3	2		2,086	
Upper Butt Creek									
113	Upper Butt Creek	1,484	125	11.9	0	0	—	80,949	100.0
Reach Subtotal		1,484	125		0	0		80,949	
Lower Butt Creek									
114	Lower Butt Creek	1,459	115	12.7	0	0	—	2,411	100.0
Reach Subtotal		1,459	115		0	0		2,411	
TOTAL		16,946	2,039		263	4		226,811	

Year 2001

A total of 2,876 fish were collected from 15 electrofishing sampling locations in 2001 (Table 8 and Appendix A). An additional 325 fish were collected during a single pass at site 116, Canyon Dam Weir – Upstream (sampled in 2001 only). However, since this site was sampled with only one electroshocker and a single pass, the results are not included in the quantitative analyses. Species abundance distribution in year 2001 was similar to that in year 2000. Sculpin was again the most frequently caught species, accounting for 59.1 percent of the total catch, followed by 34.4 percent for rainbow trout (Figure 8). Sacramento sucker accounted for 5.6 percent of the catch. Brown trout comprised less than 1 percent of the catch (0.6 percent), as did Sacramento pikeminnow (0.3 percent). No hatchery trout were collected during the 2001 sampling program.

The total collected biomass for all sites was 157,009 grams (Table 9). About 57 percent of this biomass was Sacramento sucker, followed by rainbow trout (26.3 percent), sculpin (9.6 percent), brown trout (7.2 percent), and Sacramento pikeminnow (0.04 percent) (Figure 9). A summary of results by major reach site is provided below.

Year 2002

A total of 3,201 fish were collected from the 15-electrofishing sampling locations in 2002 (Table 10 and Appendix A). Riffle sculpin and prickly sculpin were separately identified in 2002. Riffle sculpin were the most frequently caught species, accounting for 51.4 percent of the total catch, followed by rainbow trout (37.1 percent) (Figure 10). Sacramento sucker accounted for 5.2 percent of the catch, prickly sculpin 4.3 percent, brown trout comprised 0.9 percent, and Sacramento pikeminnow 0.8 percent. Hatchery trout comprised 0.2 percent of the catch.

The total collected biomass was 126,238 grams (Table 11), 55.2 percent of which was Sacramento sucker, followed by rainbow trout (28.3 percent), riffle sculpin (11.1 percent),

Table 8. Fish Species Collected at UNFFR Project Electrofishing Sites, Fall 2001.

Reach/Site No.	Site Name	Date Sampled	Site Length (m)	No. of Passes	Effort (Sec.)	Numbers Collected					Total
						Rainbow trout	Brown trout	Sacramento sucker	Sculpin	Sacramento pikeminnow	
Seneca											
101	Canyon Dam Weir-Downstream	09/19/01	100	3	10,787	31	0	3	125	0	159
102	Seneca Bridge-Upstream	10/02/01	110	3	10,620	138	3	1	302	0	444
103	Seneca Bridge-Downstream	09/14/01	100	4	6,400	98	2	4	110	0	214
104	Butt Creek Confluence-Upstream	09/18/01	104	3	8,882	117	0	3	152	0	272
105	Butt Creek Confluence-Downstream	10/03/01	100	3	8,769	124	0	1	108	0	233
106	Caribou Powerhouse-Upstream	09/27/01	110	3	9,932	89	0	6	71	0	166
Reach Total						597	5	18	868	0	1,488
Belden											
107	Belden Dam-Downstream	09/11/01	95	4	11,676	31	0	12	55	0	98
108	Tunnel Addit Bridge-Downstream	09/26/01	105	3	9,771	42	0	53	64	0	159
109	Queen Lily Campground-Upstream	10/01/01	100	3	7,676	31	0	22	60	0	113
110	Queen Lily Campground-Downstream	09/13/01	95	3	5,535	11	0	38	46	0	95
111	Siphon	09/12/01	100	3	9,304	53	0	3	92	0	148
Reach Total						168	0	128	317	0	613
Mainstem											
112	Mainstem	09/25/01	68	3	15,198	17	0	0	283	9	309
Reach Total						17	0	0	283	9	309
Upper Butt Creek											
113	Upper Butt Creek	09/16/01	100	3	7,765	46	13	16	63	0	138
Reach Total						46	13	16	63	0	138
Lower Butt Creek											
114	Lower Butt Creek	09/15/01	100	3	5,626	84	0	0	133	0	217
Reach Total						84	0	0	133	0	217
Mosquito Creek											
115	Mosquito Creek	09/28/01	100	3	3,342	76	0	0	35	0	111
Reach Total						76	0	0	35	0	111
TOTAL						988	18	162	1,699	9	2,876

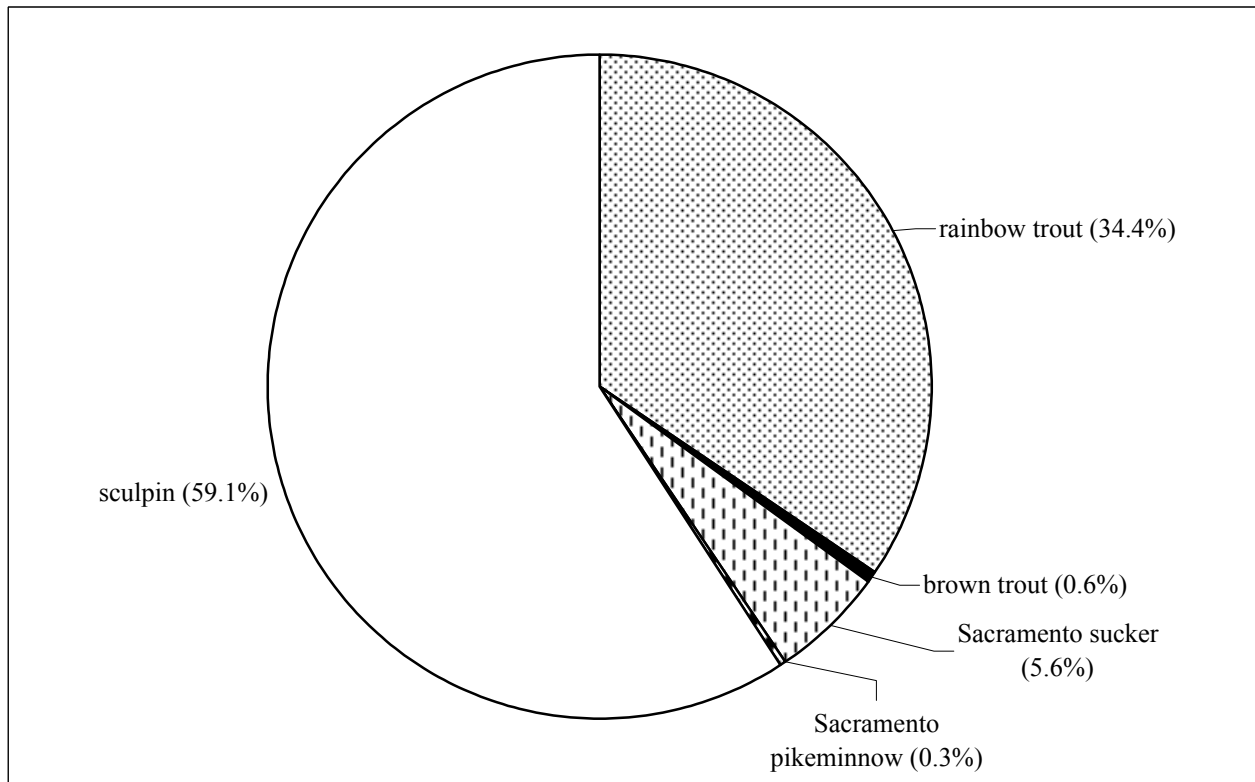


Figure 8. Total Species Composition and Relative Abundance for All Sites, NFFR, Fall 2001.

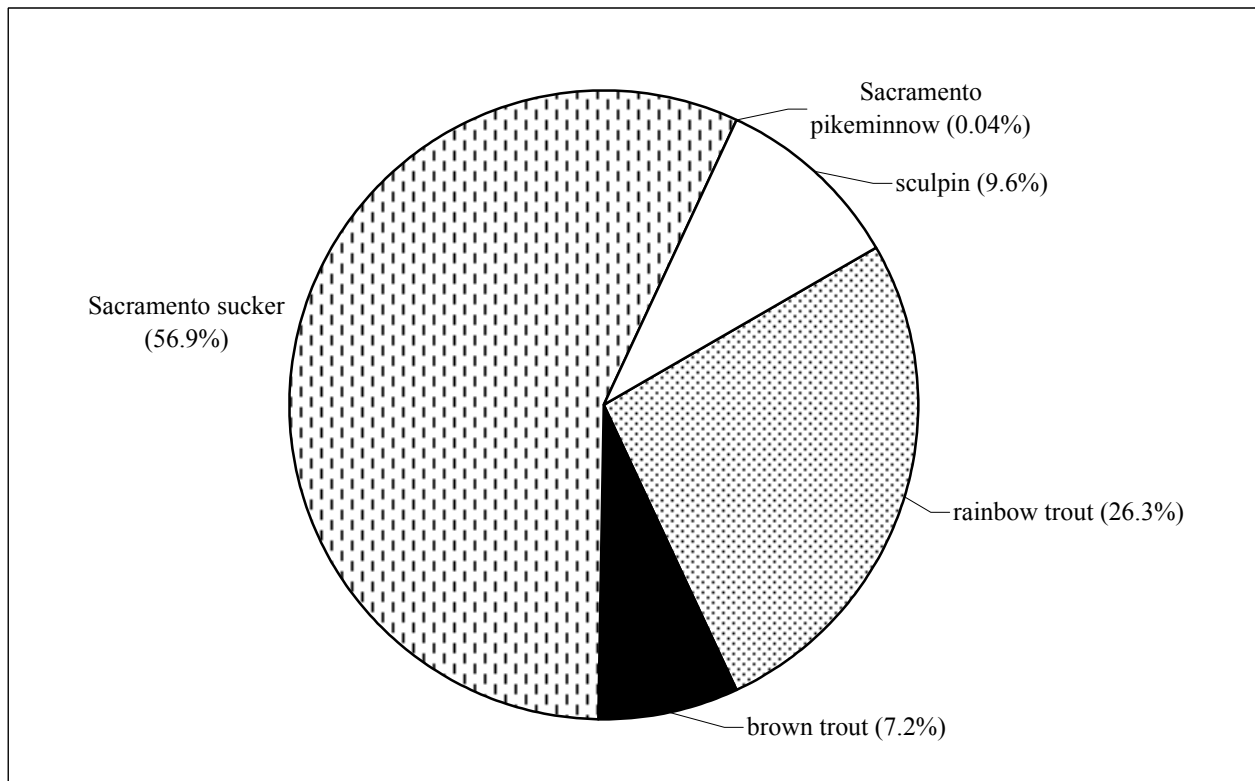


Figure 9. Total Species Biomass for All Sites, NFFR, Fall 2001.

Table 9. Biomass Estimates by Species at UNFFR Project Electrofishing Sites, Fall 2001.

		Rainbow trout			Brown trout			Sacramento Sucker		
Reach/Site No.	Site Name	Total	Total	Average	Total	Total	Average	Total	Total	Average
		Weight (g)	No.	Weight (g)	Weight (g)	No.	Weight (g)	Weight (g)	No.	Weight (g)
Seneca										
101	Canyon Dam Weir-Downstream	2,396	31	77.3	0	0	—	2,829	3	943.3
102	Seneca Bridge-Upstream	5,713	138	41.4	268	3	89.2	567	1	567.6
103	Seneca Bridge-Downstream	4,727	98	48.2	269	2	134.7	782	4	195.4
104	Butt Creek Confluence-Upstream	2,141	117	18.3	0	0	—	4	3	1.3
105	Butt Creek Confluence-Downstream	5,066	124	40.9	0	0	—	1	1	0.5
106	Caribou Powerhouse-Upstream	2,388	89	26.8	0	0	—	2,829	6	471.5
	Reach Subtotal	22,431	597		537	5		7,012	18	
Belden										
107	Belden Dam-Downstream	3,637	31	117.3	0	0	—	3,733	12	310.8
108	Tunnel Addit Bridge-Downstream	2,382	42	56.7	0	0	—	16,647	53	314.0
109	Queen Lily Campground-Upstream	2,416	31	77.9	0	0	—	15,020	22	687.3
110	Queen Lily Campground-Downstream	974	11	88.5	0	0	—	29,346	38	772.3
111	Siphon	3,938	53	74.3	0	0	—	904	3	301.2
	Reach Subtotal	13,347	168		0	0		65,650	128	
Mainstem										
112	Mainstem	1,443	17	84.9	0	0	—	0	0	—
	Reach Subtotal	1,443	17		0	0		0	0	
Upper Butt Creek										
113	Upper Butt Creek	1,377	46	29.9	10,720	13	824.6	16,608	16	1,037.9
	Reach Subtotal	1,377	46		10,720	13		16,608	16	
Lower Butt Creek										
114	Lower Butt Creek	1,011	84	12.0	0	0	—	0	0	—
	Reach Subtotal	1,011	84		0	0		0	0	
Mosquito Creek										
115	Mosquito Creek	1,751	76	23.0	0	0	—	0	0	—
	Reach Subtotal	1,751	76		0	0		0	0	
TOTAL		41,360	988		11,257	18		89,270	162	

Table 9 (cont.). Biomass Estimates by Species at UNFFR Project Electrofishing Sites, Fall 2001.

Reach/Site No.	Site Name	Sculpin			Sacramento pikeminnow			All Species	
		Total Weight (g)	Total No.	Average Weight (g)	Total Weight (g)	Total No.	Average Weight (g)	Total Weight (g)	Percentage of Reach
Seneca									
101	Canyon Dam Weir-Downstream	745	125	5.9	0	0	—	5,970	16.0
102	Seneca Bridge-Upstream	2,768	302	9.2	0	0	—	9,316	25.0
103	Seneca Bridge-Downstream	1,087	110	9.9	0	0	—	6,865	18.4
104	Butt Creek Confluence-Upstream	1,115	152	7.3	0	0	—	3,260	8.8
105	Butt Creek Confluence-Downstream	1,030	108	9.5	0	0	—	6,097	16.4
106	Caribou Powerhouse-Upstream	485	71	6.8	0	0	—	5,702	15.3
	Reach Subtotal	7,230	868		0	0		37,210	
Belden									
107	Belden Dam-Downstream	658	55	12.0	0	0	—	8,028	9.8
108	Tunnel Addit Bridge-Downstream	689	64	10.8	0	0	—	19,718	24.0
109	Queen Lily Campground-Upstream	500	60	8.3	0	0	—	17,936	21.8
110	Queen Lily Campground-Downstream	383	46	8.3	0	0	—	30,703	37.4
111	Siphon	893	92	9.7	0	0	—	5,735	7.0
	Reach Subtotal	3,123	317		0	0		82,120	
Mainstem									
112	Mainstem	2,117	283	7.5	69	9	7.6	3,629	100.0
	Reach Subtotal	2,117	283		69	9	7.6	3,629	
Upper Butt Creek									
113	Upper Butt Creek	704	63	11.2	0	0	—	29,409	100.0
	Reach Subtotal	703.5	63		0	0		29,409	
Lower Butt Creek									
114	Lower Butt Creek	1,426	133	10.3	0	0	—	2,437	100.0
	Reach Subtotal	1,426	133		0	0		2,437	
Mosquito Creek									
115	Mosquito Creek	453	35	12.9	0	0	—	2,204	100.0
	Reach Subtotal	453	35		0	0		2,204	
TOTAL		15,053	1,699		69	9		157,009	

Table 10. Fish Species Collected at the UNFFR Project Electrofishing Sites, Fall 2002.

						Numbers Collected							
Reach/Site No.	Site Name	Date Sampled	Site Length (m)	No. Passes	Effort (sec.)	Rainbow trout	Hatchery trout	Brown trout	Sacramento o sucker	Prickly sculpin	Riffle sculpin	Sacramento pikeminnow	Total
Seneca													
101	Canyon Dam Weir-Downstream	09/30/02	98	5	5,742	45	0	1	0	94	11	0	151
102	Seneca Bridge-Upstream	09/23/02	106	3	11,008	241	0	12	4	0	207	0	464
103	Seneca Bridge-Downstream	10/03/02	80	3		126	0	1	6	0	102	0	235
104	Butt Creek Confluence-Upstream	10/09/02	110	3	7,125	102	0	0	2	0	247	0	351
105	Butt Creek Confluence-Downstream	10/01/02	92	3		132	0	0	2	0	118	0	252
106	Caribou Powerhouse-Upstream	10/08/02	100	4	10,533	74	0	0	4	0	89	0	167
Reach Total						720	0	14	18	94	774	0	1,620
Belden													
107	Belden Dam-Downstream	09/16/02	88	3		41	0	0	12	16	86	1	156
108	Tunnel Addit Bridge-Downstream	09/18/02	100	3	10,617	35	0	0	45	1	55	6	142
109	Queen Lily Campground-Upstream	09/24/02	100	4	10,054	59	3	0	27	0	143	1	233
110	Queen Lily Campground-Downstream	09/19/02	94	5	13,594	61	1	0	48	2	138	3	253
111	Siphon	09/20/02	100	5	9,983	65	3	0	5	0	129	0	202
Reach Total						261	7	0	137	19	551	11	986
Mainstem													
112	Mainstem	09/17/02	72	3	15,591	14	0	0	3	26	111	16	170
Reach Total						14	0	0	3	26	111	16	170
Upper Butt Creek													
113	Upper Butt Creek	09/25/02	100	3		42	0	16	7	0	78	0	143
Reach Total						42	0	16	7	0	78	0	143
Lower Butt Creek													
114	Lower Butt Creek	09/26/02	100	3	6,327	59	0	0	0	0	85	0	144
Reach Total						59	0	0	0	0	85	0	144
Mosquito Creek													
115	Mosquito Creek	09/27/02	100	4	8,560	92	1	0	0	0	45	0	138
Reach Total						92	1	0	0	0	45	0	138
TOTAL						1,188	8	30	165	139	1,644	27	3,201

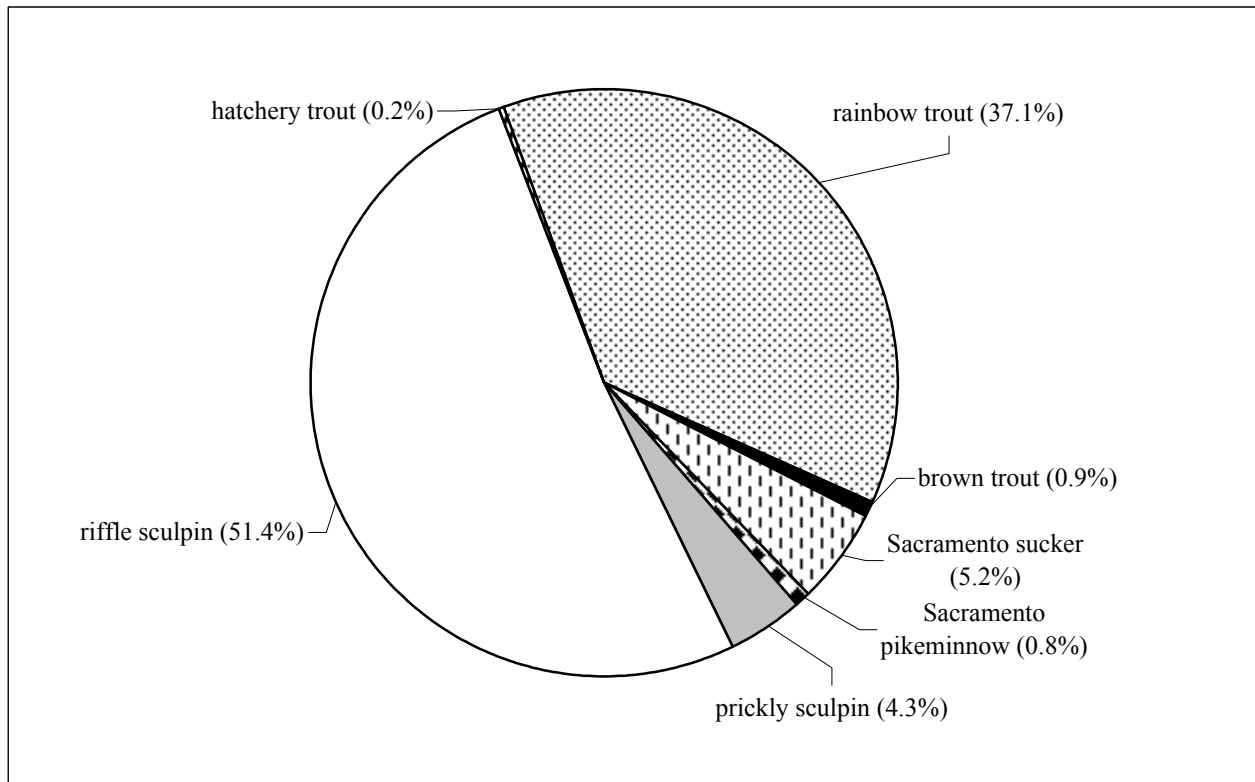


Figure 10. Total Species Composition and Relative Abundance for All Sites, NFFR, Fall 2002.

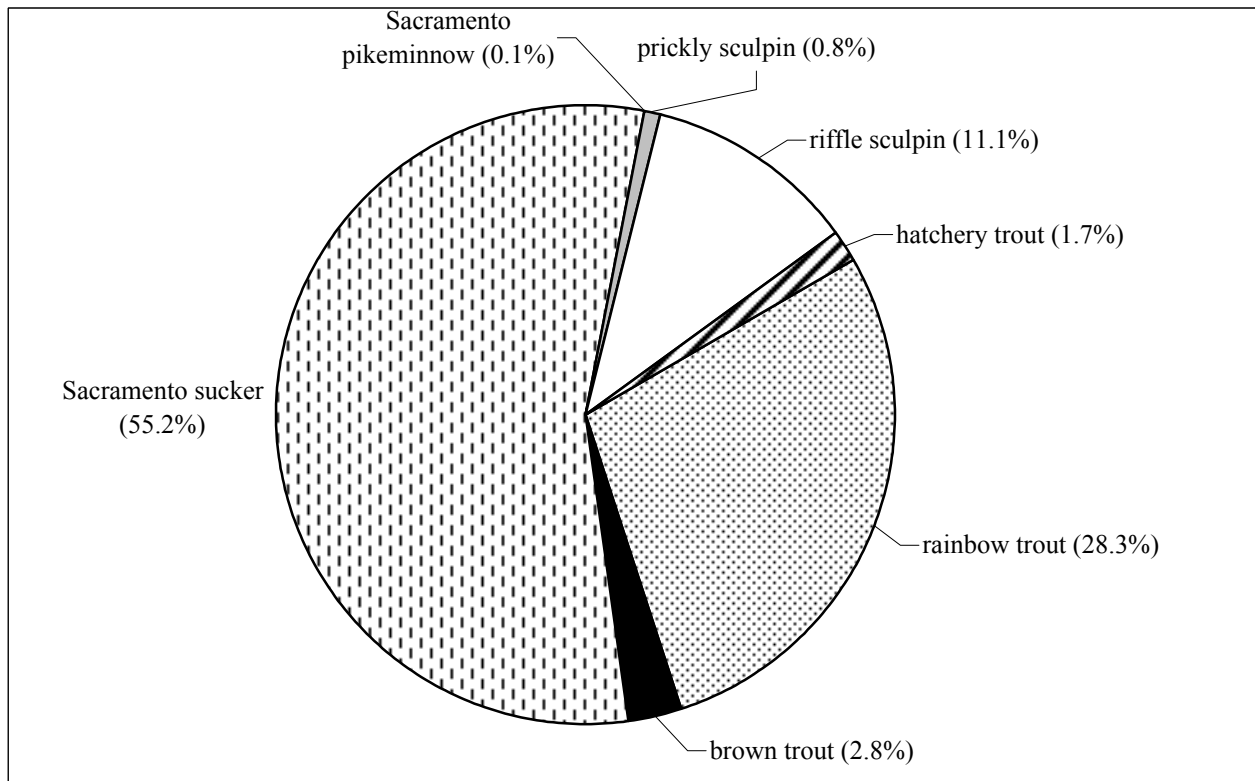


Figure 11. Total Species Biomass for All Sites, NFFR, Fall 2002.

Table 11. Biomass Estimates by Species at UNFFR Project Electrofishing Sites, Fall 2002.

		Rainbow trout			Brown trout			Sacramento Sucker		
Reach/Site No.	Site Name	Total Weight (g)	Total No.	Average Weight (g)	Total Weight (g)	Total No.	Average Weight (g)	Total Weight (g)	Total No.	Average Weight (g)
Seneca										
101	Canyon Dam Weir-Downstream	2,776.2	45	62.2	228.2	1	228.2	0.0	0	–
102	Seneca Bridge-Upstream	4,275.2	241	17.7	1,139.1	12	94.9	1,672.5	4	418.1
103	Seneca Bridge-Downstream	3,265.6	126	26.0	15.5	1	15.5	103.6	6	17.3
104	Butt Creek Confluence-Upstream	2,201.0	102	21.6	0.0	0	–	17.3	2	8.7
105	Butt Creek Confluence-Downstream	3,098.2	132	23.5	0.0	0	–	9.7	2	4.9
106	Caribou Powerhouse-Upstream	1,862.7	74	25.2	0.0	0	–	3,210.0	4	802.5
Reach Subtotal		17,478.9	720		1,382.8	14		5,013.1	18	
Belden										
107	Belden Dam-Downstream	3,190.5	41	77.8	0.0	0	–	1,661.0	12	138.4
108	Tunnel Addit Bridge-Downstream	2,571.3	35	73.5	0.0	0	–	6,522.0	45	144.9
109	Queen Lily Campground-Upstream	1,602.1	59	27.2	0.0	0	–	12,663.4	27	469.0
110	Queen Lily Campground-Downstream	3,612.7	61	59.2	0.0	0	–	36,445.3	48	759.3
111	Siphon	3,636.7	65	55.9	0.0	0	–	1,983.4	5	396.7
Reach Subtotal		14,613.3	261		0.0	0		59,275.1	137	
Mainstem										
112	Mainstem	1,266.4	14	90.5	0.0	0	–	1,207.9	3	402.6
Reach Subtotal		1,266.4	14		0.0	0		1,207.9	3	
Upper Butt Creek										
113	Upper Butt Creek	913.7	42	21.8	2,223.4	16	139.0	5,339.3	7	762.8
Reach Subtotal		913.7	42		2,223.4	16		5,339.3	7	
Lower Butt Creek										
114	Lower Butt Creek	821.8	59	13.9	0.0	0	–	0.0	0	–
Reach Subtotal		821.8	59		0.0	0		0.0	0	
Mosquito Creek										
115	Mosquito Creek	1,276.4	92	13.9	0.0	0	–	0.0	0	–
Reach Subtotal		1,276.4	92		0.0	0		0.0	0	
TOTAL		36,370.5	1,188		3,606.2	30		70,835.4	165	

Table 11 (cont.). Biomass Estimates by Species at UNFFR Project Electrofishing Sites, Fall 2002.

		Prickly Sculpin			Rifle Sculpin			Sacramento pikeminnow			All Species	
Reach/Site No.	Site Name	Total Weight (g)	Total No.	Average Weight (g)	Total Weight (g)	Total No.	Average Weight (g)	Total Weight (g)	Total No.	Average Weight (g)	Total Weight (g)	Percentage of Reach
Seneca												
101	Canyon Dam Weir-Downstream	662.1	94	7.0	143.3	11	13.0	0.0	0	–	3,809.8	12.5
102	Seneca Bridge-Upstream	0.0	0	–	1,940.9	207	9.4	0.0	0	–	9,027.7	29.4
103	Seneca Bridge-Downstream	0.0	0	–	1,077.3	102	10.6	0.0	0	–	4,462.0	14.6
104	Butt Creek Confluence-Upstream	0.0	0	–	1,324.6	247	5.4	0.0	0	–	3,542.9	11.6
105	Butt Creek Confluence-Downstream	0.0	0	–	907.9	118	7.7	0.0	0	–	4,015.8	13.1
106	Caribou Powerhouse-Upstream	0.0	0	–	716.8	89	8.1	0.0	0	–	5,789.5	18.9
	Reach Subtotal	662.1	94		6,110.8	774		0.0	0		30,647.7	
Belden												
107	Belden Dam-Downstream	139.4	16	8.7	1,251.2	86	14.5	26.9	1	26.9	6,269.0	7.7
108	Tunnel Addit Bridge-Downstream	10.2	1	10.2	458.9	55	8.3	9.6	6	1.6	9,572.0	11.8
109	Queen Lily Campground-Upstream	0.0	0	–	1,331.5	143	9.3	2.0	1	2.0	15,599.0	19.2
110	Queen Lily Campground-Downstream	18.0	2	9.0	994.4	138	7.2	17.9	3	6.0	41,088.3	50.6
111	Siphon	0.0	0	–	1,155.4	129	9.0	0.0	0	–	6,775.5	8.4
	Reach Subtotal	167.6	19		5,191.0	551		56.4	11		79,303.8	
Mainstem												
112	Mainstem	249.8	26	9.6	927.6	111	8.4	34.2	16	2.1	3,685.9	100.0
	Reach Subtotal	249.8	26		927.6	111		34.2	16		3,685.9	
Upper Butt Creek												
113	Upper Butt Creek	0.0	0	–	762.8	78	9.8	0.0	0	–	9,239.2	100.0
	Reach Subtotal	0.0	0		762.8	78		0.0	0		9,239.2	
Lower Butt Creek												
114	Lower Butt Creek	0.0	0	–	759.6	85	8.9	0.0	0	–	1,581.4	100.0
	Reach Subtotal	0.0	0		759.6	85		0.0	0		1,581.4	
Mosquito Creek												
115	Mosquito Creek	0.0	0	–	503.8	45	11.2	0.0	0	–	1,780.2	100.0
	Reach Subtotal	0.0	0		503.8	45		0.0	0		1,780.2	
TOTAL		1,079.5	139		14,255.6	1,644		90.2	27		126,238.2	

brown trout (2.8 percent), and hatchery trout 1.7 percent (Figure 11). Prickly sculpin and Sacramento pikeminnow together accounted for less than 1 percent. A summary of results by major reach is provided below.

Seneca Reach – All Sites Combined

Year 2000

A total of 1,577 fish were collected in 2000 from the six quantitative Seneca Reach electrofishing sites. Of the four fish species collected, sculpin were most abundant (69 percent), followed by rainbow trout (29 percent). Brown trout and Sacramento sucker made up the remaining 2 percent (Figure 12).

The total collected biomass in the Seneca Reach in 2000 was 33,320 grams. Rainbow trout accounted for over half (53.5 percent) of the biomass, followed by sculpin (24.5 percent), Sacramento sucker (12 percent), and brown trout (10 percent) (Figure 13).

Year 2001

Year 2001 catch results were similar to that in 2000; however, there were changes in biomass distribution. A total of 1,488 fish were collected from the six Seneca Reach sites. Sculpin (58 percent) and rainbow trout (40 percent) (Figure 14) dominated the catch. Brown trout and Sacramento sucker made up the remaining two percent.

Although the number of fish collected in the Seneca Reach 2001 decreased from that observed in year 2000, biomass was higher (37,210 grams). Rainbow trout (60 percent) and sculpin (20 percent) dominated the biomass, similar to 2000 results. However in 2001, Sacramento sucker accounted for 19 percent of biomass and the remaining 1 percent was brown trout (Figure 15).

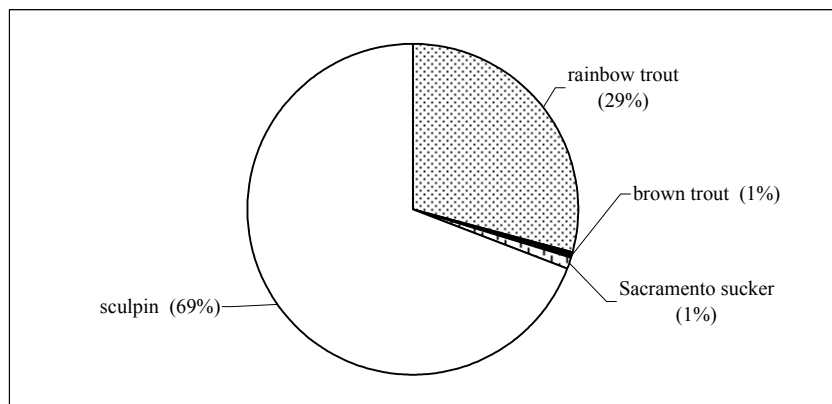


Figure 12. Species Composition and Relative Abundance for Seneca Reach, NFFR, Fall 2000.

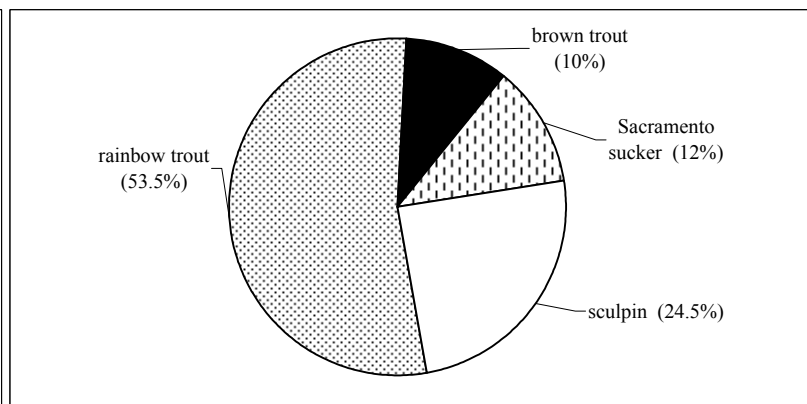


Figure 13. Species Biomass for Seneca Reach, NFFR, Fall 2000.

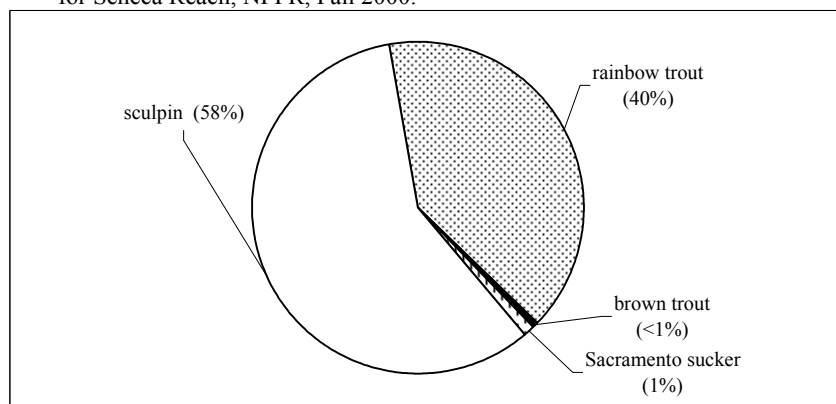


Figure 14. Species Composition and Relative Abundance for Seneca Reach, NFFR, Fall 2001.

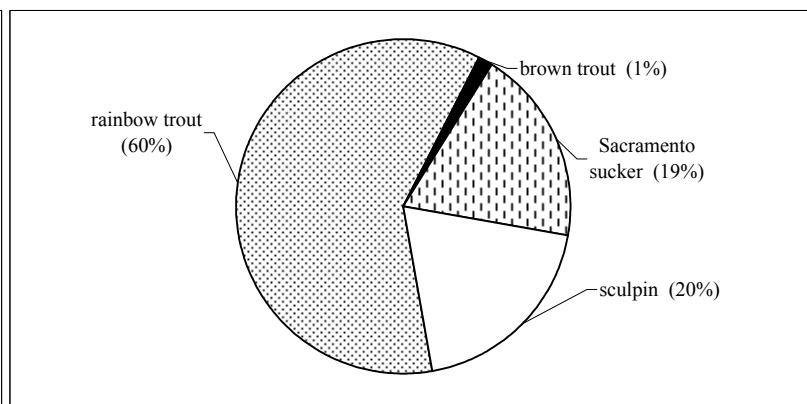


Figure 15. Species Biomass for Seneca Reach, NFFR, Fall 2001.

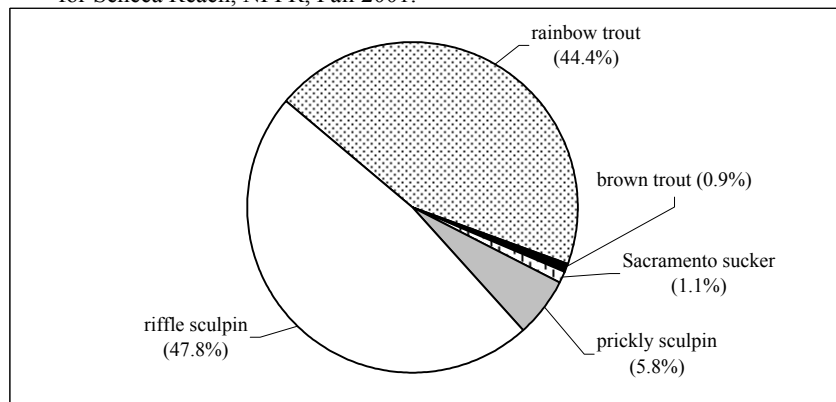


Figure 16. Species Composition and Relative Abundance, for Seneca Reach, NFFR, Fall 2002.

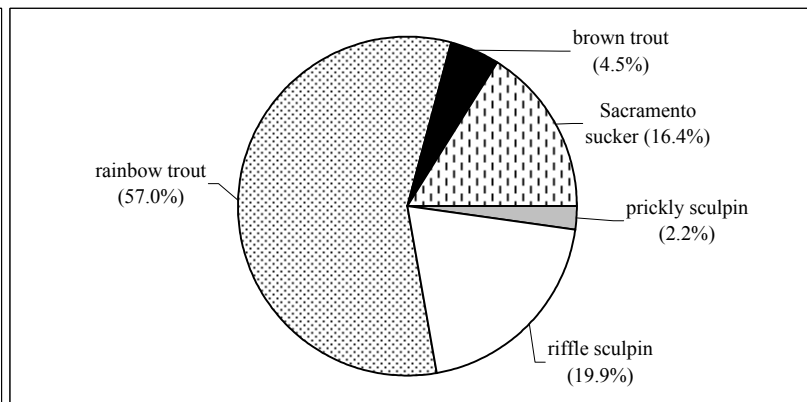


Figure 17. Species Biomass for Seneca Reach, NFFR, Fall 2002.

Year 2002

Species population distribution changed only slightly from 2001; however, there were changes in biomass distribution. A total of 1,620 fish were collected from the six Seneca Reach sites, riffle sculpin (47.8 percent) and rainbow trout (44.4 percent) were co-dominant (Figure 16). Prickly sculpin (5.8 percent), brown trout (0.9 percent) and Sacramento sucker (1.1 percent) made up the remainder of the catch.

The highest abundance of fish during the three years of study was recorded in 2002, fish biomass was the lowest recorded (30,648 grams). Biomass distribution among species was similar to that observed in 2001, with rainbow trout biomass dominant (57 percent), followed by riffle sculpin (19.9 percent), and Sacramento sucker (16.4 percent). Brown trout (4.5 percent) and prickly sculpin (2.2 percent) made up the remainder (Figure 17).

Seneca Reach – Site Specific

Site 101 - Canyon Dam Weir - Downstream

Year 2000

This site ranked fifth in fish abundance and fourth in total biomass among Seneca Reach sites in 2000. One hundred and seventy-six fish (11.2 percent of total Seneca catch) were caught from this site. Approximately 93 percent of the fish caught at this site were sculpin. Two other species were caught at this site, rainbow trout (6 fish) and Sacramento sucker (6 fish), each of which comprised just over 3 percent of the catch.

The total biomass of fish collected at this site was 5,084 grams; 15 percent of the total Seneca Reach biomass. Sculpin accounted for 26 percent of the total biomass, Sacramento sucker accounted for 68 percent, and rainbow trout accounted for 6 percent.

Rainbow trout ranged in length from 45 to 222 mm, sculpin ranged in length from 26 to 110 mm, and Sacramento sucker length ranged from 138 to 460 mm.

Year 2001

This site ranked sixth in fish abundance and fourth in fish biomass of all Seneca Reach sites in 2001. In 2001, 159 fish (10.7 percent of the total Seneca catch) were collected, of which 79 percent were Sculpin. The number of rainbow trout increased substantially in 2001 over 2000 to 31 fish. Rainbow trout (31 fish) and Sacramento sucker (3 fish) together totaled 21 percent of the catch.

The total biomass of fish collected in 2001 was 5,970 grams; 16 percent of the total Seneca Reach biomass. Sacramento sucker biomass declined to 47 percent of the total weight, whereas rainbow trout biomass increased to 40 percent of the collected biomass compared to 2000. Sculpin biomass decreased to 13 percent.

Rainbow trout ranged in length from 136 to 274 mm, Sacramento sucker ranged from 199 to 443 mm, and sculpin ranged from 34 to 110 mm.

Year 2002

This site ranked sixth in fish abundance and fifth in fish biomass of all Seneca Reach sites in 2002. In 2002, 151 fish (9.3 percent) were collected, of which 62 percent were prickly sculpin (94 fish), 30 percent were rainbow trout (45 fish), 7 percent were riffle sculpin (11 fish), and less than one percent were brown trout. No Sacramento sucker were collected in 2002.

The total biomass of fish collected in 2002 was 3,810 grams; 12.5 percent of total Seneca Reach biomass. Rainbow trout biomass increased to 73 percent of the catch, and prickly sculpin biomass increased to 17 percent compared to 2001. Brown trout accounted for 6 percent and riffle sculpin accounted for 4 percent.

Rainbow trout ranged in length from 74 to 270 mm, and sculpin ranged from 34 to 110 mm.

Site 102 - Seneca Bridge - Upstream

Year 2000

This site ranked first in fish abundance and second in fish biomass of all Seneca Reach sites in 2000. Five hundred thirty-one fish (33.7 percent of total Seneca catch) were collected at this site, of which approximately 72 percent were sculpin. Rainbow trout (143 fish) comprised 36 percent of the catch; brown trout (5 fish) comprised the remainder of the catch (0.9 percent).

The total biomass of fish collected from this site was 8,358 grams; 25 percent of the total Seneca Reach biomass. Rainbow trout accounted for 53 percent of total biomass, sculpin accounted for 26 percent, and brown trout accounted for 11 percent.

Rainbow trout ranged in length from 38 to 299 mm, brown trout ranged from 90 to 370 mm, and sculpin ranged from 20 to 180 mm.

Year 2001

This site again ranked first in fish abundance, and also ranked first in fish biomass of all Seneca Reach sites in 2001. Catch rates among species were similar to those observed in 2000. In 2001, 444 fish (29.8 percent of the total catch) were collected at this site, of which 68 percent were sculpin (302 fish). Thirty-one percent of the site catch was rainbow trout (138 fish). The remaining 1 percent included brown trout (3 fish) and Sacramento sucker (1 fish).

The total biomass of fish caught at this site was 9,316 grams, of which 61 percent were rainbow trout, 30 percent were sculpin, and the remaining 9 percent were Sacramento sucker and brown trout combined.

Rainbow trout lengths ranged from 58 to 347 mm, Sacramento sucker was 567 mm in length, brown trout ranged from 108 to 226 mm, and sculpin ranged from 30 to 148 mm.

Year 2002

This site again ranked first in fish abundance, and also ranked first in fish biomass of all Seneca Reach sites in 2002. In 2002, 464 fish (28.6 percent of the total catch) were collected at this site, of which 52 percent were rainbow trout (241 fish). Forty five percent of the site catch was riffle sculpin (207 fish), and the remaining 3.5 percent included brown trout (12 fish) and Sacramento sucker (4 fish).

The total biomass of fish caught at this site was 9,028 grams, of which 47 percent were rainbow trout, 21 percent was riffle sculpin, Sacramento sucker was 18 percent, and brown trout was 12.6 percent.

Rainbow trout lengths ranged from 39 to 313 mm, brown trout ranged from 89 to 401 mm, Sacramento sucker ranged from 70 mm to 350 mm in length, and sculpin ranged from 31 to 152 mm.

Site 103 - Seneca Bridge - Downstream

Year 2000

This site ranked third in fish abundance and first in fish biomass of all Seneca Reach sites in 2000. Two hundred and forty-two fish were collected, of which 60 percent were sculpin (144 fish), 39 percent were rainbow trout (94 fish), and brown trout (3 fish) and Sacramento sucker (1 fish) made up the remaining 1 percent of the catch.

The total biomass of fish collected from this site was 9,174 grams (27.5 percent of total Seneca biomass), of which rainbow trout accounted for 64 percent, brown trout accounted for 22 percent, and sculpin accounted for 14 percent.

Rainbow trout ranged in length from 36 to 460 mm, sculpin ranged from 11 to 140 mm, and brown trout ranged from 190 to 500 mm. The Sacramento sucker was 27 mm in length.

Year 2001

This site ranked fourth in fish abundance and second in fish biomass of all Seneca Reach sites in 2001. Species catch rates in 2001 were similar to those observed in 2000. Two hundred and fourteen fish were collected, of which 51 percent were sculpin (110 fish), and 46 percent were rainbow trout (98 fish). Brown trout (2 fish) and Sacramento sucker (4 fish) made up the remainder of the catch.

The total biomass collected from this site was 6,865 grams, of which 69 percent was rainbow trout and 16 percent was sculpin. Sacramento sucker and brown trout together accounted for about 15 percent.

Rainbow trout ranged in length from 53 to 374 mm, sculpin ranged in length from 28 to 144 mm, Sacramento sucker from 50 to 365 mm, and brown trout from 104 to 262 mm.

Year 2002

This site ranked fourth in fish abundance and third in fish biomass of all Seneca Reach sites in 2002. Species catch rates in 2002 were similar to those observed in 2001. Two hundred and thirty five fish were collected, of which 54 percent were rainbow trout (126 fish), and 43 percent were riffle sculpin (102 fish). Brown trout (1 fish) and Sacramento sucker (6 fish) made up the remainder of the catch.

The total biomass collected from this site was 4,462 grams, of which 73 percent was rainbow trout and 24 percent was riffle sculpin. Sacramento sucker and brown trout together accounted for about 3 percent.

Rainbow trout ranged in length from 46 to 377 mm, riffle sculpin ranged from 32 to 138 mm, Sacramento sucker ranged from 38 to 138 mm, and the brown trout was 112 mm.

Site 104 - Butt Creek Confluence - Upstream

Year 2000

This site ranked second in fish abundance and sixth in fish biomass of all Seneca Reach sites in 2000. Two hundred eighty-two fish were caught at this site. Approximately 78 percent of the catch was sculpin (144 fish), and 21 percent were rainbow trout (58 fish). Sacramento sucker (3 fish) comprised the remainder of the catch.

The total biomass of fish caught at the site was only 2,232 grams, of which rainbow trout accounted for 54 percent and sculpin accounted for 46 percent. Sacramento sucker accounted for less than 1 percent of total biomass.

Rainbow trout ranged in length from 32 to 255 mm, sculpin ranged from 22 to 141 mm, and Sacramento sucker ranged from 22 to 45 mm.

Year 2001

This site again ranked second in fish abundance and sixth in fish biomass of all Seneca Reach sites in 2001. Of the 272 fish caught at this site, 56 percent were sculpin (152 fish). The number of rainbow trout increased substantially (117 fish) over 2000, accounting for 43 percent of the catch. Sacramento sucker accounted for 1 percent.

The total biomass for this site was 3,260 grams. Rainbow trout biomass increased to 66 percent, while sculpin biomass decreased to 34 percent compared to 2000. Sacramento sucker biomass was less than 1 percent of the total.

Rainbow trout ranged in length from 47 to 328 mm, sculpin ranged from 32 to 149 mm, and Sacramento sucker ranged in length from 32 to 58 mm.

Year 2002

This site again ranked second in fish abundance and sixth in fish biomass of all Seneca Reach sites in 2002. Of the 351 fish caught at this site, 70 percent were riffle sculpin (247 fish). The number of rainbow trout decreased (102 fish) from both 2000 and 2001, accounting for 29 percent of the catch. Sacramento sucker accounted for less than 1 percent.

The total biomass for this site was 3,543 grams. Rainbow trout biomass was 62 percent, riffle sculpin was 37 percent, and Sacramento sucker was less than 1 percent of the total.

Rainbow trout ranged in length from 50 to 330 mm, sculpin ranged from 32 to 130 mm, and Sacramento sucker ranged in length from 52 to 106 mm.

Site 105: Butt Creek Confluence - Downstream

Year 2000

This site ranked fourth in fish abundance and third in fish biomass of all Seneca Reach sites in 2000. One hundred ninety-seven fish were caught at this site. The catch consisted primarily of sculpin (104 fish) and rainbow trout (91 fish) 53 percent and 46 percent of the catch, respectively. Together, brown trout (1 fish) and Sacramento sucker (1 fish) accounted for 1 percent of the catch.

The total biomass of fish caught at the site was 5,763 grams. Rainbow trout accounted for 76 percent of the total biomass, sculpin accounted for 14 percent, brown trout accounted for 9 percent, and Sacramento sucker accounted for less than 1 percent.

Rainbow trout ranged in length from 48 to 350 mm, sculpin ranged from 32 to 142 mm, the Sacramento sucker was 170 mm, and the brown trout was 359 mm in length.

Year 2001

This site ranked third in both fish abundance and in fish biomass of all Seneca Reach sites in 2001. Two hundred and thirty-three fish were caught at this site. Catch rates were similar among species as in 2000. Rainbow trout (124 fish) and sculpin (108 fish) accounted for 53 percent and 46 percent, respectively. Only one Sacramento sucker was caught.

The total biomass for this site was 6,162 grams. Rainbow trout biomass was 83 percent of the total biomass, while sculpin accounted for 17 percent. Sacramento sucker biomass was incidental.

Rainbow trout ranged in length from 40 to 390 mm, sculpin ranged in length from 34 to 132 mm, and the Sacramento sucker was 35 mm in length.

Year 2002

This site ranked third in fish abundance and fourth in fish biomass of all Seneca Reach sites in 2002. Catch rates were similar among species as in the two previous sampling efforts. Two hundred and fifty-two fish were caught, of which rainbow trout (132 fish) and riffle sculpin (118 fish) accounted for 52 and 47 percent, respectively. Only two Sacramento sucker were caught, representing less than one percent of the fish caught.

The total biomass for this site was 4,016 grams. Rainbow trout accounted for 77 percent, sculpin accounted for 22 percent, and the Sacramento sucker biomass was incidental.

Rainbow trout ranged in length from 49 to 244 mm, sculpin ranged from 34 to 138 mm, and Sacramento sucker ranged from 40 to 88 mm in length.

Site 106: Caribou Powerhouse – Upstream

Year 2000

This site ranked sixth in fish abundance and fifth in fish biomass of all Seneca Reach sites in 2000. One hundred forty-nine fish were caught at the site. Sculpin (73 fish) and rainbow trout (69 fish) accounted for 49 percent and 46 percent of the catch, respectively. Sacramento sucker (7 fish) comprised 5 percent of the catch.

The total biomass of fish caught at the site was 2,709 grams, of which rainbow trout accounted for 63 percent of total biomass, sculpin accounted for 21 percent, and Sacramento sucker accounted for 16 percent.

Rainbow trout caught at the site ranged in length from 44 to 273 mm, sculpin ranged in length from 35 to 154 mm, and Sacramento sucker ranged in length from 124 to 210 mm.

Year 2001

This site ranked fifth both in fish abundance and fish biomass for all Seneca Reach sites in 2001. One hundred and sixty-six fish were collected at this site, of which rainbow trout (89 fish) and sculpin (71 fish) accounted for 54 and 43 percent of the catch, respectively. Six Sacramento suckers were collected and accounted for 3 percent of the catch.

The total biomass for this site was 5,702 grams, of which Sacramento sucker biomass increased substantially to 50 percent compared to 2001. Rainbow trout accounted for 42 percent and sculpin accounted for the remaining 8 percent.

Rainbow trout ranged in length from 54 to 338 mm, Sacramento sucker ranged from 162 to 365 mm, and sculpin ranged from 36 to 129 mm.

Year 2002

This site ranked fifth in fish abundance and second in fish biomass for all Seneca Reach sites in 2002. One hundred and sixty-seven fish were collected at this site. Rainbow trout declined to 44 percent (74 fish) from 2001, and sculpin (89 fish) accounted for 53 percent of the catch. Four Sacramento sucker were collected, accounting for 2 percent of the catch.

The total biomass for this site was 5,790 grams, of which Sacramento sucker biomass accounted for 55 percent, rainbow trout accounted for 32 percent, and riffle sculpin accounted for the remaining 12 percent.

Rainbow trout ranged in length from 56 to 238 mm, Sacramento sucker ranged from 367 to 396 mm, and sculpin ranged from 30 to 152 mm.

Site 116: Canyon Dam Weir – Upstream

Year 2001

This site was only sampled in 2001. The sampling effort consisted of only one pass with a single electroshocker. Three hundred twenty-five fish were caught. Eighty percent of the catch was sculpin, followed by 15 percent for rainbow trout (49 fish), and 5 percent Sacramento sucker. Rainbow trout lengths ranged from 150 to 290 mm. Because this site was only evaluated qualitatively, results from this site were not included in the overall analysis.

Belden Reach – All Sites Combined

Year 2000

One thousand and twenty-eight fish were collected from the five Belden Reach sites in 2000, not including 17 hatchery rainbow trout. Hatchery rainbow trout were easily distinguished from wild trout because of their frayed dorsal fins, clubbed pelvic and pectoral fins, and general body

shape. Sculpin (611 fish) were numerically dominant throughout the Belden Reach sites accounting for 59.4 percent of total Belden Reach fish composition. Rainbow trout (219 fish) accounted for 21.3 percent and Sacramento sucker (196 fish) accounted for 19.1 percent. Only four Sacramento pikeminnow were collected from Belden Reach sites (less than 1 percent) (Figure 18).

The total fish biomass collected from Belden Reach sites was 108,045 grams. Sacramento sucker represented 79.4 percent of the total reach biomass, followed by rainbow trout (15.5 percent), and sculpin (4.8 percent). Sacramento pikeminnow were also caught from the Belden Reach, but they only represented 0.2 percent of the total biomass (Figure 19).

Year 2001

Fewer fish were collected from Belden Reach sites in 2001 as compared to 2000. Six hundred and thirteen fish were caught from the six Belden Reach sites during 2001, of which 51.7 percent of the catch was sculpin (317 fish), followed by 27.4 percent for rainbow trout (168 fish), and 20.9 percent Sacramento sucker (129 fish) (Figure 20). No Sacramento pikeminnow were collected from Belden Reach sites in 2001.

There was a decline in the total biomass in 2001 as compared to biomass collected in 2000. However, species distribution remained the same. The total biomass for Belden Reach was 82,120 grams. Sacramento sucker represented 80 percent of the total biomass, followed by 16.2 percent for rainbow trout, and 3.8 percent for sculpin (Figure 21).

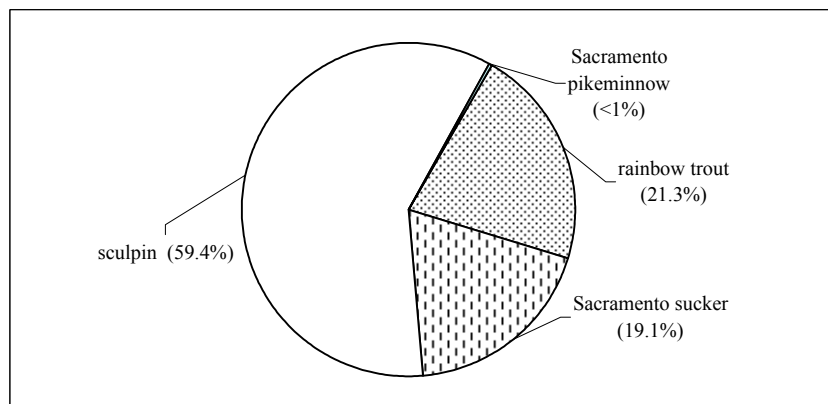


Figure 18. Species Composition and Relative Abundance for Belden Reach, NFFR, Fall 2000.

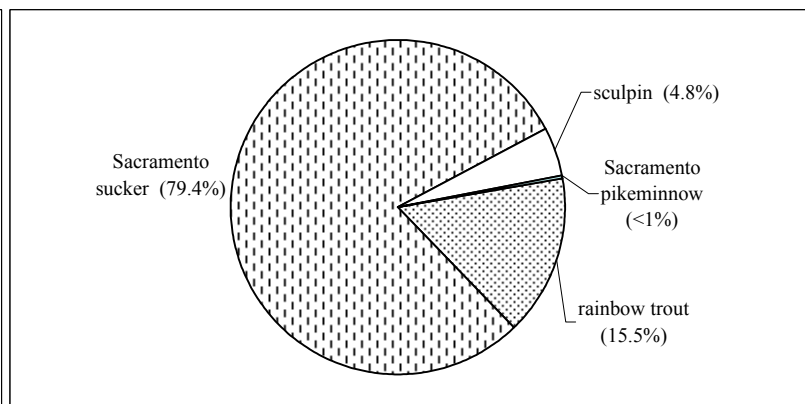


Figure 19. Species Biomass for Belden Reach, NFFR, Fall 2000.

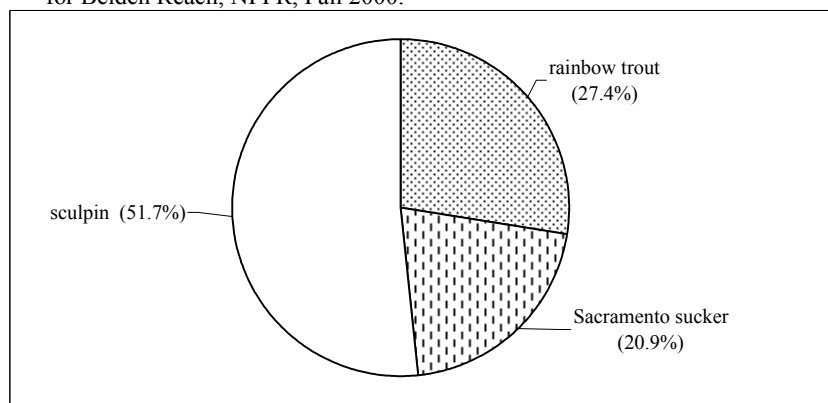


Figure 20. Species Composition and Relative Abundance for Belden Reach, NFFR, Fall 2001.

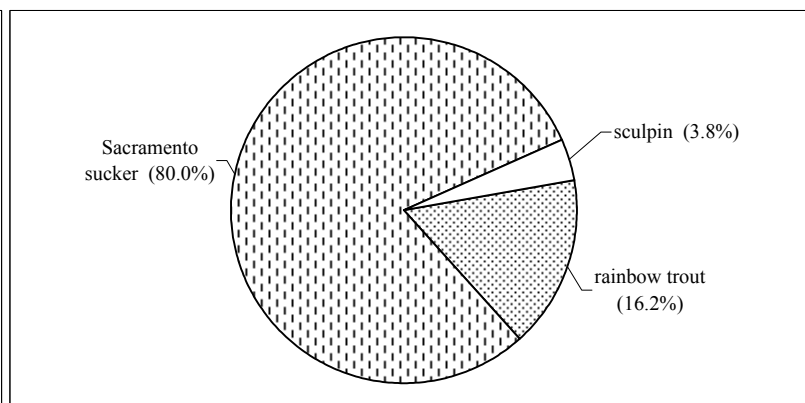


Figure 21. Species Biomass for Belden Reach, NFFR, Fall 2001.

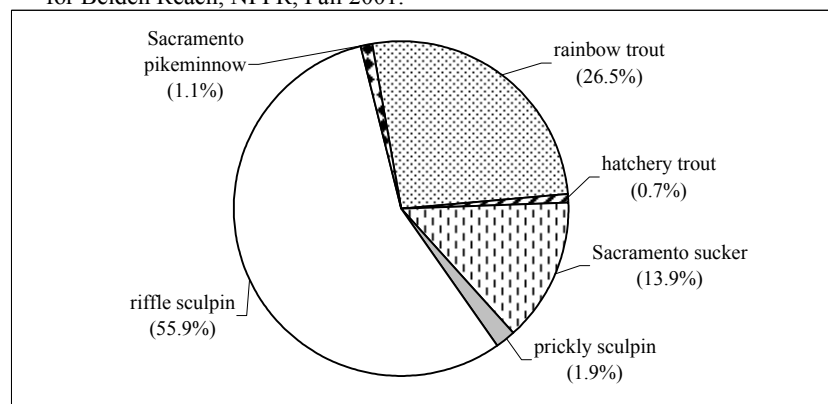


Figure 22. Species Composition and Relative Abundance for Belden Reach, NFFR, Fall 2002.

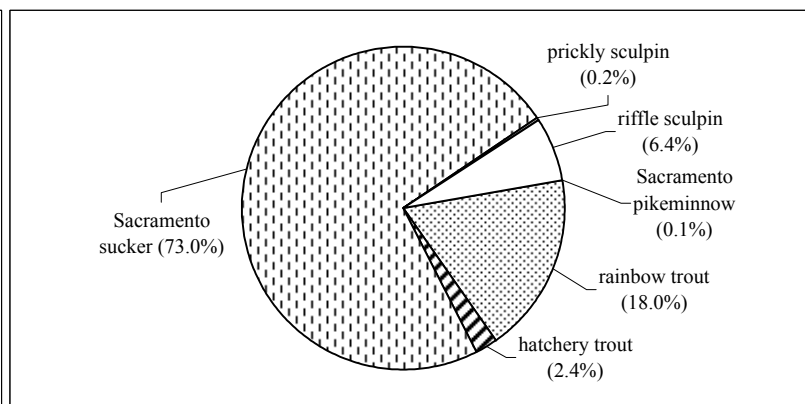


Figure 23. Species Biomass for Belden Reach, NFFR, Fall 2002.

Year 2002

Belden Reach fish abundance increased in 2002 as compared to 2001. Nine hundred eighty six were caught from the five Belden Reach sites during 2002, of which 55.9 percent were riffle sculpin (551 fish), followed by 26.5 percent for rainbow trout (261 fish), 13.9 percent Sacramento sucker (137 fish), 1.9 percent prickly sculpin (19 fish), and 1.1 percent Sacramento pikeminnow (11 fish) (Figure 22). Less than one percent of the total catch consisted of hatchery trout.

The total biomass for Belden reach in 2002 was 79,304 grams. Sacramento sucker represented 73 percent of the total biomass, followed by 18 percent for rainbow trout, 6.4 percent for riffle sculpin, 0.2 percent for prickly sculpin, and 0.1 percent for Sacramento pikeminnow (Figure 23). In addition, hatchery trout made 2.4 percent of the total biomass.

Belden Reach – Site Specific

Site 107: Belden Dam – Downstream

Year 2000

This site ranked fourth both in fish abundance and fish biomass of all Belden Reach sites in 2000. One hundred seventy-five fish were caught at this site, of which sculpin (86 fish) accounted for 49 percent, 29 percent were rainbow trout (50 fish), and 22 percent were Sacramento sucker (39 fish).

The total biomass of fish collected at this site was 12,230 grams. Sacramento sucker accounted for 52 percent of total biomass, rainbow trout accounted for 37 percent, and sculpin accounted for 11 percent.

Rainbow trout ranged in length from 90 to 320 mm, sculpin ranged from 40 to 130 mm, and Sacramento sucker ranged from 58 to 348 mm.

Year 2001

This site ranked fourth both in fish abundance and fish biomass of all Belden Reach sites in 2001. Ninety-eight fish were caught, of which sculpin represented 56 percent of the total catch (55 fish). Rainbow trout numbers decreased to 31 fish, accounting for 32 percent of the catch. Sacramento sucker also decreased to 12 fish, representing 12 percent of the catch.

The total biomass for this site was 8,028 grams. Nearly 47 percent of the biomass was Sacramento sucker, rainbow trout was 45 percent, and sculpin accounted for the remaining 8 percent of the biomass.

Rainbow trout ranged in length from 86 to 298 mm, Sacramento sucker ranged from 138 to 344 mm, and sculpin ranged from 43 to 123 mm.

Year 2002

This site ranked fourth in fish abundance and fifth in fish biomass of all Belden Reach sites in 2001, essentially the same as in the previous two sampling efforts. One hundred fifty-six fish were caught at this site in 2002. Riffle sculpin (86 fish) represented 55 percent of the total catch. Rainbow trout numbers increased to 41 fish, accounting for 26 percent of the catch. Prickly sculpin (16 fish) accounted for 10 percent, Sacramento sucker (12 fish) accounted for 8 percent, and Sacramento pikeminnow (1 fish) accounted for <1 percent of the catch.

The total biomass for this site was 6,269 grams. Nearly 51 percent of the biomass was rainbow trout, Sacramento sucker was 27 percent, prickly sculpin was 17 percent, and riffle sculpin was 4 percent. Sacramento pikeminnow accounted for 1 percent.

Rainbow trout ranged in length from 85 to 365 mm, Sacramento sucker ranged from 53 to 359 mm, and sculpin ranged from 37 to 131 mm.

Site 108: Tunnel Addit Bridge – Downstream

Year 2000

This site ranked second in fish abundance and first in fish biomass of all Belden Reach sites in 2000. Two hundred sixty-six fish were caught at this site, of which Sacramento sucker accounted for 38 percent (101 fish), rainbow trout accounted for 19 percent (52 fish), sculpin accounted for 42 percent (111 fish), and Sacramento pikeminnow (2 fish) accounted for less than 1 percent.

The total biomass of fish caught at the site was 49,388 grams. Sacramento sucker accounted for 91 percent of total biomass, whereas rainbow trout accounted for 6 percent. Sculpin accounted for 2 percent of the biomass, and Sacramento pikeminnow less than 1 percent.

Rainbow trout caught at the site ranged in length from 75 to 268 mm, sculpin ranged from 38 to 127 mm, Sacramento sucker ranged from 51 to 495 mm, and Sacramento pikeminnow ranged from 230 to 250 mm.

Year 2001

This site again ranked second in fish abundance, but decreased to second in rank for fish biomass of all Belden Reach sites in 2001. One hundred and fifty-nine fish were caught at this site.

Sculpin (64 fish) represented 40 percent of the total catch. Sacramento sucker catch decreased to 33 percent (53 fish), and rainbow trout catch decreased to 26 percent (42 fish) compared to 2000.

The total biomass for this site was 19,718 grams. Eighty-four percent of the total biomass was Sacramento sucker, rainbow trout accounted for 12 percent, and sculpin represented only 4 percent of the catch.

Rainbow trout lengths ranged from 71 to 306 mm, sculpin ranged from 43 to 135 mm, and Sacramento sucker ranged from 52 to 465 mm.

Year 2002

This site dropped to fifth in fish abundance and third in fish biomass of all Belden Reach sites in 2002. One hundred and forty-two fish were caught at this site. Riffle sculpin represented 39 percent of the total catch (55 fish), Sacramento sucker accounted for 32 percent (45 fish), rainbow trout accounted for 25 percent (35 fish), and Sacramento pikeminnow and prickly sculpin made up the remainder of the catch (6 and 1 fish, respectively).

The total biomass for this site was 9,572 grams. Sixty-eight percent of the total biomass was Sacramento sucker, rainbow trout accounted for 27 percent, and sculpin (prickly and riffle) represented 5 percent of the catch.

Rainbow trout lengths ranged from 56 to 345 mm, sculpin ranged from 29 to 132 mm, and Sacramento sucker ranged from 48 to 419 mm.

Site 109: Queen Lily Campground - Upstream

Year 2000

This site ranked fifth in fish abundance and second in fish biomass of all Belden Reach sites in 2000. One hundred thirty-five fish were caught at this site. Approximately 54 percent of the catch was sculpin (73 fish), 27 percent were rainbow trout (36 fish), and Sacramento sucker (26 fish) comprised the remaining 19 percent of the catch.

The total biomass of fish caught at the site was 24,093 grams. Sacramento sucker accounted for 91 percent of total biomass, rainbow trout accounted for 7 percent, and sculpin 2 percent.

Rainbow trout ranged in length from 46 to 339 mm, sculpin ranged from 26 to 125 mm, and Sacramento sucker ranged from 51 to 750 mm.

Year 2001

This site ranked third both in fish abundance and fish biomass in 2001 of all Belden Reach sites. One hundred thirteen fish were caught at this site. Sculpin (60 fish) was the most abundant species, representing nearly 53 percent of the catch. Twenty-seven percent were rainbow trout (31 fish) and 20 percent were Sacramento sucker (22 fish).

The total biomass for this site was 17,936 grams. Eighty-four percent of the total biomass was Sacramento sucker, followed by rainbow trout with 13 percent, and sculpin with 3 percent.

Rainbow trout caught at the site ranged in length from 62 to 415 mm, sculpin ranged from 42 to 126 mm, and Sacramento sucker ranged in length from 50 to 470 mm.

Year 2002

This site ranked second both in fish abundance and fish biomass in 2002 of all Belden Reach sites. Two hundred thirty-three fish were caught at this site. Riffle Sculpin (144 fish) was the most abundant species, representing 61 percent of the catch. Rainbow trout accounted for 25 percent of the catch (59 fish), and nearly 12 percent were Sacramento sucker (27 fish).

The total biomass for this site was 16,504 grams (including 905 grams of hatchery trout). Seventy-seven percent of the total biomass was Sacramento sucker, followed by rainbow trout with 10 percent, and riffle sculpin with 8 percent. Hatchery trout accounted for the remaining 5 percent of biomass.

Rainbow trout caught at the site ranged in length from 63 to 332 mm, sculpin ranged from 37 to 126 mm, and Sacramento sucker ranged from 52 to 429 mm.

Site 110: Queen Lily Campground - Downstream

Year 2000

This site ranked third both in fish abundance and fish biomass of all Belden Reach sites in 2000. One hundred eighty-three fish were collected, of which 74 percent were sculpin (136 fish), 17 percent were rainbow trout (31 fish), and 9 percent were Sacramento sucker (16 fish).

The total biomass of fish caught at the site was 12,325 grams. Sacramento sucker accounted for 62 percent of total biomass, rainbow trout accounted for 29 percent, and sculpin accounted for 9 percent.

Rainbow trout ranged in length from 77 to 460 mm, sculpin ranged in length from 39 to 130 mm, and Sacramento sucker ranged in length from 223 to 465 mm.

Year 2001

This site ranked fifth in fish abundance and first in fish biomass of all Belden Reach sites in 2001. Ninety-five fish were caught at this site, of which 48 percent were sculpin (46 fish), 40 percent were Sacramento sucker (38 fish), and 12 percent were rainbow trout (11 fish). Rainbow trout abundance declined in 2001 by almost one-third compared to 2000.

The total biomass for this site during 2001 was 30,703 grams. Ninety-six percent of the total biomass was Sacramento sucker, 3 percent was rainbow trout, and only 1 percent was sculpin.

Rainbow trout ranged in length from 82 to 265 mm, sculpin ranged from 44 to 123 mm, and Sacramento sucker ranged from 46 to 460 mm.

Year 2002

This site ranked first in both fish abundance and fish biomass of all Belden Reach sites in 2002. Two hundred fifty-three fish were caught at this site, of which 55 percent were riffle sculpin (48 fish), 24 percent were rainbow trout (61 fish), and 19 percent were Sacramento sucker (48 fish). Hatchery trout made up 2 percent of the catch.

The total biomass for this site in 2002 was 41,328 grams (including 240 grams of hatchery trout). Eighty-eight percent of the biomass was Sacramento sucker, 9 percent was rainbow trout, and 2 percent was riffle sculpin. Hatchery trout accounted for 1 percent of the catch.

Rainbow trout ranged in length from 63 to 392 mm, sculpin ranged from 36 to 122 mm, and Sacramento sucker ranged from 53 to 468 mm.

Site 111: Siphon

Year 2000

This site ranked first in fish abundance and fifth in fish biomass of all Belden Reach sites in 2000. Two hundred eighty six fish were caught (including 17 hatchery trout). Sculpin (205 fish) were the most abundant species, representing 76 percent of the catch, followed by 19 percent for rainbow trout (50 fish), and 5 percent for Sacramento sucker (14 fish), not including the hatchery trout.

The total biomass of fish caught at the site was 10,009 grams. Rainbow trout accounted for 38 percent of the total biomass, Sacramento sucker accounted for 46 percent, and sculpin accounted for 16 percent.

Rainbow trout caught at the site ranged in length from 60 to 320 mm, sculpin ranged from 36 to 131 mm, and Sacramento sucker ranged from 64 to 460 mm.

Year 2001

This site ranked second in fish abundance and fifth in fish biomass of all Belden Reach sites in 2001. One hundred and forty-eight fish were caught, of which 62 percent were sculpin (92 fish), 36 percent were rainbow trout (53 fish) and 2 percent were Sacramento sucker (3 fish).

The total biomass for this site was 5,735 grams. Nearly 69 percent of the biomass was rainbow trout. Sculpin and Sacramento sucker each represented 16 percent of the total biomass.

Rainbow trout ranged in length from 55 to 390 mm, sculpin ranged from 32 to 147 mm, and Sacramento sucker ranged from 122 to 403 mm.

Year 2002

This site ranked third in fish abundance and fourth in fish biomass of all Belden Reach sites in 2002. Two hundred and two fish were caught at this site, of which 65 percent were riffle sculpin (129 fish). Rainbow trout numbers increased slightly (65 fish), over both 2000 and 2001 accounting for 32 percent of the catch. Only 5 Sacramento sucker were collected in 2002, accounting for slightly less than 3 percent of the catch. Hatchery trout (3 fish) made up 1 percent of the catch.

The total biomass for this site was 7,577 grams (including 801 grams of hatchery trout). Nearly 48 percent of the biomass was rainbow trout, with Sacramento sucker representing 26 percent of the total biomass, and riffle sculpin accounting for 15 percent. Hatchery trout made up the remaining 11 percent.

Rainbow trout ranged in length from 57 to 265 mm, sculpin ranged from 35 to 128 mm, and Sacramento sucker ranged from 52 to 450 mm.

Mainstem

Site 112: Mainstem - Belden Town – Upstream

Year 2000

One hundred twelve fish were collected at this site in 2000. Sculpin (99 fish) was the most abundant species, representing 88 percent of the catch. Rainbow trout (7 fish) comprised 6 percent of the catch, followed by 4 percent for Sacramento sucker (4 fish), and 2 percent for Sacramento pikeminnow (2 fish) (Figure 24).

The total biomass of fish collected at this site was 2,086 grams. Sacramento sucker accounted for 45 percent of total biomass, rainbow trout accounted for 24.5 percent, sculpin percent (Figure 25), and Sacramento pikeminnow accounted for less than 1 percent.

Rainbow trout caught at the site ranged in length from 80 to 360 mm, sculpin ranged from 34 to 110 mm, and Sacramento sucker ranged in length from 79 to 455 mm.

Year 2001

Three hundred nine fish were caught at the mainstem site in 2001, of which 92 percent were sculpin (283 fish). The rainbow trout catch accounted for 6 percent of the biomass (increased to 17 fish) and 9 Sacramento pikeminnow accounted for 3 percent of the catch (Figure 26).

The total biomass for this site was 3,629 grams. Sculpin represented 58 percent of the total biomass, rainbow trout biomass increased to 40 percent, and Sacramento pikeminnow biomass was 2 percent (Figure 27).

Rainbow trout ranged in length from 67 to 302 mm, sculpin ranged from 51 to 112 mm, and Sacramento pikeminnow ranged from 15 to 137 mm.

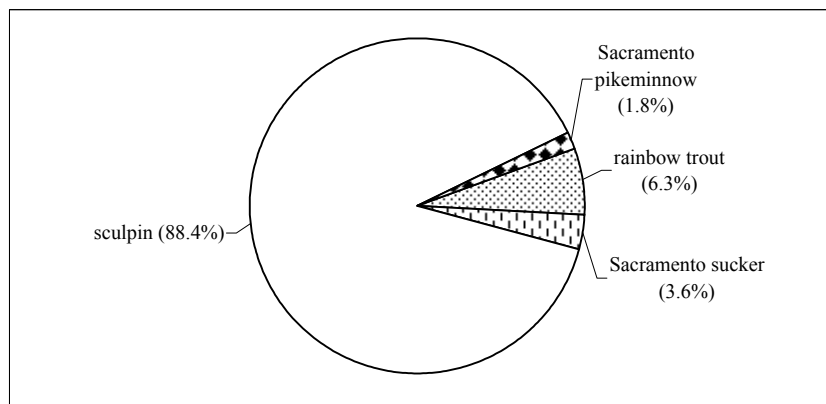


Figure 24. Species Composition and Relative Abundance for Mainstem, NFFR, Fall 2000.

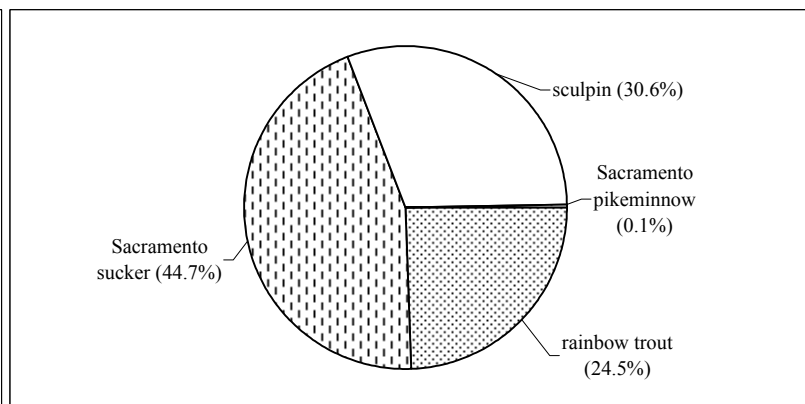


Figure 25. Species Biomass for Mainstem, NFFR, Fall 2000.

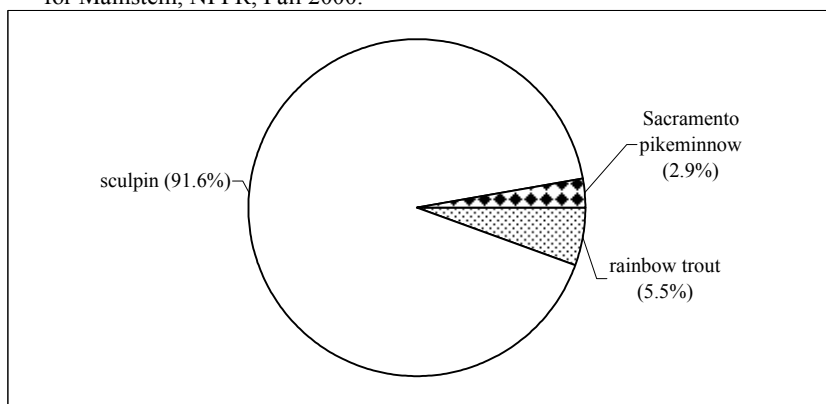


Figure 26. Species Composition and Relative Abundance for Mainstem, NFFR, Fall 2001.

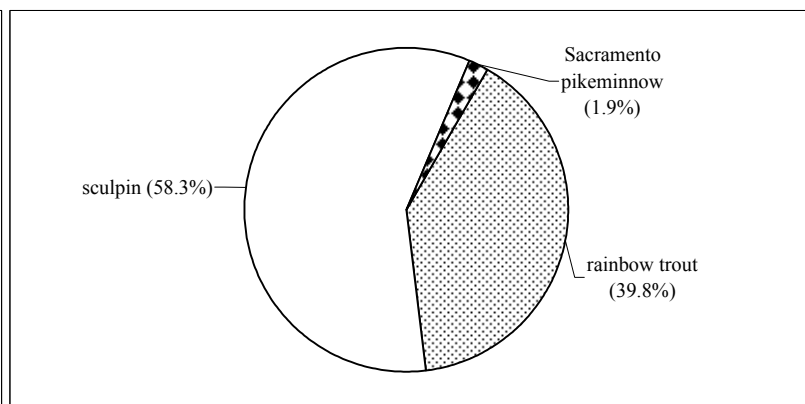


Figure 27. Species Biomass for Mainstem, NFFR, Fall 2001.

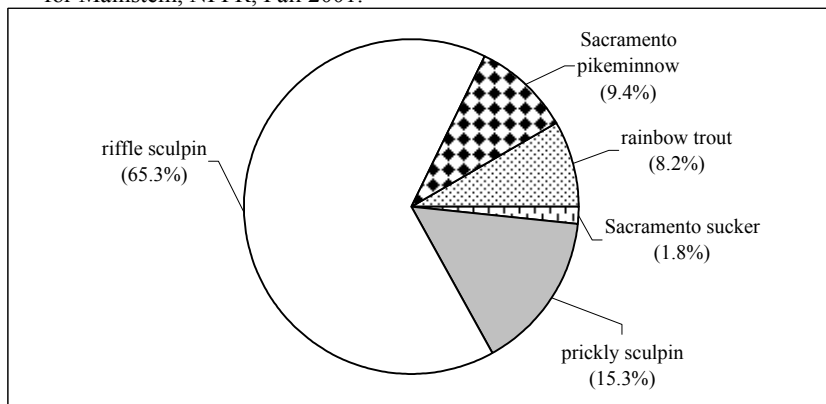


Figure 28. Species Composition and Relative Abundance for Mainstem, NFFR, Fall 2002.

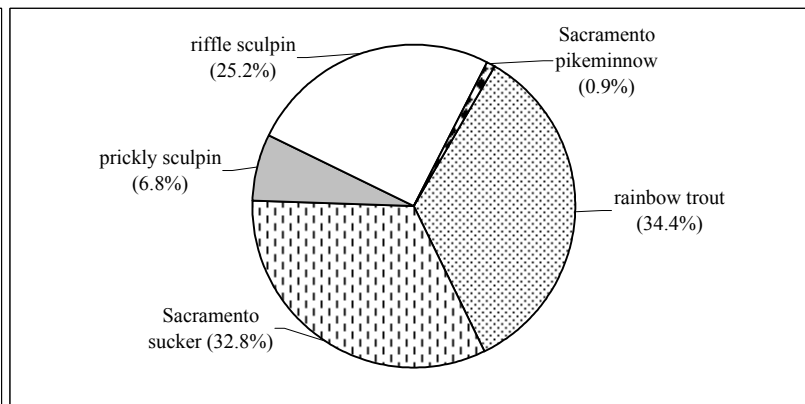


Figure 29. Species Biomass for Mainstem, NFFR, Fall 2002.

Year 2002

One hundred seventy fish were caught at the mainstem site, of which 80 percent were sculpin (137 fish); 65 percent were riffle sculpin (111 fish) and 15 percent were prickly sculpin (26 fish). Rainbow trout accounted for 8 percent of the catch (14 fish), Sacramento pikeminnow accounted for 9.4 percent (16 fish), and Sacramento sucker for less than 2 percent (3 fish) of the catch (Figure 28).

The total biomass at this site was 3,686 grams. Rainbow trout biomass was 34.4 percent, riffle sculpin represented 25.2 percent of the total biomass, Sacramento sucker was 32.8 percent, prickly sculpin was 6.8 percent, and Sacramento pikeminnow was less than 1 percent (Figure 29).

Rainbow trout ranged in length from 63 to 334 mm, sculpin ranged from 50 to 114 mm, Sacramento sucker ranged from 79 mm to 460 mm, and Sacramento pikeminnow ranged from 32 to 124 mm.

Upper Butt Creek

Site 113: Upper Butt Creek

Year 2000

The catch included 263 fish at this site, with sculpin (125 fish) making up 48 percent of all fish collected. Rainbow trout accounted for 28.5 percent (75 fish), Sacramento sucker (50 fish) accounted for 19 percent, and brown trout (13 fish) accounted for 5 percent (Figure 30).

The total biomass of fish caught at the site was 80,949 grams. Sacramento sucker accounted for 85 percent of total biomass, brown trout accounted for 8.5 percent, rainbow trout accounted for 5 percent, and sculpin accounted for the remaining 1.5 percent (Figure 31).

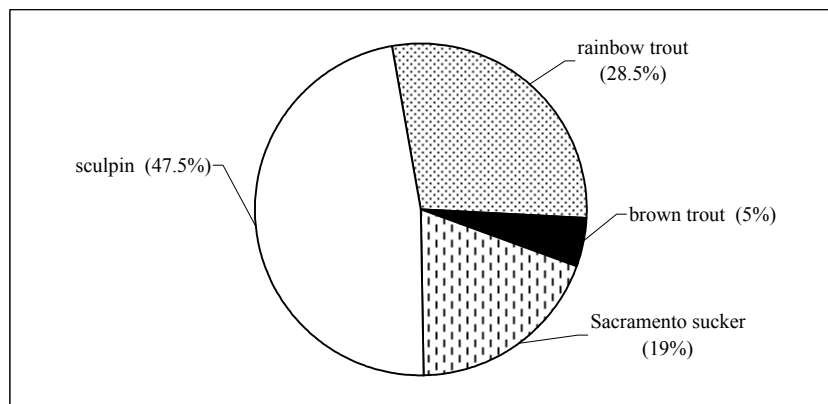


Figure 30. Species Composition and Relative Abundance for Upper Butt Creek, NFFR, Fall 2000.

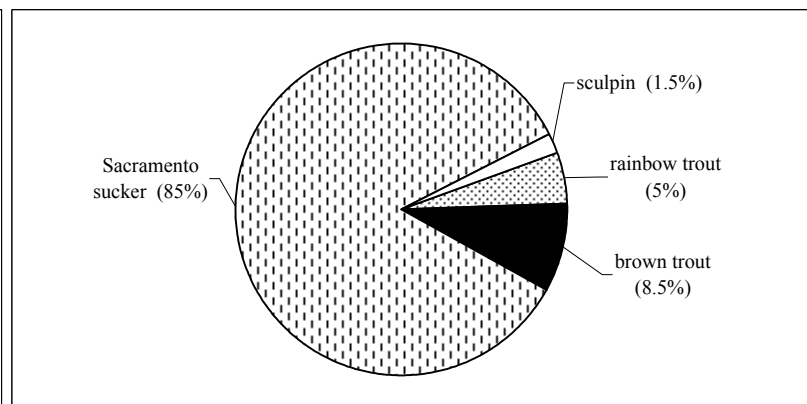


Figure 31. Species Biomass for Upper Butt Creek, NFFR, Fall 2000.

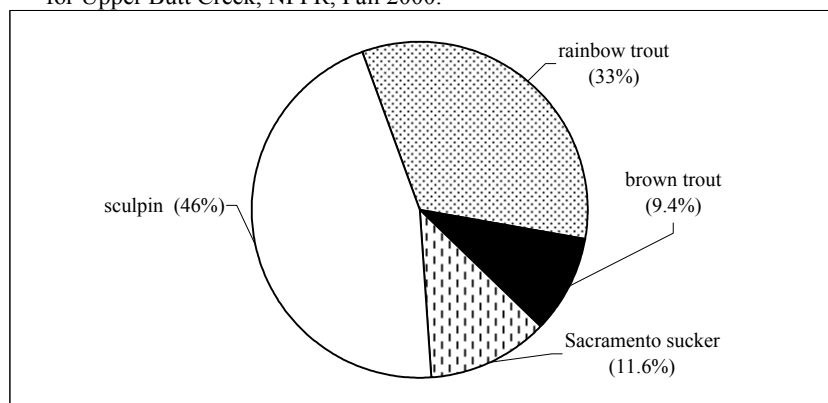


Figure 32. Species Composition and Relative Abundance for Upper Butt Creek, NFFR, Fall 2001.

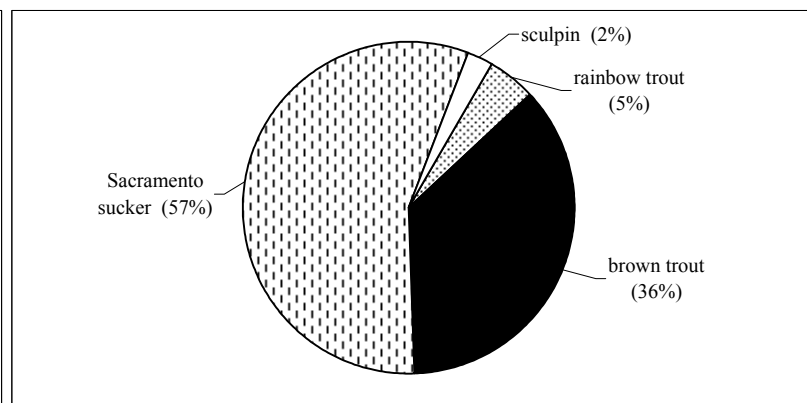


Figure 33. Species Biomass for Upper Butt Creek, NFFR, Fall 2001.

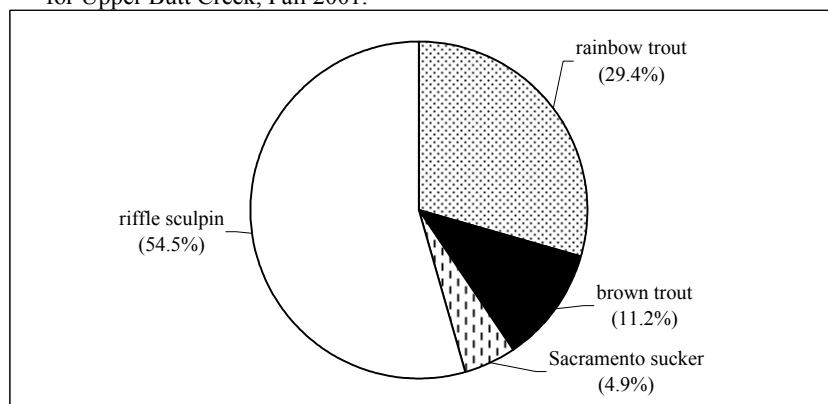


Figure 34. Species Composition and Relative Abundance for Upper Butt Creek, NFFR, Fall 2002.

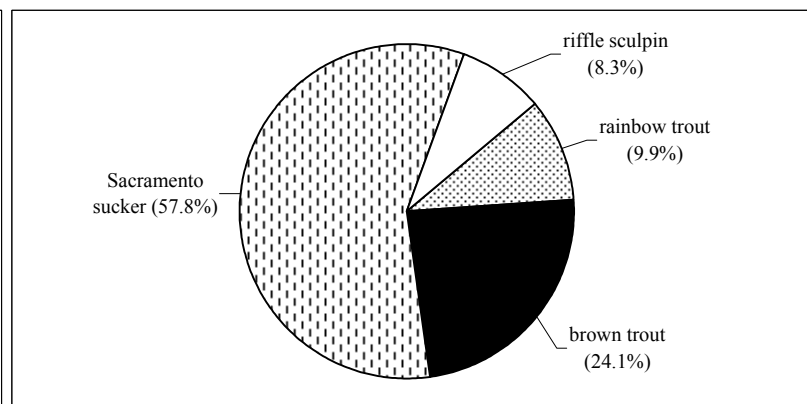


Figure 35. Species Biomass for Upper Butt Creek, NFFR, Fall 2002.

Rainbow trout ranged in length from 52 to 350 mm, Sacramento sucker ranged in length from 129 to 510 mm, and sculpin ranged in length from 27 to 141 mm.

Year 2001

One hundred and thirty-eight fish were collected, of which 46 percent were sculpin (63 fish). The rainbow trout catch in 2001 (46 fish) decreased from 2000, accounting for 33 percent, as did Sacramento sucker (16 fish), accounting for 11.6 percent. The brown trout catch remained stable (13 fish) and accounted for 9.4 percent (Figure 32).

The total biomass for this site was 29,409 grams. Approximately 57 percent of the biomass was Sacramento sucker, followed by 36 percent for brown trout, 5 percent for rainbow trout, and 2 percent for sculpin (Figure 33).

Rainbow trout ranged in length from 47 to 241 mm, sculpin ranged from 33 to 147 mm, brown trout ranged in length from 71 to 688 mm, and Sacramento sucker ranged from 171 to 508 mm.

Year 2002

One hundred and forty-three fish were collected, of which 55 percent were riffle sculpin (78 fish). Rainbow trout accounted for 29.4 percent (42 fish), Sacramento sucker accounted for 4.9 percent (7 fish), and brown trout accounted for 11 percent (16 fish) (Figure 34).

The total biomass for this site was 9,239 grams. Approximately 58 percent of this biomass was Sacramento sucker, followed by 24.1 percent for brown trout, 9.9 percent for rainbow trout, and 8.3 percent for riffle sculpin (Figure 35).

Rainbow trout ranged in length from 42 to 219 mm, sculpin ranged from 31 to 144 mm, brown trout ranged from 89 to 390 mm, and Sacramento sucker ranged from 161 mm to 478 mm.

Lower Butt Creek Reach

Site 114: Lower Butt Creek

Year 2000

The entire catch of 176 fish was comprised of sculpin and rainbow trout at this site. Sculpin (115 fish) accounted for 65 percent of the catch and rainbow trout 35 percent (61 fish) (Figure 36).

The total biomass of fish collected at this site was 2,411 grams. Sculpin accounted for 60 percent of the total biomass, and rainbow trout accounted for 40 percent (Figure 37). Rainbow trout ranged in length from 48 to 208 mm, and sculpin ranged in length from 33 to 158 mm.

Year 2001

Sculpin and rainbow trout again were the only species in the catch of 217 fish at this site. Sculpin (133 fish) accounted for 61.3 percent of the catch. The numbers of rainbow trout increased in 2001 (84 fish), and accounted for 38.7 percent of the catch (Figure 38).

The total biomass was 2,437 grams. Sculpin represented 58 percent of the total biomass for this site, and rainbow trout accounted for 42 percent (Figure 39).

Rainbow trout ranged in length from 44 to 211 mm, and sculpin ranged in length from 25 to 146 mm.

Year 2002

Sculpin and rainbow trout were again the only species in the catch of 144 fish at this site during 2002. Sculpin (85 fish) accounted for 59 percent of the catch. The rainbow trout catch

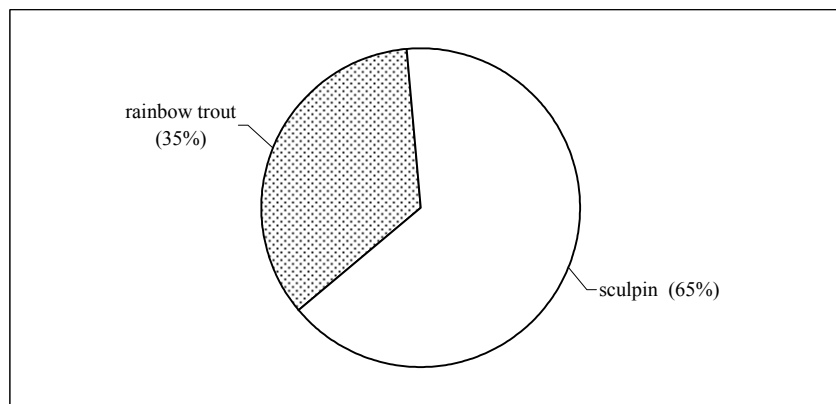


Figure 36. Species Composition and Relative Abundance for Lower Butt Creek, NFFR, Fall 2000.

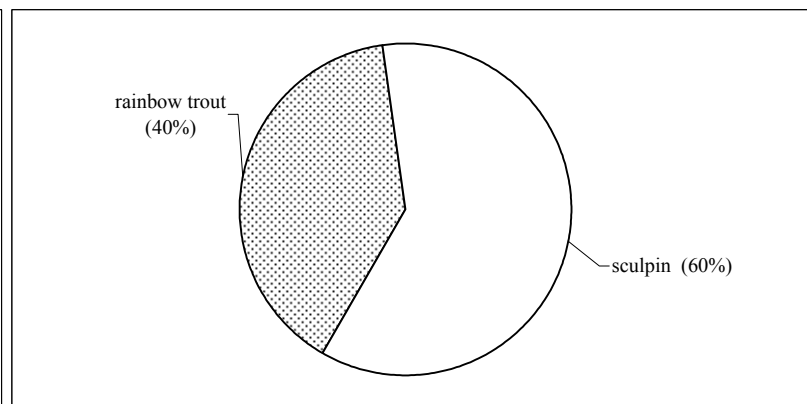


Figure 37. Species Biomass for Lower Butt Creek, NFFR, Fall 2000.

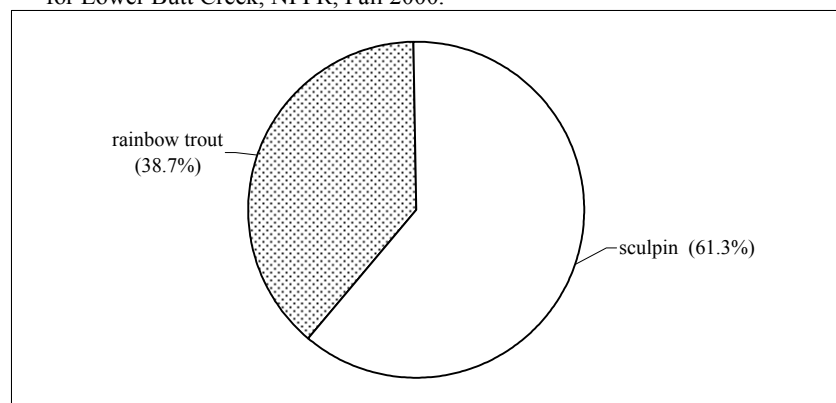


Figure 38. Species Composition and Relative Abundance for Lower Butt Creek, Fall 2001.

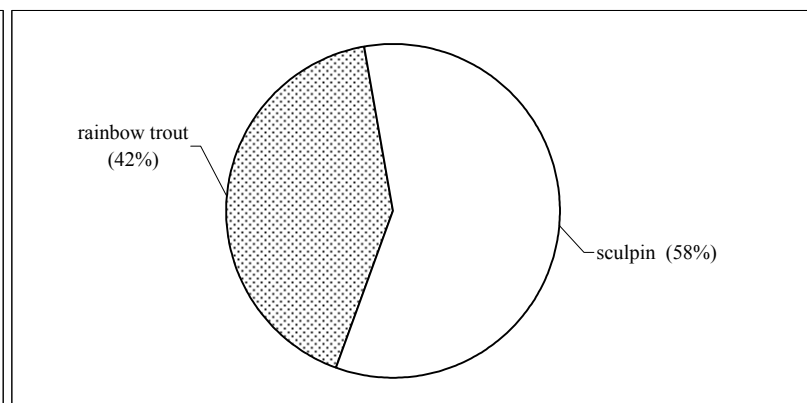


Figure 39. Species Biomass for Lower Butt Creek, NFFR, Fall 2001.

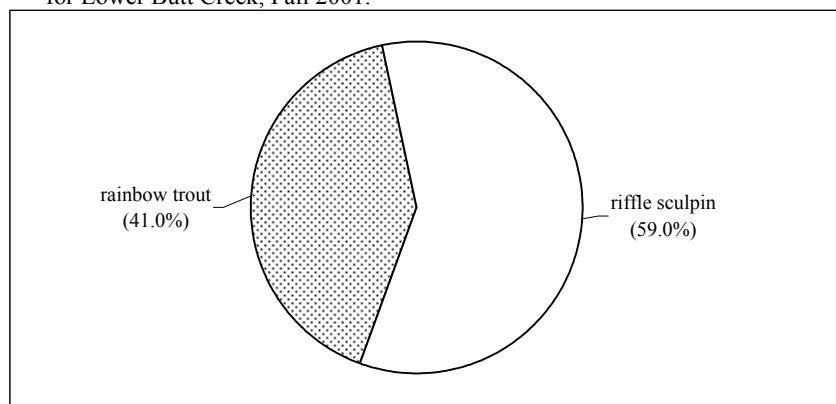


Figure 40. Species Composition and Relative Abundance for Lower Butt Creek, NFFR, Fall 2002.

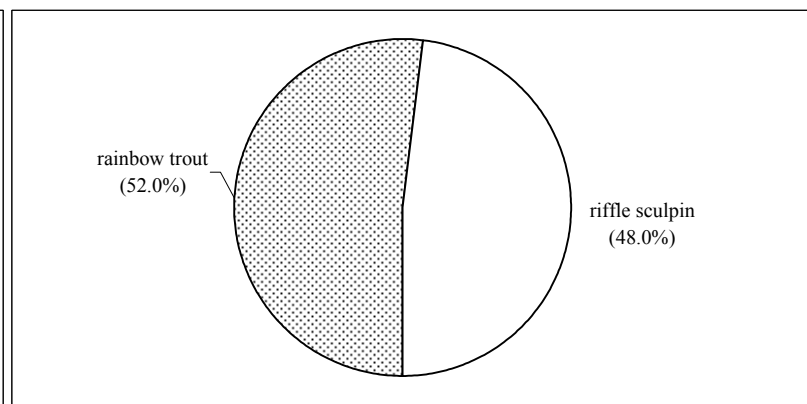


Figure 41. Species Biomass for Lower Butt Creek, NFFR, Fall 2002.

decreased in 2002 (59 fish) compared to 2001 (84 fish) but was similar to 2000 (61 fish), and accounted for 41 percent of the catch (Figure 40).

The total biomass was 1,581 grams. Sculpin represented 48 percent of the biomass, and rainbow trout accounted for 52 percent (Figure 41).

Rainbow trout ranged in length from 49 to 209 mm, and sculpin ranged from 38 to 152 mm.

Mosquito Creek Reach

Site 115: Mosquito Creek

Year 2000

No electrofishing was performed at Mosquito Creek during 2000.

Year 2001

The entire catch of 111 fish consisted of rainbow trout and sculpin, of which 69 percent was rainbow trout (76 fish), and 31 percent was sculpin (35 fish) (Figure 42).

The total biomass was 2,204 grams, of which nearly 80 percent was rainbow trout and 20 percent was sculpin (Figure 43).

Rainbow trout ranged in length from 41 to 272 mm and sculpin ranged from 60 to 130 mm.

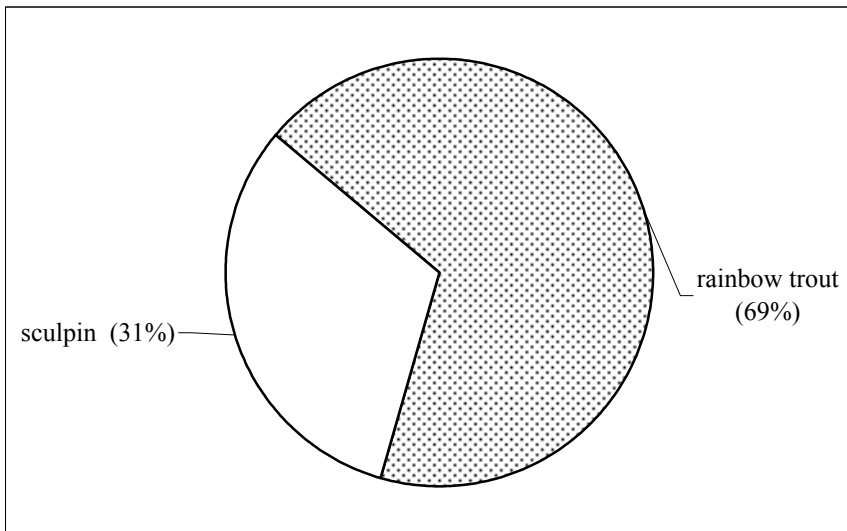


Figure 42. Species Composition and Relative Abundance for Mosquito Creek, NFFR, Fall 2001.

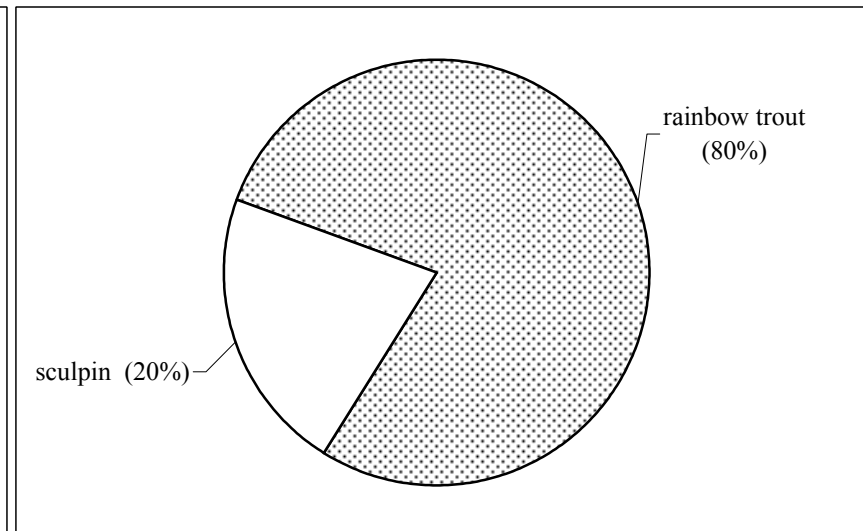


Figure 43. Species Biomass for Mosquito Creek, NFFR, Fall 2001.

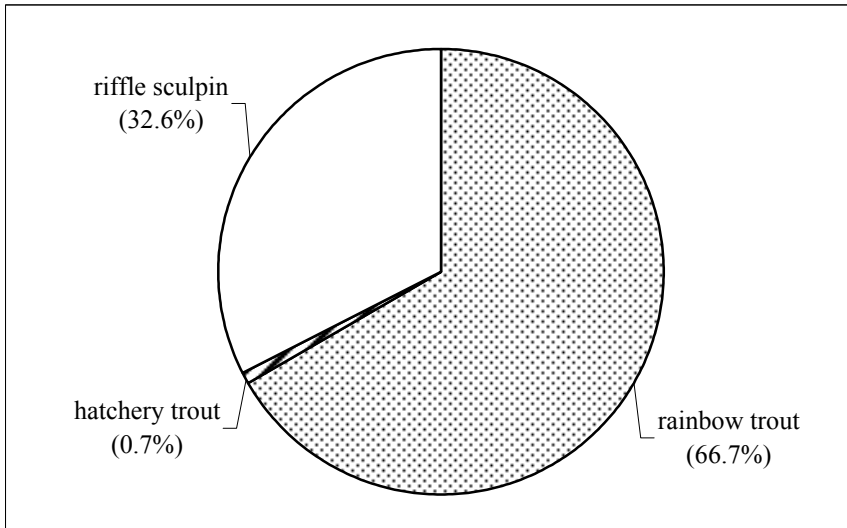


Figure 44. Species Composition and Relative Abundance for Mosquito Creek, NFFR, Fall 2002.

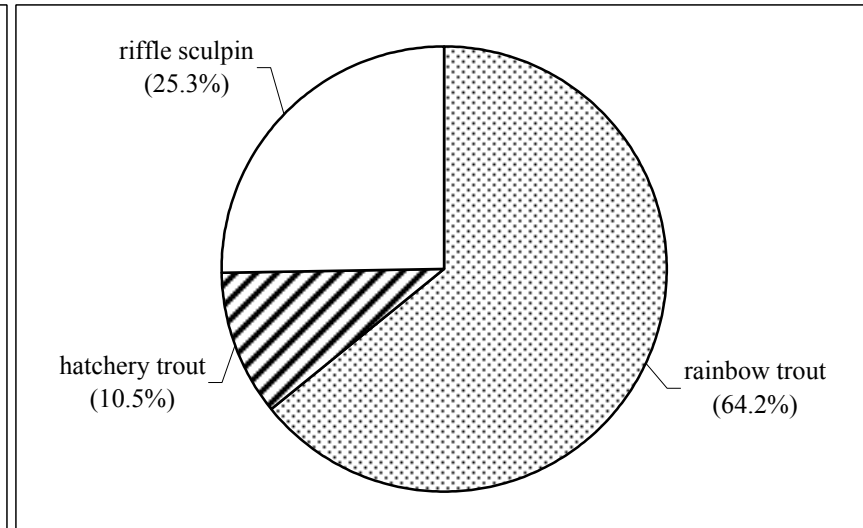


Figure 45. Species Biomass for Mosquito Creek, NFFR, Fall 2002.

Year 2002

The catch of 138 fish consisted of rainbow trout and riffle sculpin, of which 66.7 percent was rainbow trout (92 fish), and 32.6 percent was riffle sculpin (45 fish) (Figure 44). One hatchery trout, accounting for less than 1 percent of the catch, was also collected.

The total biomass was 1,988 grams (including 208 grams of hatchery trout), of which 64.2 percent was rainbow trout, 25.3 percent was sculpin, and one hatchery trout accounted for 10.5 percent (Figure 45).

Rainbow trout ranged in length from 40 to 205 mm and sculpin ranged from 35 to 139 mm.

3.2.3 Snorkel Survey Results

Eleven direct observation snorkel sites were sampled in 2000, 16 sites in 2001, and 18 sites in 2002 to supplement fish population data collected by backpack electrofishing, especially in the deeper pool areas where backpack electrofishing was not possible (Appendix C). In 2000, site lengths varied from 12 to 50 m at the nine Seneca Reach sites, and from 12 to 38 m at the two Belden Reach sites. In 2001, site lengths ranged from 15 to 50 m at the ten Seneca Reach snorkeling sites, and from 15 to 48 m at the six Belden Reach sites. In 2002, site lengths ranged from 9 to 45 m at the twelve snorkeling sites, and from 15 to 40 m at the six Belden Reach sites.

Because site lengths were variable, it was not possible to directly compare results among sites. Consequently, the data were standardized to reflect the number of fish per 100 m. During the three years of record, average rainbow trout abundance (per 100 m) in Belden Reach pool habitat was 1.4 to 2.2 times more abundant than in Seneca Reach pool habitat (1.4 in 2000, 1.5 in 2001, and 2.2 in 2002). During the three years of record, average Sacramento sucker abundance (per 100 m) of Belden Reach pool habitat was 6.0 to 25.0 times more abundant than in Seneca Reach pool habitat (6.0 in 2000, 25.0 in 2001, and 10.7 in 2002).

Year 2000

Snorkel survey results for 2000 are summarized in Table 12 and length-frequencies of observed fish are presented in Table 13. Average number of rainbow trout per 100 m was higher in Belden Reach pools, averaging 84.0 trout/100 m, as compared with 59.1 trout/100 m at Seneca Reach pools. Average numbers of Sacramento sucker were comparable to the electrofishing results; suckers were relatively abundant in Belden Reach (52.0 suckers/100 m) and scarce in the Seneca Reach (8.7 sucker/100 m).

In general, more rainbow trout were observed in the “0-3 inches” class, followed by similar numbers in 2 other length classes: “3 to 6 inches” and “6 to 9 inches”. Also, larger trout (“12 to 15 inches” and “greater than 15 inches”) were more abundant in Belden Reach pool habitat, as compared with Seneca Reach pool habitat. Sacramento sucker were generally evenly distributed among size classes in Seneca Reach pool habitat, except that no suckers greater than 15 inches were observed. This contrasts with observations in Belden Reach pool habitat, where the majority of Sacramento sucker were greater than 15 inches in length.

Year 2001

Snorkel survey results for 2001 are summarized in Table 14, and the length-frequencies of observed fish are presented in Table 15. In 2001, average rainbow trout abundance was again higher in Belden Reach pools (67.9 trout/100m) as compared to 44.6 trout/100 m in Seneca Reach. An average of 77.6 suckers/100 m were observed in Belden Reach pools, compared to 3.1 suckers/100 m in Seneca Reach pools. One smallmouth bass was observed upstream from the confluence with Davis Creek in Seneca Reach.

Rainbow trout length range patterns observed in 2001 were similar to those observed in 2000. However, most of the Sacramento suckers observed in 2001 were larger individuals (greater than 9 inches) in both Seneca and Belden Reach pool habitat. Larger Sacramento sucker (“12 to 15 inches” and “greater than 15 inches”) were most abundant in Belden Reach pool habitat.

Table 12. Observational Data Summary for the UNFFR Project Snorkel Survey Sites, Fall 2000.

										No. Observed (1st/2nd Pass)		
Reach Name / Site No.	Site Name	Date Sampled	RM	Elevation (m)	Site Length (m)	Site Width Max (m)	Site Depth Avg (m)	Visibility (m)	No. of Passes	Rainbow trout	Sacramento sucker	Sculpin
Seneca												
301	Skinner Flat pool 1	09/19/00	17.7	1302	12	9	1.0	0.6	2	0/0	4/2	0/0
302	Skinner Flat pool 2	09/19/00	17.8	1287	50	18	1.5	0.8	1	3	0	2
303	Davis Creek-Upstream pool 1	09/19/00	14.8	1119	23	14	3.0	1.1	2	10/3	6/0	0/1
304	Davis Creek Confluence pool	09/19/00	14.6	1116	16	11	1.0	1.1	2	6/2	3/7	0/0
305	Butt Creek Confluence-Downstream pool 1	09/18/00	9.3	951	26	12	1.8	1.7	2	23/16	0/1	2/1
306	Butt Creek Confluence-Downstream pool 2	09/18/00	9.2	945	35	12	0.8	1.8	2	39/23	1/0	1/0
307	Butt Creek Confluence-Downstream pool 3	09/18/00	9.1	942	25	14	1.7	2.4	2	15/7	1/0	1/1
308	Caribou Powerhouse-Upstream pool 1	09/18/00	8.7	930	37	13	1.0	1.2	2	29/25	0/1	2/0
309	Caribou Powerhouse-Upstream pool 2	09/18/00	8.6	927	18	12	1.0	1.2	2	14/18	0/0	0/0
*Reach Subtotal					242					143	21	9
Number per 100 m										59.1	8.7	3.7
Belden												
310	Mosquito Creek Confluence-Downstream	09/27/00	3.4	780	12	9	1.3	4.6	2	14/11	1/1	0/2
311	Queen Lily Campground-Downstream	09/27/00	2.2	756	38	15	1.1	4.6	2	26/28	12/25	0/0
*Reach Subtotal					50					42	26	2
Number per 100 m										84.0	52.0	4.0
TOTAL NUMBER ¹					292					185	47	11

* Subtotal and total numbers based on the maximum number of fish observed between the two passes.

Table 13. Length Frequency by Species and Site for the UNFFR Project Snorkel Survey Sites, Fall 2000.

Reach Name / Site No. Site name		Numbers Observed (1st Pass/ 2nd Pass):													
		Rainbow Trout						Sacramento Sucker						Sculpin	
		0 > 3"	3 > 6"	6 > 9"	9 > 12"	12 > 15"	15"+	0 > 3"	3 > 6"	6 > 9"	9 > 12"	12 > 15"	15"+	0 > 3"	3 > 6"
Seneca															
301	Skinner Flat pool 1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1/2	0/0	3/0	0/0	0/0	0/0	0/0
302	Skinner Flat pool 2	0	3	0	0	0	0	0	0	0	0	0	0	0	0/0
303	Davis Creek-Upstream pool 1	8/1	2/1	0/0	0/0	0/1	0/0	0/0	0/0	2/0	2/0	2/0	0/0	0/0	0/1
304	Davis Creek confluence pool	3/1	3/1	0/0	0/0	0/0	0/0	3/7	0/0	0/0	0/0	0/0	0/0	0/0	0/0
305	Butt Creek Confluence-Dowstream pool 1	16/11	4/2	3/2	0/1	0/0	0/0	0/0	0/0	0/0	0/1	0/0	0/0	2/1	0/0
306	Butt Creek Confluence-Dowstream pool 2	16/12	14/11	6/8	0/0	2/0	1/0	0/0	1/0	0/0	0/0	0/0	0/0	0/0	1/0
307	Butt Creek Confluence-Dowstream pool 3	4/2	0/4	6/1	3/0	1/0	1/0	0/0	0/0	1/0	0/0	0/0	0/0	0/0	0/0
308	Caribou Powerhouse-Upstream pool 1	12/14	3/6	12/3	2/2	1/0	0/0	0/0	0/0	0/1	0/0	0/0	0/0	2/0	0/0
309	Caribou Powerhouse-Upstream pool 2	5/4	6/2	3/1	0/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Belden															
310	Mosquito Creek Confluence-Downstream	1/0	2/2	3/1	6/4	2/4	0/0	0/0	0/0	0/0	0/0	1/1	0/0	0/2	0/0
311	Queen Lily Campground-Downstream	0/5	5/5	11/3	2/12	4/3	4/0	00/0	00/0	0/0	1/0	1/0	10/25	0/0	0/0

Table 14. Observational Data Summary for the UNFFR Project Snorkel Survey Sites, Fall 2001.

										Numbers Observed (1st/2nd Pass)			
Reach Name		Date		Elevation	Site Length	Site Width	Site Depth	Visibility	No. of	Rainbow	Sacramento		Smallmouth
/ Site No.	Site Name	Sampled	RM	(m)	(m)	Max (m)	Max (m)	(m)	Passes	trout	sucker	Sculpin	bass
Seneca													
301	Skinner Flat pool 1	10/12/01	17.7	1302	32	10	1.2	1.5	2	10/7	0/0	0/0	0/0
302	Skinner Flat pool 2	10/12/01	17.8	1287	37	9	2.4	1.8	1	6	0	1	0
305	Butt Creek Confluence-Dowstream pool 1	10/01/01	9.3	951	40	16	1.8	2.6	2	14/15	0/0	0/2	0/0
306	Butt Creek Confluence-Dowstream pool 2	10/01/01	9.2	945	50	12	1.2	1.2	2	26/27	2/1	1/2	0/0
307	Butt Creek Confluence-Dowstream pool 3	10/01/01	9.1	942	35	12	1.2	1.5	2	23/10	0/0	0/1	0/0
308	Caribou Powerhouse-Upstream pool 1	10/01/01	8.7	930	40	10	2.0	1.0	2	30/30	0/0	0/1	0/0
309	Caribou Powerhouse-Upstream pool 2	10/01/01	8.6	927	15	10	1.2	1.8	2	20/20	0/0	0/0	0/0
316	Salmon Falls	10/12/01	15.8	1119	39	15	1.8	1.0	2	5/2	2/0	0/0	0/0
317	Davis Creek-Upstream pool 2	10/11/01	15.2	1116	27	10	1.4	1.5	2	13/15	5/7	2/0	1/0
318	Davis Creek-Upstream pool 3	10/11/01	15.3	1132	35	15	3.0	1.5	2	5/4	0/0	2/0	0/0
*Reach Subtotal					350					156	11	11	1
Number per 100 m										44.6	3.1	3.1	0.3
Belden													
310	Mosquito Creek Confluence-Downstream	10/05/01	3.4	780	48	20	3.0	1.3	2	16/5	52/42	0/0	0/0
311	Queen Lily Campground-Downstream	10/05/01	2.2	756	15	14	2.7	1.2	2	14/11	0/0	0/0	0/0
312	Queen Lily Campground-Upstream pool 1	10/05/01	2.5	771	40	20	2.1	1.5	2	17/13	16/11	0/0	0/0
313	Queen Lily Campground-Upstream pool 2	10/05/01	2.8	792	22	10	0.6	0.8	2	26/24	11/4	0/0	0/0
314	Mosquito Creek-Upstream pool 1	10/05/01	4.3	798	18	10	1.6	1.6	2	16/22	42/22	0/0	0/0
315	Mosquito Creek-Upstream pool 2	10/05/01	4.6	805	22	12	1.8	1.5	2	17/17	7/5	0/0	0/0
*Reach Subtotal					165					112	128	0	0
Number per 100 m										67.9	77.6	0.0	0.0
*TOTAL NUMBER										268	139	11	1

* Subtotal and total numbers based on the maximum number of fish observed between the two passes

Table 15. Length Frequency by Species and Site for the UNFFR Project Snorkel Survey Sites, Fall 2001.

Reach Name / Site No. Site name		Numbers Observed (1st Pass/ 2nd Pass):														Smallmouth bass
		Rainbow trout						Sacramento sucker						Sculpin		
		0 - 3"	3 - 6"	6 - 9"	9 - 12"	12 - 15"	15"+	0 - 3"	3 - 6"	6 - 9"	9 - 12"	12 - 15"	15"+	0 - 3"	3 - 6"	
Seneca																
301	Skinner Flat pool 1	0/4	6/4	0/0	2/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
302	Skinner Flat pool 2	0	1	4	0	1	0	0	0	0	0	0	0	1	0	0
305	Butt Creek Confluence-Dowstream pool 1	11/5	1/8	2/1	0/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/2	0/0	0/0
306	Butt Creek Confluence-Dowstream pool 2	4/13	12/8	7/6	1/0	1/0	1/0	0/0	0/0	0/0	0/1	2/0	0/0	1/2	0/0	0/0
307	Butt Creek Confluence-Dowstream pool 3	5/5	5/2	10/2	3/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/1	0/0	0/0
308	Caribou Powerhouse-Upstream pool 1	10/11	3/10	13/9	4/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/1	0/0	0/0
309	Caribou Powerhouse-Upstream pool 2	6/14	9/3	5/2	0/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
316	Salmon Falls	0/0	1/0	4/1	0/0	0/0	0/1	0/0	0/0	0/0	0/0	0/0	2/0	0/0	0/0	0/0
317	Davis Creek-Upstream pool 2	0/2	3/2	7/8	2/2	1/1	0/0	0/0	0/0	0/0	0/0	0/0	5/7	1/0	1/0	1/0
318	Davis Creek-Upstream pool 3	0/0	3/4	2/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1/0	1/0	0/0
Belden																
310	Mosquito Creek Confluence-Downstream	4/2	10/2	0/0	2/0	0/1	0/0	0/0	0/0	0/0	0/0	52/42	0/0	0/0	0/0	0/0
311	Queen Lily Campground-Downstream	4/3	6/4	0/2	4/0	0/2	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
312	Queen Lily Campground-Upstream pool 1	8/5	0/3	9/5	0/0	0/0	0/0	0/0	0/0	0/0	16/11	0/0	0/0	0/0	0/0	0/0
313	Queen Lily Campground-Upstream pool 2	0/0	6/0	14/16	3/4	2/4	1/0	0/0	0/0	0/0	0/0	0/0	11/4	0/0	0/0	0/0
314	Mosquito Creek-Upstream pool 1	0/0	2/2	9/18	0/0	4/0	1/2	0/0	0/0	0/0	0/0	42/22	0/0	0/0	0/0	0/0
315	Mosquito Creek-Upstream pool 2	2/6	0/1	4/6	0/0	11/4	0/0	0/0	0/0	0/0	0/0	7/5	0/0	0/0	0/0	0/0

Year 2002

Snorkel survey results for 2002 are summarized in Table 16, and the length-frequencies of observed fish are presented in Table 17. In 2002, snorkel survey results reflected the same patterns as observed in 2000 and 2001; average rainbow trout abundance was higher in Belden Reach pools (55.0 trout/100m) as compared to 24.9 trout/100 m in Seneca Reach. Further, an average of 47.0 suckers/100 m were observed in Belden Reach pools, compared to 4.4 suckers/100 m in Seneca Reach pools. As in 2001, smallmouth bass (2 fish) were observed upstream from the confluence with Davis Creek in Seneca Reach during 2002 surveys. In contrast to 2000 and 2001, Sacramento pikeminnow and hatchery rainbow trout were observed in Belden Reach pool habitats.

In general, rainbow trout were evenly distributed among three length ranges (“0 to 3 inches”, “3 to 6 inches”, and “6 to 9 inches”); however, larger trout were more abundant in Belden Reach pool habitat. As observed in 2001, most of the Sacramento suckers observed in 2002 were larger individuals (greater than 9 inches) in both Seneca and Belden Reach pool habitat. Larger Sacramento sucker (“12 to 15 inches” and “greater than 15 inches”) were most abundant in Belden Reach pool habitat, however fewer individuals were observed in 2002 than in 2000 and 2001.

4.0 SPECIES POPULATION ESTIMATES

Two methods of reporting population estimates are presented in this section: age-specific population estimates and age class estimates derived as a percentage of the total population (all age classes combined) from the population age structure. Age-specific population estimates were calculated directly from the catch by pass for each age class as determined by scale aging and length-frequency analysis, through the use of maximum likelihood equations. Age-specific population estimates have associated standard error estimates. Population estimates derived

Table 16. Observational Data Summary for the UNFFR Project Snorkel Survey Sites, Fall 2002.

										Numbers Observed (1st/2nd Pass)				
Reach Name /		Elevation	Date	Site	Site	Site	Visibility	No. of	Rainbow	Sacramento		Sacramento	Smallmouth	
Site No.	Site Name	RM	Sampled	Length	Max	Max	(m)	Passes	trout	sucker	Sculpin	pikeminnow	bass	
Seneca														
301	Skinner Flat Pool 1	17.7	1302	09/26/02	9	12	1.2	0.5	2	9/1	0/0	0/0	0/0	
302	Skinner Flat Pool 2	17.8	1287	09/26/02	23	9	1.2	0.5	2	2/0	0/0	0/0	0/0	
303	Davis Creek Pool 1	14.8	1119	09/26/02	15	12	3.0	0.8	2	4/1	1/4	0/1	0/0	
304	Davis Creek Confluence Pool	14.6	1116	09/26/02	14	11	1.5	0.8	2	0/1	10/11	0/0	0/0	
305	Butt Creek Confluence-Dowstream Pool 1	9.3	951	09/27/02	40	15	1.5	1.0	2	9/9	0/0	0/0	0/0	
306	Butt Creek Confluence-Dowstream Pool 2	9.2	945	09/27/02	45	15	1.2	1.0	2	4/13	0/0	1/2	0/0	
307	Butt Creek Confluence-Dowstream Pool 3	9.1	942	09/27/02	30	18	1.2	1.0	2	4/9	0/0	0/1	0/0	
308	Caribou Powerhouse-Upstream Pool 1	8.7	930	09/27/02	50	15	1.7	1.0	2	7/12	0/0	0/0	0/0	
309	Caribou Powerhouse-Upstream Pool 2	8.6	927	09/27/02	35	15	1.2	1.0	2	18/11	0/0	0/0	0/0	
316	Salmon Falls	15.8	1119	09/27/02	39	15	1.8	0.5	2	0/0	0/0	0/0	0/0	
317	Davis Creek-Upstream Pool 2	15.2	1116	09/26/02	17	7	1.8	0.5	2	4/1	0/0	0/2	0/0	
318	Davis Creek-Upstream Pool 3	15.3	1132	09/26/02	24	8	4.0	0.5	2	4/0	0/0	0/0	0/0	
*Reach Subtotal					341				85	15	6	0	2	
Number per 100 m									24.9	4.4	1.8	0.0	0.6	
Belden														
310	Mosquito Creek Confluence-Downstream	3.4	780	09/15/02	40	12	2.1	1.2	2	11/5	10/5	0/1	0/0	
311	Queen Lily Campground-Downstream	2.2	756	09/15/02	15	14	2.7	1.2	2	13/6	13/3	0/0	1/2	
312	Queen Lily Campground-Upstream Pool 1	2.5	771	09/15/02	25	12	2.1	1.5	2	12/9	2/1	0/0	0/0	
313	Queen Lily Campground-Upstream Pool 2	2.8	792	09/14/02	22	10	2.1	0.8	2	8/5	7/1	0/0	2/0	
314	Mosquito Creek-Upstream Pool 1	4.3	798	09/14/02	25	10	1.6	1.2	2	16/18	26/10	0/0	0/0	
315	Mosquito Creek-Upstream Pool 2	4.6	805	09/14/02	22	8	2.0	1.2	1	1	12	0	0	
*Reach Subtotal					149				82	70	1	4	0	
Number per 100 m									55.0	47.0	0.7	2.7	0.0	
*TOTAL NUMBER									167	85	7	4	2	

* Subtotal and total numbers based on the maximum number of fish observed between the two passes

Table 17. Length Frequency by Species and Site for the UNFFR Project Snorkel Survey Sites, Fall 2002.

Reach Name / Site No. Site name		Numbers Observed (1st Pass/ 2nd Pass):													
		Rainbow trout					Sacramento sucker				Sculpin		Sacramento pikeminnow		Smallmouth bass
		0 - 3"	3 - 6"	6 - 9"	9 - 12"	12 - 15"	6 - 9"	9 - 12"	12 - 15"	15"+	0 - 3"	3 - 6"	3 - 6"	9 - 12"	9 - 12"
Seneca															
301	Skinner Flat Pool 1	9/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
302	Skinner Flat Pool 2	0/0	1/0	1/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
303	Davis Creek Pool 1	0/1	3/0	0/0	0/0	1/0	0/0	0/4	1/0	0/0	0/0	0/1	0/0	0/0	0/2
304	Davis Creek Confluence Pool	0/1	0/0	0/0	0/0	0/0	0/0	5/8	5/3	0/0	0/0	0/0	0/0	0/0	0/0
305	Butt Creek Confluence-Dowstream Pool 1	3/3	1/2	2/3	2/1	1/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
306	Butt Creek Confluence-Dowstream Pool 2	1/3	2/8	0/2	0/0	1/0	0/0	0/0	0/0	0/0	1/2	0/0	0/0	0/0	0/0
307	Butt Creek Confluence-Dowstream Pool 3	1/0	2/5	1/2	0/2	0/0	0/0	0/0	0/0	0/0	0/1	0/0	0/0	0/0	0/0
308	Caribou Powerhouse-Upstream Pool 1	2/0	1/3	4/9	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
309	Caribou Powerhouse-Upstream Pool 2	2/2	10/7	3/2	1/0	2/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
316	Salmon Falls	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
317	Davis Creek-Upstream Pool 2	4/0	0/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/2	0/0	0/0	0/0
318	Davis Creek-Upstream Pool 3	1/0	3/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Belden															
310	Mosquito Creek Confluence-Downstream	2/0	4/0	5/0	0/4	0/1	0/0	5/0	5/5	0/0	0/0	0/1	0/0	0/0	0/0
311	Queen Lily Campground-Downstream	0/0	3/0	5/3	5/3	0/0	0/0	3/0	5/3	5/0	0/0	0/0	0/2	1/0	0/0
312	Queen Lily Campground-Upstream Pool 1	2/2	3/2	5/2	2/2	0/1	0/0	0/0	2/1	0/0	0/0	0/0	0/0	0/0	0/0
313	Queen Lily Campground-Upstream Pool 2	3/2	2/2	3/1	0/0	0/0	0/0	2/0	5/1	0/0	0/0	0/0	2/0	0/0	0/0
314	Mosquito Creek-Upstream Pool 1	2/3	5/5	7/7	1/2	1/1	3/3	8/4	13/3	2/0	0/0	0/0	0/0	0/0	0/0
315	Mosquito Creek-Upstream Pool 2	1	5	10	4	0	0	1	10	1	0	0	0	0	0

from population age structure are developed first by calculating total population estimates (all age classes combined) using maximum likelihood equations. The total population estimate was then partitioned by age class by multiplying the age class percent of site total (i.e., percentage by age class of total site rainbow trout catch) by the total population estimate. No standard error was calculated for this estimate. However, the two estimates were developed to bound the actual population size.

4.1 Seneca Reach Population Estimates

Population estimates for all fish collected from the Seneca Reach in 2000, 2001 and 2002 are summarized by site (Tables 18 through 20) and are presented graphically (Figures 46 through 58).

Site 101 - Canyon Dam Weir - Downstream

In 2000, estimated fish populations at this site were 6 rainbow trout, 6 Sacramento sucker, and 340 sculpin. In 2001, the estimated population of rainbow trout increased to 36 fish. Population estimates for other species were 3 Sacramento suckers and 140 sculpin. In 2002, estimated population of rainbow trout further increased to 47 fish and one brown trout. Sculpin were identified by species in 2002, and the population estimates were 95 prickly sculpin and 15 riffle sculpin. No Sacramento suckers were captured at this site in 2002.

Site 102 - Seneca Bridge - Upstream

In 2000, estimated fish populations at this site were 177 rainbow trout, 5 brown trout, and 496 sculpin. In 2001, the estimated rainbow trout population increased to 430, while population estimates for other species were 1 Sacramento sucker, 3 brown trout, and 452 sculpin. The estimated rainbow trout population declined in 2002 to 288. The population estimates for other species were 12 brown trout, 4 Sacramento sucker, and 259 riffle Sculpin.

Table 18. Total Fish Population Estimates by Species for the UNFFR Project Electrofishing Sites, Fall 2000.

Reach/Site No.	(m)	Rainbow trout		Brown trout		Sacramento sucker		Sculpin		Sacramento pikeminnow	
		Pop. Est.	SE ¹	Pop. Est.	SE ¹	Pop. Est.	SE ¹	Pop. Est.	SE ¹	Pop. Est.	SE ¹
Seneca											
101	100	6	1.0	0	0	6	0.1	340	100.6	0	0
102	110	177	9.7	5	0.1	0	0	496	21.6	0	0
103	100	100	4.1	3	0.7	1	0.0	165	9.5	0	0
104	110	65	5.5	0	0	3	1.3	302	30.7	0	0
105	99	106	8.6	1	0.0	1	0.0	128	12.7	0	0
106	110	84	10.1	0	0	11	10.6	78	4.0	0	0
Belden											
107	95	62	9.3	0	0	40	1.6	90	3.2	0	0
108	105	60	7.2	0	0	120	10.5	166	31.3	2	0.0
109	100	38	4.3	0	0	28	2.9	128	43.9	0	0
110	100	43	12.7	0	0	16	0.9	161	11.8	0	0
111	100	57	5.6	0	0	14 ²	~	240	13.1	0	0
Mainstem											
112	80	8	3.1	0	0	4	0.0	275	199.7	2	1.0
Upper Butt Creek											
113	98	83	5.6	13	0.9	76	22.6	178	27.5	0	0
Lower Butt Creek											
114	100	72	7.7	0	0	0	0	136	10.6	0	0

nc = none collected

¹ SE = Standard error of the mean

² No estimate available--actual catch reported

Population Estimates and Standard Error calculated by Microfish 3.0

Van Deventer, J. S. and W. S. Platts 1985, 1986. Microfish 3.0. Microfish Interactive Program. Microsoft Corp.

Table 19. Total Fish Population Estimates by Species at the UNFFR Project Electrofishing Sites, Fall 2001.

Reach/Site No.	(m)	Rainbow trout		Brown trout		Sacramento sucker		Sculpin		Sacramento pikeminnow	
		Pop. Est.	SE ¹	Pop. Est.	SE ¹	Pop. Est.	SE ¹	Pop. Est.	SE ¹	Pop. Est.	SE ¹
Seneca											
101	100	36	5.3	0	0	3 ²	~	140	7.7	0	0
102	110	430	288.1	3	1.3	1 ²	~	452	52.1	0	0
103	100	127	15.9	2	1.1	4	1.5	137	13.8	0	0
104	104	124	4.4	0	0	3	1.3	177	11.2	0	0
105	100	211	52.9	0	0	1 ²	~	328	239.4	0	0
106	110	112	13.5	0	0	8	5.7	104	23.3	0	0
Belden											
107	95	39	8.0	0	0	15	5.4	60	4.3	0	0
108	105	49	6.2	0	0	56	2.9	68	3.5	0	0
109	100	46	16.5	0	0	22	1.1	65	4.0	0	0
110	95	12	2.5	0	0	39	0.8	46	1.6	0	0
111	100	59	4.9	0	0	5	9.7	99	4.7	0	0
Mainstem											
112	68	19	3.2	0	0	0	0	359	24.7	12	6.5
Upper Butt Creek											
113	100	57	9.2	13	0.9	16	0.9	77	9.8	0	0
Lower Butt Creek											
114	100	93	5.8	0	0	0	0	160	12.8	0	0
Mosquito Creek											
115	100	77	1.6	0	0	0	0	55	21.5	0	0

nc = none collected

¹ SE = Standard error of the mean

² Actual catch reported - no estimate available

Population Estimates and Standard Error calculated by Microfish 3.0

Van Deventer, J. S. and W. S. Platts 1985, 1986. Microfish 3.0. Microfish Interactive Program. Microsoft Corp.

Table 20. Total Fish Population Estimates by Species at the UNFFR Project Electrofishing Sites, Fall 2002.

Reach/Site No.	(m)	Rainbow trout		Brown trout		Sacramento sucker		Prickly sculpin		Riffle sculpin		Sacramento pikeminnow	
		Pop. Est.	SE ¹	Pop. Est.	SE ¹	Pop. Est.	SE ¹	Pop. Est.	SE ¹	Pop. Est.	SE ¹	Pop. Est.	SE ¹
Seneca													
101	98	47	2.4	1 ²	~	0	0	95	1.6	15	7.3	0	0
102	106	288	16.5	12	0.5	4	1.0	0	0	259	19.7	0	0
103	80	138	6.4	1 ²	~	8	5.7	0	0	129	14.8	0	0
104	110	112	5.9	0	0	2 ²	~	0	0	256	4.4	0	0
105	92	180	23.6	0	0	2	1.0	0	0	154	18.4	0	0
106	100	81	4.9	0	0	4 ²	~	0	0	91	2.1	0	0
Belden													
107	88	46	4.8	0	0	12	0.7	17	2.2	95	5.8	1 ²	~
108	100	39	4.2	0	0	45	0.3	1 ²	~	69	10.5	6	0.7
109	100	66	5.3	0	0	30	3.5	0	0	153	5.3	1 ²	~
110	94	66	3.9	0	0	48	0.5	2	0.1	146	4.5	3	0.4
111	100	76	7.4	0	0	5	0.5	0	0	139	5.3	0	0
Mainstem													
112	72	16	3.6	0	0	3	0.3	30	4.7	125	7.6	16	0.7
Upper Butt Creek													
113	100	48	5.4	17	2.0	7	0.1	0	0	110	21.1	0	0
Lower Butt Creek													
114	100	67	6.0	0	0	0	0	0	0	90	3.8	0	0
Mosquito Creek													
115	100	93	1.5	0	0	0	0	0	0	45	1.0	0	0

nc = none collected

¹ SE = Standard error of the mean

² Actual catch reported - no estimate available

Population Estimates and Standard Error calculated by Microfish 3.0

Van Deventer, J. S. and W. S. Platts 1985, 1986. Microfish 3.0. Microfish Interactive Program. Microsoft Corp.

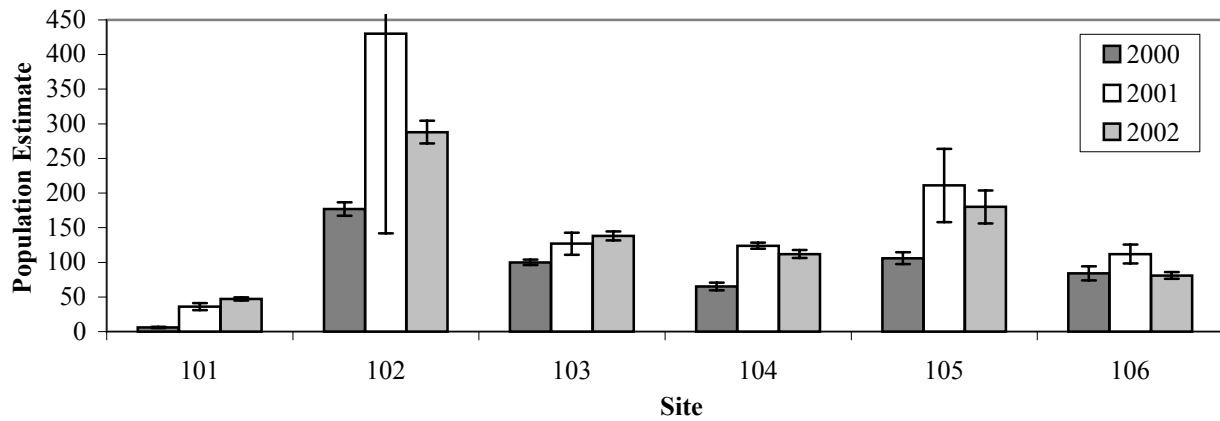


Figure 46. Rainbow Trout Total Population Estimates, Seneca Reach Sites, Fall 2000, 2001, and 2002.

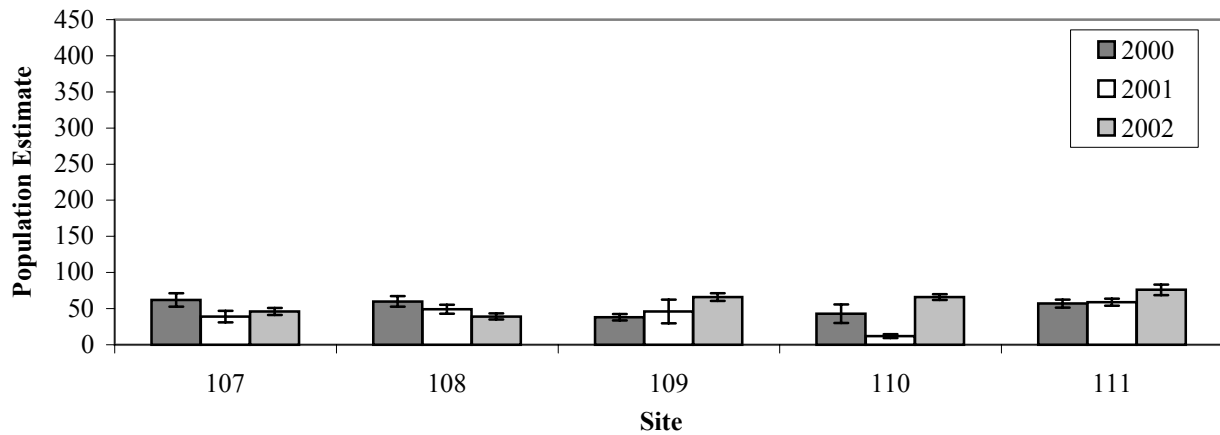


Figure 47. Rainbow Trout Total Population Estimates, Belden Reach Sites, Fall 2000, 2001, and 2002.

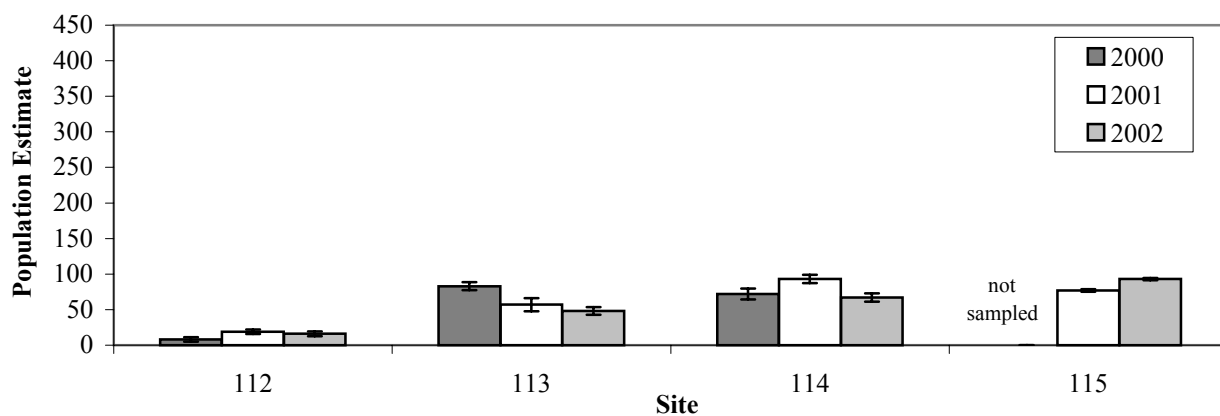


Figure 48. Rainbow Trout Total Population Estimates, Mainstem, Upper Butt Creek, Lower Butt Creek, and Mosquito Creek Sites, Fall 2000, 2001, and 2002.

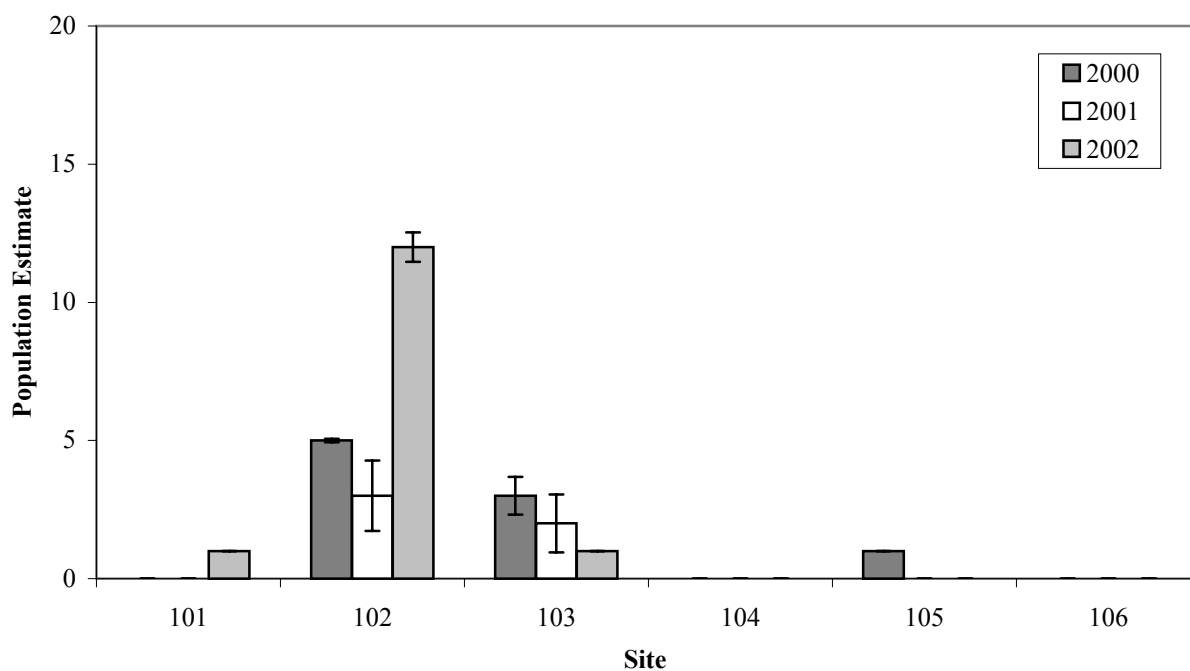


Figure 49. Brown Trout Total Population Estimates, Seneca Reach, Fall 2000, 2001, and 2002.

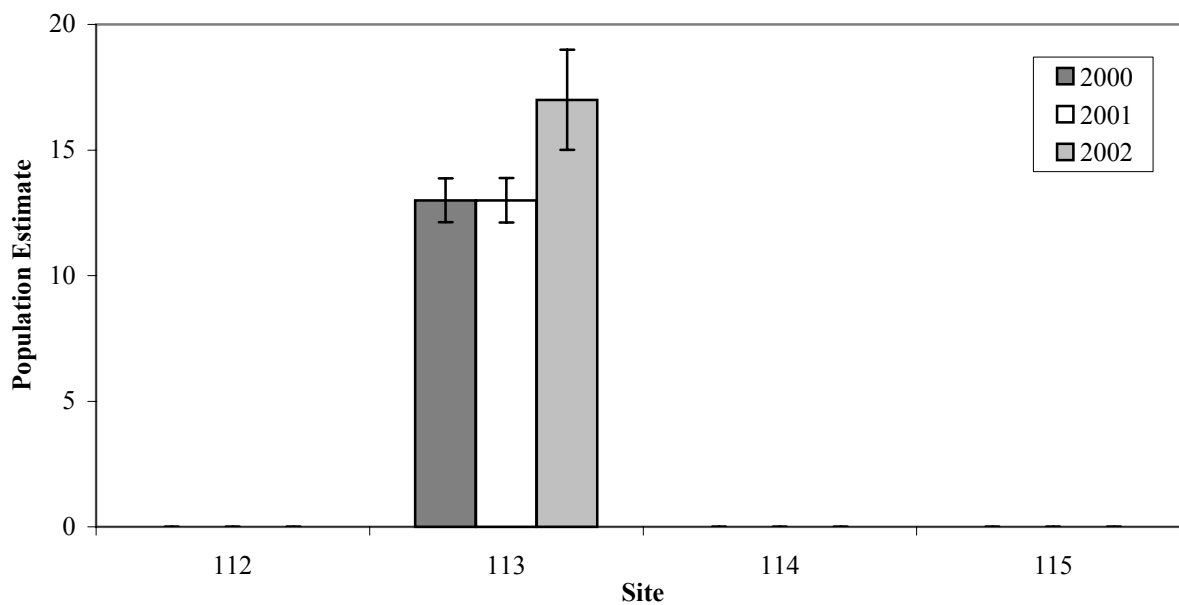


Figure 50. Brown Trout Total Population Estimates, Mainstem, Upper Butt Creek, Lower Butt Creek, and Mosquito Creek Sites, Fall 2000, 2001, and 2002.

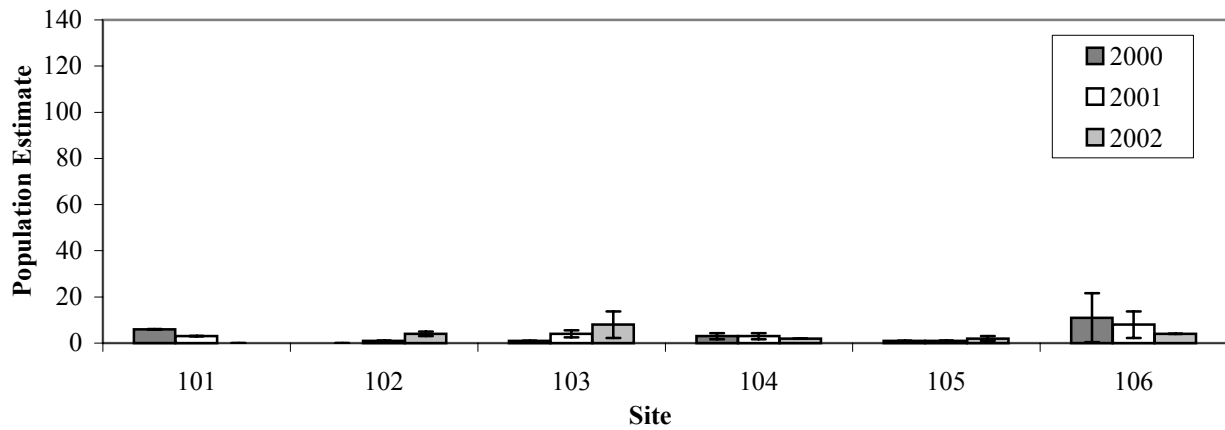


Figure 51. Sacramento Sucker Total Population Estimates, Seneca Reach Sites, Fall 2000, 2001, and 2002.

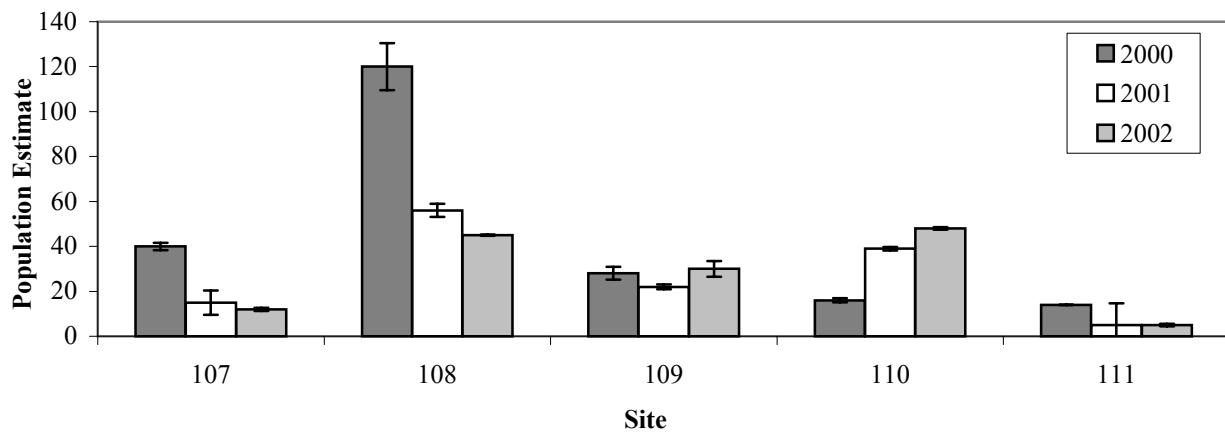


Figure 52. Sacramento Sucker Total Population Estimates, Belden Reach Sites, Fall 2000, 2001, and 2002.

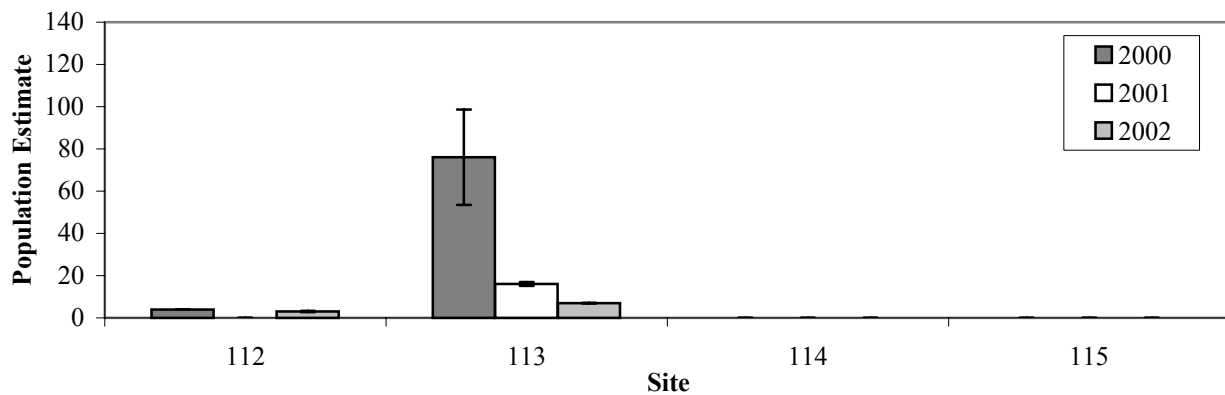


Figure 53. Sacramento Sucker Total Population Estimates, Mainstem, Upper Butt Creek, Lower Butt Creek, and Mosquito Creek Sites, Fall 2000, 2001, and 2002.

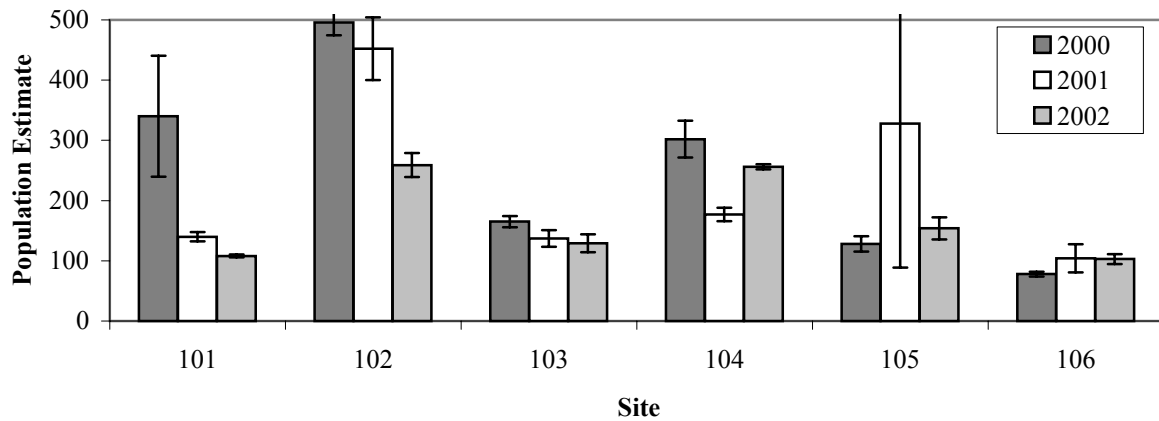


Figure 54. Sculpin Total Population Estimates, Seneca Reach Sites, Fall 2000, 2001, and 2002.

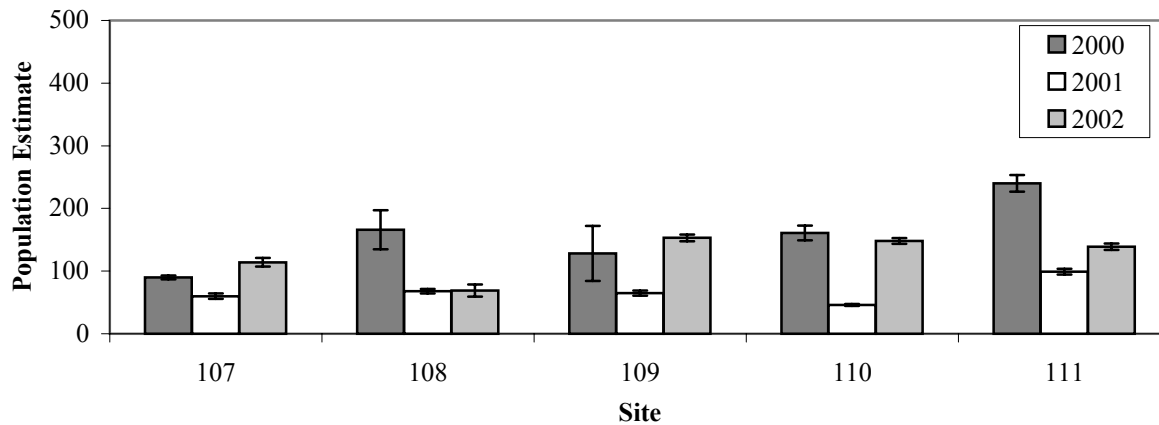


Figure 55. Sculpin Total Population Estimates, Belden Reach Sites, Fall 2000, 2001, and 2002.

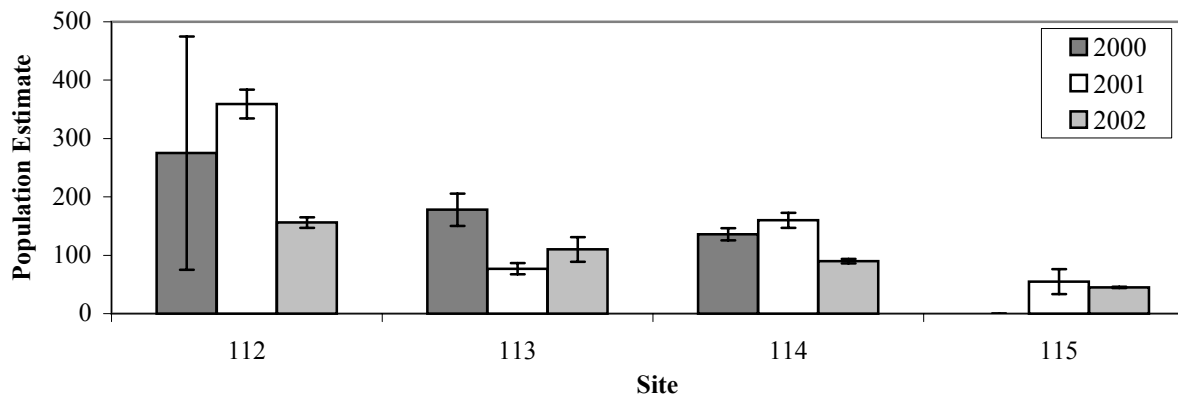


Figure 56. Sculpin Total Population Estimates, Mainstem, Upper Butt Creek, Lower Butt Creek, and Mosquito Creek Sites, Fall 2000, 2001, and 2002.

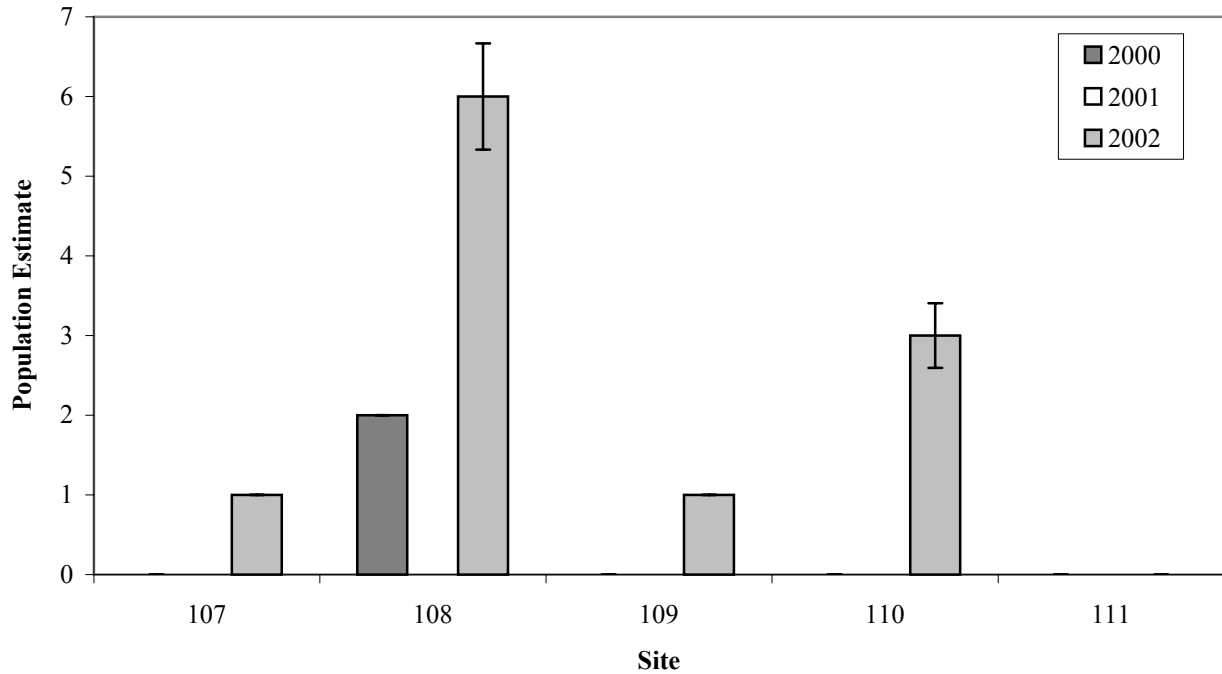


Figure 57. Sacramento Pikeminnow Total Population Estimates, Belden Reach Sites, Fall 2000, 2001, and 2002.

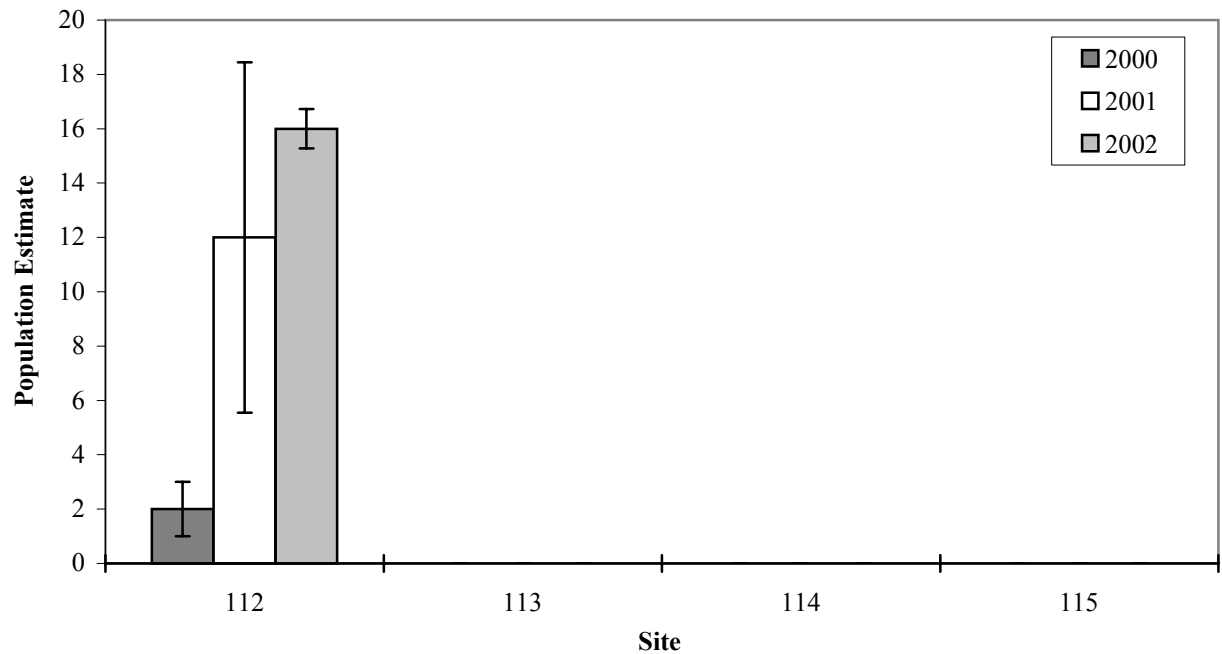


Figure 58. Sacramento Pikeminnow Total Population Estimates, Mainstem, Upper Butt Creek, Lower Butt Creek, and Mosquito Creek Sites, Fall 2000, 2001, and 2002.

Site 103 - Seneca Bridge - Downstream

In 2000, estimated fish populations at this site were 100 rainbow trout, 3 brown trout, 1 Sacramento sucker, and 165 sculpin. In 2001, the estimated rainbow trout population increased to 127 fish. Population estimates for other species were 2 brown trout, 4 Sacramento sucker and 137 sculpin. In 2002, the estimated rainbow trout population increased slightly to 138 fish. Population estimates for the other species were one brown trout, 8 Sacramento sucker, and 129 riffle sculpin.

Site 104 - Butt Creek Confluence - Upstream

In 2000, estimated fish populations at this site were 65 rainbow trout, 3 Sacramento sucker, and 302 sculpin. In 2001, the estimated rainbow trout population increased to 124 fish. Population estimates for other species were 3 Sacramento sucker and 177 prickly sculpin. In 2002, the estimated rainbow trout population slightly declined to 112 fish. Riffle sculpin population estimate was 256 fish and the Sacramento sucker estimate was 2 fish.

Site 105: Butt Creek Confluence - Downstream

In 2000, estimated fish populations at this site were 106 rainbow trout, 1 brown trout, 1 Sacramento sucker, and 128 sculpin. In 2001, the estimated rainbow trout population increased to 211 fish. Population estimates for other species were 1 Sacramento sucker and 328 sculpin. In 2002, the estimated rainbow trout population declined to 180 fish, and the estimated population of the other species were 154 riffle sculpin and 2 Sacramento sucker.

Site 106: Caribou Powerhouse – Upstream

In 2000, estimated fish populations at this site were 84 rainbow trout, 11 Sacramento sucker, and 78 sculpin. In 2001, the estimated rainbow trout population increased to 112 fish. Population estimates for other species were 8 Sacramento sucker and 104 sculpin. In 2002, the estimated

rainbow trout population declined to 81 fish, and the estimated populations for the other species were 91 riffle sculpin and 4 Sacramento sucker.

4.1.1 Rainbow Trout Population and Age Estimates

The Seneca Reach had the highest estimated rainbow trout populations in all years. Site-specific rainbow trout population estimates ranged from 6 (site 101 *Canyon Dam Weir-Downstream*) to 177 fish (site 102 *Seneca Bridge-Upstream*) in 2000, from 36 (site 101 *Canyon Dam Weir-Downstream*) to 430 fish (site 102 *Seneca Bridge-Upstream*) in 2001, and from 47 (site 101 *Canyon Dam Weir-Downstream*) to 288 fish (site 102 *Seneca Bridge-Upstream*) in 2002 (see Figure 46). For all years, rainbow trout abundance was greatest at site 102 *Seneca Bridge-Upstream*, followed by site 105 *Butt Creek Confluence-Downstream*, and site 103 *Seneca Bridge-Downstream*. Rainbow trout abundance was consistently lowest at Site 101 *Canyon Dam Weir-Downstream* for all years.

Rainbow trout population age structure for 2000, 2001, and 2002 is presented in Table 21, Table 22, and 23, respectively. Age class 0+ rainbow trout were the most abundant age class at all Seneca Reach sites, except for site 101 *Canyon Dam Weir – Downstream*. Age class 0+ percentages ranged from 33.3 (site 101 *Canyon Dam Weir – Downstream*) to 74.1 percent (site 104 *Butt Creek Confluence-Upstream*) of the rainbow trout population for 2000, from zero (site 101 *Canyon Dam Weir – Downstream*) to 82.9 percent (site 104 *Butt Creek Confluence – Upstream*) for 2001, and from 44.4 percent (site 101 *Canyon Dam Weir – Downstream*) to 82.2 percent (site 102 *Seneca Bridge– Upstream*) for 2002. Age class 1+ rainbow trout ranged from 12.1 (site 104 *Butt Creek Confluence - Upstream*) to 50.0 percent (site 101 *Canyon Dam Weir – Downstream*) of the total population in 2000, from 12.8 (site 104 *Butt Creek Confluence – Upstream*) to 45.2 (site 101 *Canyon Dam Weir – Downstream*) percent in 2001, and from 14.1 (site 102 *Seneca Bridge – Upstream*) to 28.8 (site 105 *Butte Creek Confluence – Downstream*) percent in 2002. Adult (age class 2+ and older) rainbow trout percentage ranged from 11.2 (site 102 *Seneca Bridge – Upstream*) to 22.3 (site 103 *Seneca Bridge – Downstream*) percent in 2000, from 4.3 (site 104 *Butt Creek Confluence – Upstream*) to 54.8 (site 101 *Canyon Dam Weir –*

Table 21. Rainbow Trout Population Age Structure for the UNFFR Project Electrofishing Sites, Fall 2000.

Reach / Site No.	Age	Number	Percent of Site Total	Estimated No. (from Total Pop. Est.)	Length Range (mm)	Mean Length (mm)	Mean Weight (g)	Mean Condition Factor
Seneca Reach								
101	0+	2	33.3	2	45 - 66	55.5	3.6	1.984
	1+	3	50.0	3	165 - 182	174.3	52.3	0.978
	2+	1	16.7	1	222	222.0	145.0	1.325
102	0+	93	65.0	115	38 - 110	74.1	5.1	1.251
	1+	34	23.8	42	115 - 200	154.9	41.7	1.074
	2+	16	11.2	20	210 - 299	243.9	156.9	1.009
103	0+	46	48.9	49	36 - 97	72.9	5.0	1.444
	1+	27	28.7	29	115 - 182	152.9	41.4	1.136
	2+	21	22.3	22	197 - 460	248.4	213.5	1.081
104	0+	43	74.1	48	32 - 108	67.5	4.1	1.816
	1+	7	12.1	8	111 - 170	136.1	32.4	1.175
	2+	8	13.8	9	178 - 255	207.4	99.0	1.072
105	0+	47	51.6	55	48 - 115	76.7	6.6	1.346
	1+	24	26.4	28	118 - 170	147.7	42.0	1.242
	2+	20	22.0	23	175 - 350	228.8	152.9	1.132
106	0+	48	69.6	58	44 - 100	69.5	4.7	1.618
	1+	11	15.9	13	126 - 165	147.6	40.6	1.251
	2+	10	14.5	12	182 - 273	205.1	104.5	1.159
Belden Reach								
107	0+	17	34.0	21	90 - 137	107.0	15.8	1.251
	1+	21	42.0	26	170 - 222	197.9	95.4	1.208
	2+	12	24.0	15	228 - 320	253.4	189.2	1.144
108	0+	24	46.2	28	75 - 130	98.5	12.5	1.335
	1+	22	42.3	25	145 - 235	191.4	81.5	1.135
	2+	6	11.5	7	236 - 268	250.7	172.5	1.090
109	0+	24	66.7	25	46 - 114	74.9	5.6	1.462
	1+	8	22.2	8	163 - 219	193.0	81.8	1.118
	2+	4	11.1	4	248 - 339	275.8	221.8	1.025
110	0+	13	41.9	18	77 - 118	95.9	11.3	1.211
	1+	11	35.5	15	170 - 230	206.6	104.0	1.165
	2+	7	22.6	10	252 - 460	310.3	333.7	1.034
111	0+	15	30.0	17	60 - 104	87.7	8.2	1.221
	1+	30	60.0	34	140 - 235	197.8	91.3	1.159
	2+	5	10.0	6	243 - 320	273.3	213.8	1.047
Mainstem								
112	0+	5	71.4	6	80 - 120	97.2	9.4	0.980
	1+	1	14.3	1	140	140.0	35.0	1.276
	2+	1	14.3	1	360	360.0	429.0	0.919
Upper Butt Creek								
113	0+	31	41.3	34	52 - 95	72.0	5.2	1.421
	1+	40	53.3	44	116 - 228	162.8	49.9	1.047
	2+	4	5.3	4	254 - 350	305.0	471.3	1.446
Lower Butt Creek								
114	0+	44	72.1	52	48 - 94	70.1	4.3	1.180
	1+	9	14.8	11	107 - 145	119.6	20.8	1.182
	2+	8	13.1	9	152 - 208	179.4	72.3	1.235

Table 22. Rainbow Trout Population Age Structure for the UNFFR Project Electrofishing Sites, Fall 2001.

Reach/Site No.	Age	Number	Percent of Site Total	Estimated No. (from Total Pop. Est.)	Length Range (mm)	Mean Length (mm)	Mean Weight (g)	Mean Condition Factor
Seneca Reach								
101	0+	0	0.0	0	—	—	—	—
	1+	14	45.2	16	136 - 173	152.9	47.3	1.303
	2+	17	54.8	20	177 - 274	197.8	102.0	1.284
102	0+	80	58.0	249	58 - 114	80.2	7.3	1.305
	1+	39	28.3	122	130 - 187	160.1	50.8	1.206
	2+	19	13.8	59	193 - 347	235.6	165.8	1.154
103	0+	50	51.0	65	53 - 101	76.2	5.9	1.211
	1+	34	34.7	44	105 - 189	151.5	41.8	1.142
	2+	14	14.3	18	193 - 374	248.6	215.0	1.111
104	0+	97	82.9	103	47 - 103	75.8	5.6	1.211
	1+	15	12.8	16	113 - 185	153.3	46.4	1.186
	2+	5	4.3	5	211 - 328	241.0	180.6	1.186
105	0+	78	62.9	133	40 - 127	80.7	7.4	1.240
	1+	27	21.8	46	132 - 172	151.5	41.0	1.161
	2+	19	15.3	32	182 - 390	234.2	177.8	1.193
106	0+	58	65.2	73	54 - 105	77.7	6.2	1.238
	1+	22	24.7	28	113 - 173	145.6	37.3	1.173
	2+	9	10.1	11	175 - 338	216.1	134.5	1.190
Belden Reach								
107	0+	5	16.1	6	86 - 105	95.2	11.0	1.247
	1+	18	58.1	23	140 - 225	201.8	106.4	1.268
	2+	8	25.8	10	227 - 298	255.8	208.4	1.219
108	0+	18	42.9	21	71 - 103	86.8	8.7	1.279
	1+	20	47.6	23	133 - 207	179.9	72.8	1.202
	2+	4	9.5	5	212 - 306	253.0	192.1	1.116
109	0+	15	48.4	22	62 - 104	86.1	8.7	1.311
	1+	14	45.2	21	160 - 224	190.3	84.0	1.186
	2+	2	6.5	3	240 - 415	327.5	555.2	1.244
110	0+	2	18.2	2	82 - 100	91.0	8.4	1.095
	1+	6	54.5	7	156 - 203	185.7	76.2	1.167
	2+	3	27.3	3	222 - 265	238.0	166.6	1.215
111	0+	16	30.2	18	55 - 88	77.4	5.9	1.209
	1+	32	60.4	36	147 - 220	181.2	72.0	1.180
	2+	5	9.4	6	242 - 390	286.8	308.2	1.147
Mainstem								
112	0+	6	35.3	7	67 - 109	87.0	9.8	1.389
	1+	6	35.3	7	188 - 203	195.5	86.4	1.153
	2+	5	29.4	6	217 - 302	238.0	173.1	1.243
Upper Butt Creek								
113	0+	13	28.3	16	47 - 77	63.5	3.3	1.203
	1+	27	58.7	33	99 - 154	128.6	24.6	1.111
	2+	6	13.0	7	183 - 241	211.3	111.3	1.134
Lower Butt Creek								
114	0+	63	75.0	70	44 - 103	69.0	4.0	1.087
	1+	12	14.3	13	108 - 142	121.6	20.0	1.080
	2+	9	10.7	10	143 - 211	169.7	57.9	1.128
Mosquito Creek								
115	0+	36	47.4	36	41 - 90	59.9	2.7	1.126
	1+	17	22.4	17	93 - 116	104.2	12.5	1.090
	2+	23	30.3	23	133 - 272	171.8	62.7	1.135

Table 23. Rainbow Trout Population Age Structure for the UNFFR Project Electrofishing Sites, Fall 2002.

Reach/Site No.	Age	Number	Percent of Site Total	Estimated No. (from Total Pop. Est.)	Length Range (mm)	Mean Length (mm)	Mean Weight (g)	Mean Condition Factor
Seneca Reach								
101	0+	20	44.4	21	74 - 101	88.2	9.3	1.326
	1+	9	20.0	9	106 - 189	147.2	49.8	1.368
	2+	16	35.6	17	190 - 270	218.1	133.9	1.276
102	0+	198	82.2	237	39 - 98	73.9	5.4	1.315
	1+	34	14.1	41	101 - 187	156.9	47.0	1.160
	2+	9	3.7	11	190 - 313	238.0	177.9	1.188
103	0+	95	75.4	104	46 - 99	77.4	5.9	1.191
	1+	23	18.3	25	110 - 187	152.1	41.0	1.111
	2+	8	6.3	9	194 - 377	253.6	220.6	1.160
104	0+	78	76.5	86	50 - 99	81.2	6.7	1.184
	1+	16	15.7	18	100 - 176	136.0	32.5	1.146
	2+	8	7.8	9	183 - 330	220.6	145.0	1.191
105	0+	84	63.6	115	49 - 102	78.3	6.3	1.217
	1+	38	28.8	52	103 - 190	144.4	38.7	1.165
	2+	10	7.6	14	192 - 244	210.5	110.0	1.168
106	0+	46	62.2	50	56 - 107	81.6	6.8	1.194
	1+	20	27.0	22	108 - 168	144.4	35.8	1.118
	2+	8	10.8	9	184 - 238	208.6	104.0	1.129
Belden Reach								
107	0+	11	26.8	12	85 - 96	90.2	9.1	1.219
	1+	18	43.9	20	102 - 188	124.7	29.3	1.373
	2+	12	29.3	13	195 - 365	248.8	213.6	1.284
108	0+	15	42.9	17	56 - 105	85.8	9.0	1.299
	1+	13	37.1	14	117 - 204	175.4	73.7	1.290
	2+	7	20.0	8	208 - 345	248.9	211.2	1.217
109	0+	40	67.8	45	63 - 105	84.4	7.7	1.207
	1+	17	28.8	19	108 - 204	145.8	44.1	1.212
	2+	2	3.4	2	227 - 332	279.5	272.4	1.122
110	0+	42	68.9	45	63 - 107	87.9	9.0	1.262
	1+	5	8.2	5	122 - 203	154.4	48.4	1.184
	2+	14	23.0	15	210 - 392	255.2	213.9	1.164
111	0+	34	52.3	40	57 - 107	86.5	8.7	1.269
	1+	13	20.0	15	131 - 197	181.8	73.6	1.197
	2+	18	27.7	21	198 - 265	220.7	132.5	1.174
Mainstem								
112	0+	6	42.9	7	63 - 97	80.2	6.8	1.256
	1+	3	21.4	3	98 - 112	106.0	17.0	1.402
	2+	5	35.7	6	200 - 347	261.4	235.0	1.158
Upper Butt Creek								
113	0+	26	61.9	30	42 - 84	65.8	3.6	1.216
	1+	10	23.8	11	106 - 147	127.7	24.7	1.153
	2+	6	14.3	7	177 - 219	195.7	95.4	1.251
Lower Butt Creek								
114	0+	47	79.7	53	49 - 98	73.2	5.0	1.165
	1+	7	11.9	8	114 - 158	137.0	29.6	1.109
	2+	5	8.5	6	168 - 209	185.8	76.2	1.156
Mosquito Creek								
115	0+	54	58.7	55	40 - 85	65.7	3.3	1.093
	1+	20	21.7	20	91 - 123	105.5	12.6	1.040
	2+	18	19.6	18	125 - 205	154.5	47.1	1.150

Downstream) percent in 2001, and from 3.7 (site 102 *Seneca Bridge – Upstream*) to 35.6 (site 101 *Canyon Dam Weir – Downstream*) percent in 2002.

Age-specific rainbow trout population estimates for 2000, 2001 and 2002 are summarized by site in Table 24 and presented in Figure 59. Rainbow trout production was greatest in the Seneca Reach during all three years. Only two age class 0+ rainbow trout were estimated at site 101 *Canyon Dam Weir – Downstream* in 2000, and none for 2001, but was the most abundant age class in 2002, with an estimated 20 fish present. Age-specific population estimates for age class 0+ rainbow trout in the Seneca Reach ranged from 2 to 132 fish in 2000, from 0 to 405 fish in 2001, and from 20 to 254 fish in 2002. Age-specific population estimates of age class 1+ rainbow trout in the Seneca Reach ranged from 3 to 53 fish in 2000, from 15 to 72 fish in 2001, and from 9 to 50 fish in 2002. Age-specific population estimates for age class 2+ rainbow trout in the Seneca Reach ranged from 1 to 22 fish in 2000, from 5 to 28 fish in 2001, and from 8 to 20 fish in 2002.

4.1.2 *Brown Trout Population and Age Estimates*

Brown trout were collected in low abundance from three Seneca Reach sites in 2000 and 2002, and from two sites in 2001 (see Tables 6, 8, and 10). At those sites, the estimated brown trout population ranged from 1 (site 105 *Butt Creek Confluence – Downstream*) to 5 fish (site 102 *Seneca Bridge – Upstream*) in 2000, from 2 (site 103 *Seneca Bridge – Downstream*) to 3 fish (site 102 *Seneca Bridge – Upstream*) in 2001, and from 1 (site 101 *Canyon Dam Weir – Downstream* and site 103 *Seneca Bridge – Downstream*) to 12 fish (site 102 *Seneca Bridge – Upstream*) in 2002 (see Tables 18 through 20; Figure 60).

Brown trout production (based on the presence of age class 0+) was absent at all sites, with the exception of site 102 *Seneca Bridge – Upstream*, where 2, 1, and 3 age class 0+ fish were collected in 2000, 2001, and 2002 respectively (Table 25, Table 26, and Table 27). Age class 1+ brown trout were collected in low abundance only from site 102 *Seneca Bridge – Upstream* and site 103 *Seneca Bridge – Downstream*, but were collected from those sites during all three years of study (Table 28). One age class 2+ brown trout was collected from site 102 *Seneca Bridge –*

Table 24. Age Specific Rainbow Trout Population Estimates for the UNFFR Project Electrofishing Sites, Fall 2000, 2001, and 2002.

Reach / Site No.	Age (Years)	Year 2000		Year 2001		Year 2002	
		RBT POP. EST.	SE	RBT POP. EST.	SE	RBT POP. EST.	SE
Seneca Reach							
101	0+	2	0.4	0	0.0	20	0.8
	1+	3	0.3	15	2.3	9	1.0
	2+	1	0.0	19	3.2	17	1.9
102	0+	132	23.5	405	670.1	254	21.9
	1+	53	20.5	72	33.1	34	1.0
	2+	16	1.1	21	3.1	9	0.5
103	0+	48	2.5	72	18.0	101	4.2
	1+	28	1.8	42	6.6	31	9.9
	2+	21	1.2	19	6.1	8	0.5
104	0+	46	3.3	103	4.2	84	4.3
	1+	7	0.9	15	0.8	17	2.0
	2+	10	4.7	5	0.4	9	2.6
105	0+	51	3.8	125	33.7	107	13.9
	1+	29	5.9	44	21.5	50	11.1
	2+	22	3.1	28	12.9	20	25.4
106	0+	61	10.6	67	6.8	47	1.6
	1+	11	1.0	36	19.7	32	17.1
	2+	10	1.1	9	1.2	8	1.1
Belden Reach							
107	0+	19	3.1	5	1.2	14	5.6
	1+	30	11.7	30	18.6	19	2.2
	2+	12	1.0	8	0.4	12	0.7
108	0+	27	3.8	19	2.0	19	6.4
	1+	24	2.9	27	9.4	13	0.9
	2+	18	57.6	4	0.2	7	0.6
109	0+	25	1.9	18	4.7	45	4.7
	1+	9	2.6	17	5.1	17	0.9
	2+	8	17.6	2	1.9	2	1.1
110	0+	14	2.5	2	0.4	44	2.4
	1+	14	5.6	6	1.4	6	3.5
	2+	8	3.0	3	0.7	14	1.0
111	0+	15	0.9	18	3.4	40	5.8
	1+	51	14.5	35	3.4	14	2.3
	2+	16	1.0	5	0.2	19	1.9
Mainstem							
112	0+	8	10.9	6	1.0	6	1.0
	1+	1	1.0	6	0.1	3	1.3
	2+	1	1.0	6	3.6	5	0.8
Upper Butt Creek							
113	0+	38	7.3	33	16.9	29	3.7
	1+	41	1.9	29	1.8	10	1.1
	2+	4	0.5	11	2.4	6	1.0
Lower Butt Creek							
114	0+	51	5.9	72	6.5	51	3.9
	1+	9	1.2	12	0.4	11	10.6
	2+	8	1.1	9	1.0	5	0.4
Mosquito Creek							
115	0+	---	---	36	0.7	55	1.4
	1+	---	---	19	3.2	20	0.6
	2+	---	---	2	3.8	18	0.5

Age class population estimates calculated directly from catch by pass using Microfish 3.0 statistical analysis (Van Deventer, JS. And W.S. Platts, 1989. Microcomputer Software System for Generating Population Statistics from Electrofishing Data (Microfish 3.0). USDA Forest Service General Technical Report INT-254

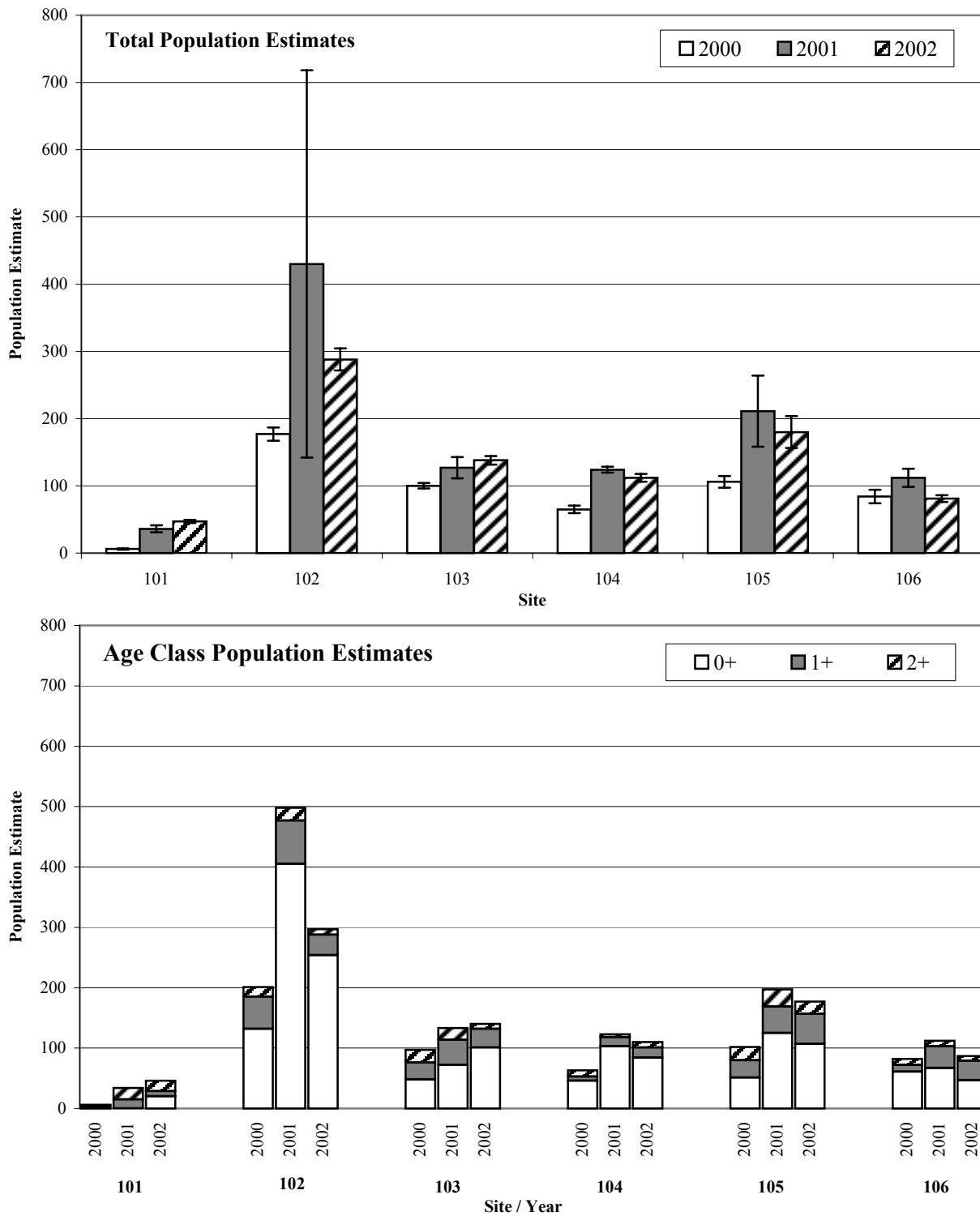


Figure 59. Rainbow Trout Population Estimates, Total and Age Class Specific, for Seneca Reach Sites, Fall 2000, 2001, and 2002.

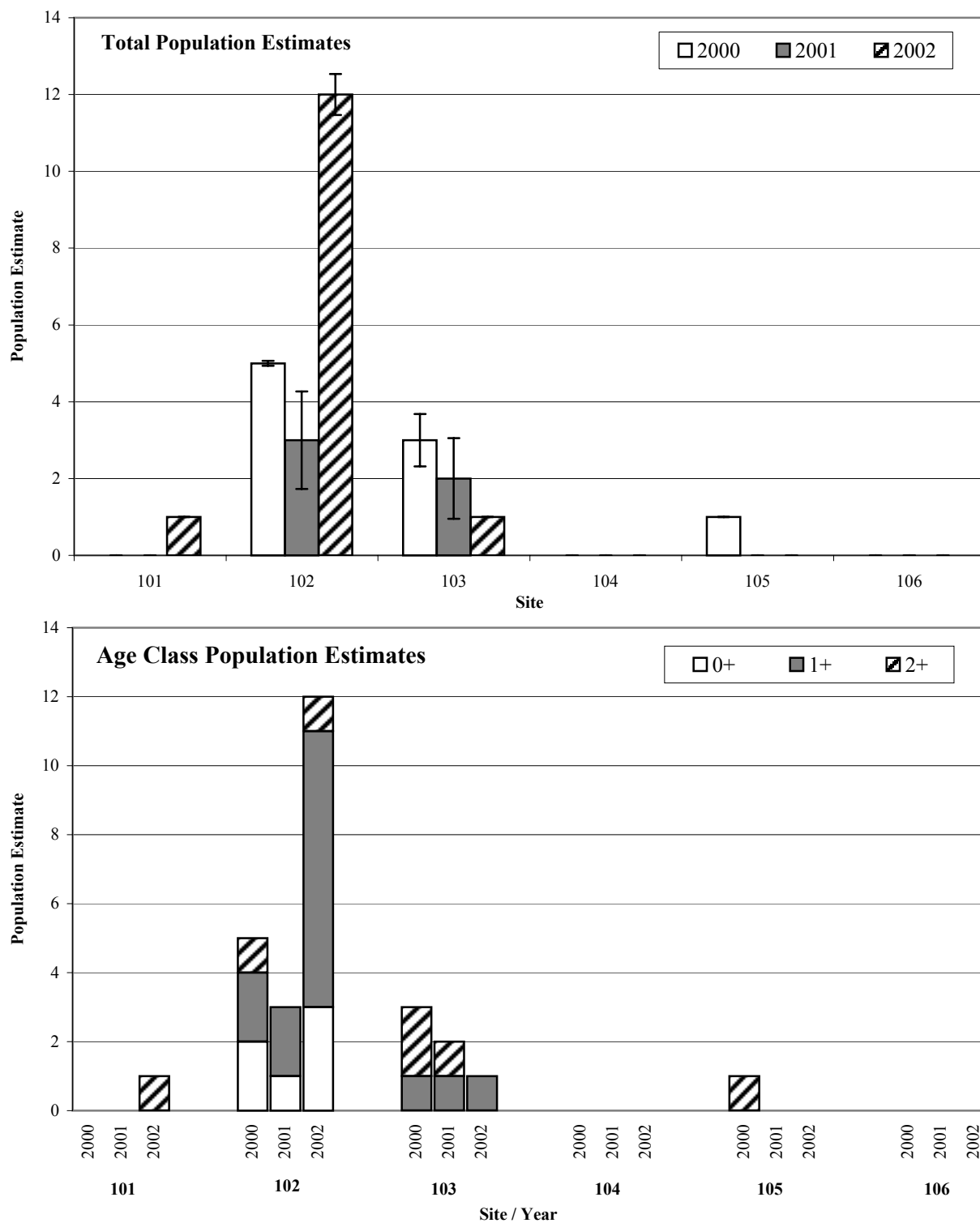


Figure 60. Brown Trout Population Estimates, Total and Age Class Specific, for Seneca Reach Sites, Fall 2000, 2001, and 2002.

Table 25. Brown Trout Population Age Structure for the UNFFR Project Electrofishing Sites, Fall 2000.

Reach / Site Number	Age	Number	Percent of Site Total	Estimated No. (from Total Pop. Est.)	Length Range (mm)	Mean Length (mm)	Mean Weight (g)	Mean Condition Factor
Seneca Reach								
101	—	—	—	—	—	—	—	—
102	0+	2	40.0	2	90 - 106	98.0	14.5	1.510
	1+	2	40.0	2	195 - 200	197.5	78.0	1.014
	2+	1	20.0	1	370	370.0	700.0	1.382
103	0+	—	—	—	—	—	—	—
	1+	1	33.3	1	190	190.0	71.0	1.035
	2+	2	66.7	2	301 - 500	400.5	980.0	1.300
104	—	—	—	—	—	—	—	—
105	0+	—	—	—	—	—	—	—
	1+	—	—	—	—	—	—	—
	2+	1	100.0	1	359	359.0	500.0	1.081
106	—	—	—	—	—	—	—	—
Belden Reach								
107	—	—	—	—	—	—	—	—
108	—	—	—	—	—	—	—	—
109	—	—	—	—	—	—	—	—
110	—	—	—	—	—	—	—	—
111	—	—	—	—	—	—	—	—
Mainstem								
112	—	—	—	—	—	—	—	—
Upper Butt Creek								
113	0+	7	53.8	7	88 - 104	96.9	10.3	1.115
	1+	1	7.7	1	185	185.0	69.0	1.090
	2+	5	38.5	5	287 - 650	450.4	1,341.6	1.184
Lower Butt Creek								
114	—	—	—	—	—	—	—	—
Mosquito Creek								
115	ns	ns	ns	ns	ns	ns	ns	ns

— Indicates no brown trout

ns = not sampled

Table 26. Brown Trout Population Age Structure for the UNFFR Project Electrofishing Sites, Fall 2001.

Reach / Site Number	Age	Number	Percent of Site Total	Estimated No. (from Total Pop. Est.)	Length Range (mm)	Mean Length (mm)	Mean Weight (g)	Mean Condition Factor
Seneca Reach								
101	—	—	—	—	—	—	—	—
102	0+	1	33.3	1	108	108.0	15.1	1.199
	1+	2	66.7	2	205 - 226	215.5	126.3	1.248
	2+	—	—	—	—	—	—	—
103	0+	—	—	—	—	—	—	—
	1+	1	50.0	1	104	104.0	14.0	1.245
	2+	1	50.0	1	262	262.0	255.4	1.420
104	—	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—
106	—	—	—	—	—	—	—	—
Belden Reach								
107	—	—	—	—	—	—	—	—
108	—	—	—	—	—	—	—	—
109	—	—	—	—	—	—	—	—
110	—	—	—	—	—	—	—	—
111	—	—	—	—	—	—	—	—
Mainstem								
112	—	—	—	—	—	—	—	—
Upper Butt Creek								
113	0+	8	61.5	8	71 - 99	86.0	7.5	1.148
	1+	1	7.7	1	164	164.0	46.4	1.052
	2+	4	30.8	4	455 - 688	575.8	2,653.5	1.278
Lower Butt Creek								
114	—	—	—	—	—	—	—	—
Mosquito Creek								
115	—	—	—	—	—	—	—	—

— Indicates no brown trout

Table 27. Brown Trout Population Age Structure for the UNFFR Project Electrofishing Sites, Fall 2002.

Reach / Site No.	Age	Number	Percent of Site Total	Estimated No. (from Total Pop. Est.)	Length Range (mm)	Mean Length (mm)	Mean Weight (g)	Mean Condition Factor
Seneca Reach								
101	0+	—	—	—	—	—	—	—
	1+	—	—	—	—	—	—	—
	2+	1	100.0	1	264	264.0	228.2	1.240
102	0+	3	25.0	3	89 - 101	94.3	10.4	1.226
	1+	8	66.7	8	107 - 120	113.8	18.0	1.221
	2+	1	8.3	1	401	401.0	963.9	1.495
103	0+	—	—	—	—	—	—	—
	1+	1	100.0	1	112	112.0	15.5	1.103
	2+	—	—	—	—	—	—	—
104	—	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—
106	—	—	—	—	—	—	—	—
Belden Reach								
107	—	—	—	—	—	—	—	—
108	—	—	—	—	—	—	—	—
109	—	—	—	—	—	—	—	—
110	—	—	—	—	—	—	—	—
111	—	—	—	—	—	—	—	—
Mainstem								
112	—	—	—	—	—	—	—	—
Upper Butt Creek								
113	0+	2	12.5	2	89 - 90	89.5	8.4	1.172
	1+	6	37.5	6	91 - 132	104.2	12.5	1.071
	2+	8	50.0	9	156 - 390	241.6	266.4	1.213
Lower Butt Creek								
114	—	—	—	—	—	—	—	—
Mosquito Creek								
115	—	—	—	—	—	—	—	—

- Indicates no brown trout

Table 28. Age-Specific Brown Trout Population Estimates for the UNFFR Project Electrofishing Sites, Fall 2000, 2001, and 2002.

		Year 2000		Year 2001		Year 2002	
Reach / Site No.	Age (Years)	BT POP. EST.	SE	BT POP. EST.	SE	BT POP. EST.	SE
Seneca Reach							
101	0+	0	0	0	0	0	0
	1+	0	0	0	0	0	0
	2+	0	0	0	0	1*	—
102	0+	2	0.38	1*	—	3*	—
	1+	2	0.38	2	0.38	8	0.77
	2+	1*	—	0	0	1*	—
103	0+	0	0	0	0	0	0
	1+	1*	—	1*	—	1*	—
	2+	2	0.38	1*	—	0	0
105	0+	0	0	0	0	0	0
	1+	0	0	0	0	0	0
	2+	1*	—	0	0	0	0
Upper Butt Creek							
113	0+	7	0.58	8	0.51	2*	—
	1+	1*	—	1*	—	6	0.67
	2+	5	0.44	4	0.97	9	2.61

* Number reflects actual catch (no estimate from microfish possible).

Upstream, 2 were collected from site 103 *Seneca Bridge – Downstream*, and 1 was collected from site 105 *Butt Creek Confluence – Downstream* in 2000. Only one age class 2+ brown trout was collected from Seneca Reach in 2001 (site 103 *Seneca Bridge – Downstream*) and 2002 (site 102 *Seneca Bridge – Upstream*).

4.2 Belden Reach Population Estimates

Population estimates for all fish collected in the Belden Reach in 2000, 2001, and 2002 are summarized by site (see Tables 18 through 20), and are presented graphically (see Figure 46 through 58).

Site 107: Belden Dam Downstream

In 2000, estimated fish populations at this site were 62 rainbow trout, 40 Sacramento sucker, and 90 sculpin. In 2001, the estimated rainbow trout population decreased to 39 fish. The estimated Sacramento sucker population decreased to 15 fish, and the estimated sculpin population decreased to 60 fish. There was a slight increase in the estimated rainbow trout population to 46 fish in 2002. The estimated Sacramento sucker population was 12 fish, riffle sculpin was 95 fish, and prickly sculpin was 17 fish.

Site 108: Tunnel Addit Bridge Downstream

In 2000, estimated fish populations were 60 rainbow trout, 120 Sacramento sucker, 166 sculpin, and 2 Sacramento pikeminnow. In 2001, the estimated rainbow trout population increased to 103 fish, while the estimated Sacramento sucker population decreased to 56 fish, and the estimated sculpin population decreased to 68 fish. No Sacramento pikeminnow were collected in 2001. In 2002, the estimated rainbow trout population declined to 39 fish, and the estimated Sacramento sucker population declined to 45 fish. The riffle sculpin population was estimated at 69 fish. One prickly sculpin was collected at this site in 2002.

Site 109: Queen Lily Campground - Upstream

In 2000, estimated fish populations at this site were 38 rainbow trout, 28 Sacramento sucker, and 128 sculpin. In 2001, the estimated rainbow trout population increased to 46 fish, while the estimated Sacramento sucker population decreased to 22 fish, and the estimated sculpin population decreased to 65 fish. In 2002, the estimated rainbow trout population further increased to 66 fish. The estimated Sacramento sucker population increased to 30 fish, and the estimated riffle sculpin population increased to 153 fish.

Site 110: Queen Lily Campground - Downstream

In 2000, estimated fish populations at this site were 43 rainbow trout, 16 Sacramento sucker, and 161 sculpin. In 2001, the estimated rainbow trout population decreased to 12 fish, while the estimated Sacramento sucker population increased to 39 fish and the estimated sculpin population was 46 fish. All species population estimates increased in 2002 over 2001: rainbow trout increased to 66 fish, Sacramento sucker increased to 48 fish, and riffle sculpin increased to 146 fish. Two prickly sculpin were also captured.

Site 111: Siphon

In 2000, estimated populations at this site were 50 rainbow trout, 14 Sacramento sucker, and 240 sculpin. In 2001, estimated rainbow trout populations increased slightly to 59 fish, while the estimated Sacramento sucker population decreased to 5 fish and the sculpin population estimate decreased to 99 fish. In 2002, the estimated rainbow trout population increased to 76 fish, the Sacramento sucker estimate remained at 5 fish, and the riffle sculpin estimated population increased to 139 fish.

4.2.1 *Rainbow Trout Population and Age Estimates*

Estimated rainbow trout populations at Belden Reach sites were lower than those observed at Seneca Reach sites during the three years of study. In the Belden Reach, total rainbow trout population estimates ranged from 38 (site 109 *Queen Lily Campground – Upstream*) to 62 fish (site 107 *Belden Dam – Downstream*) in 2000, from 12 (site 110 *Queen Lily Campground – Downstream*) to 59 fish (site 111 *Siphon*) in 2001, and from 39 (site 108 *Tunnel Addit Bridge – Downstream*) to 76 fish (site 111 *Siphon*) in 2002 (see Tables 18 through 20).

Rainbow trout populations were quite variable among sites and from year to year in the Belden Reach. However, in all but one year (2000) of the study, greatest rainbow trout populations in the Belden Reach were observed at the furthest downstream site, site 111 *Siphon*. In 2000, rainbow trout were most abundant at site 107 *Belden Dam – Downstream*, followed closely by site 108 *Tunnel Addit Bridge – Downstream*, and site 111 *Siphon*. In 2001, rainbow trout were most abundant at site 111 *Siphon*, followed in order by site 108 *Tunnel Addit Bridge – Downstream*, site 109 *Queen Lily Campground – Upstream*, and site 107 *Belden Dam Downstream*. The rainbow trout population was exceptionally low (lowest of all sites during the entire three years of study) at site 110 *Queen Lily Campground – Downstream* in 2001. In 2002, rainbow trout were most abundant at site 111 *Siphon*, followed in order by site 109 *Queen Lily Campground – Upstream* and site 110 *Queen Lily Campground – Downstream*.

In 2000, age class 0+ rainbow trout were generally the most abundant age class at Belden Reach sites, ranging from 30.0 (site 111 *Siphon*) to 66.7 percent (site 109 *Queen Lily Campground – Upstream*) (see Table 21). In 2001, the percentage of age class 0+ rainbow trout ranged from 16.1 (site 107 *Belden Dam – Downstream*) to 48.4 percent (site 109 *Queen Lily Campground – Upstream*) in 2001 (see Table 22). In 2002, the percentage of age class 0+ rainbow trout ranged from 26.8 (site 107 *Belden Dam – Downstream*) to 68.9 percent (site 110 *Queen Lily Campground – Downstream*) (see Table 23).

In 2000, the percentage of age class 1+ rainbow trout ranged from 22.2 (site 109 *Queen Lily Campground – Upstream*) to 60.0 percent (site 111 *Siphon*), from 45.2 (site 109 *Queen Lily*

Campground – Upstream) to 60.4 percent (site 111 *Siphon*) in 2001, and from 8.2 (site 110 *Queen Lily Campground – Downstream*) to 43.9 percent (site 107 *Belden Dam – Downstream*) in 2002 (see Tables 21 through 23).

Adult (age class 2+ and older) rainbow trout were the least abundant age class at Belden Reach sites, ranging from 10.0 (site 111 *Siphon*) to 24.0 percent (site 107 *Belden Dam – Downstream*) in 2000, from 6.5 (site 109 *Queen Lily Campground – Upstream*) to 27.3 percent (site 110 *Queen Lily Campground – Downstream*) in 2001, and from 3.4 (site 109 *Queen Lily Campground – Upstream*) to 29.3 percent (site 107 *Belden Dam – Downstream*) in 2002 (see Tables 21 through 23 and Figure 61).

Age-specific rainbow trout population estimates are summarized by site for 2000, 2001 and 2002 in Table 24 and are presented graphically in Figure 61. Rainbow trout production was lower at Belden Reach sites than at Seneca Reach sites during all years. Rainbow trout production in Belden Reach (as depicted by the presence of age class 0+ fish) during the three years of study was greatest in 2002, and was lowest in 2001 (See Figure 61). Age-specific estimates for age class 0+ rainbow trout at the Belden Reach sites ranged from 14 (site 110 *Queen Lily Campground – Downstream*) to 27 fish (site 108 *Tunnel Addit Bridge – Downstream*) in 2000, from 2 (site 110 *Queen Lily Campground – Downstream*) to 19 fish (site 108 *Tunnel Addit Bridge – Downstream*) in 2001, and from 14 (site 107 *Belden Dam – Downstream*) to 45 fish (site 109 *Queen Lily Campground – Upstream*) in 2002 (see Table 24).

Age-specific population estimate for age class 1+ rainbow trout ranged from 9 (site 109 *Queen Lily Campground – Upstream*) to 51 fish (site 111 *Siphon*) in 2000, from 6 (site 110 *Queen Lily Campground – Downstream*) to 35 fish (site 111 *Siphon*) in 2001, and from 6 (site 109 *Queen Lily Campground – Downstream*) to 19 fish (site 107 *Belden Dam Downstream*) in 2002 (see Table 24).

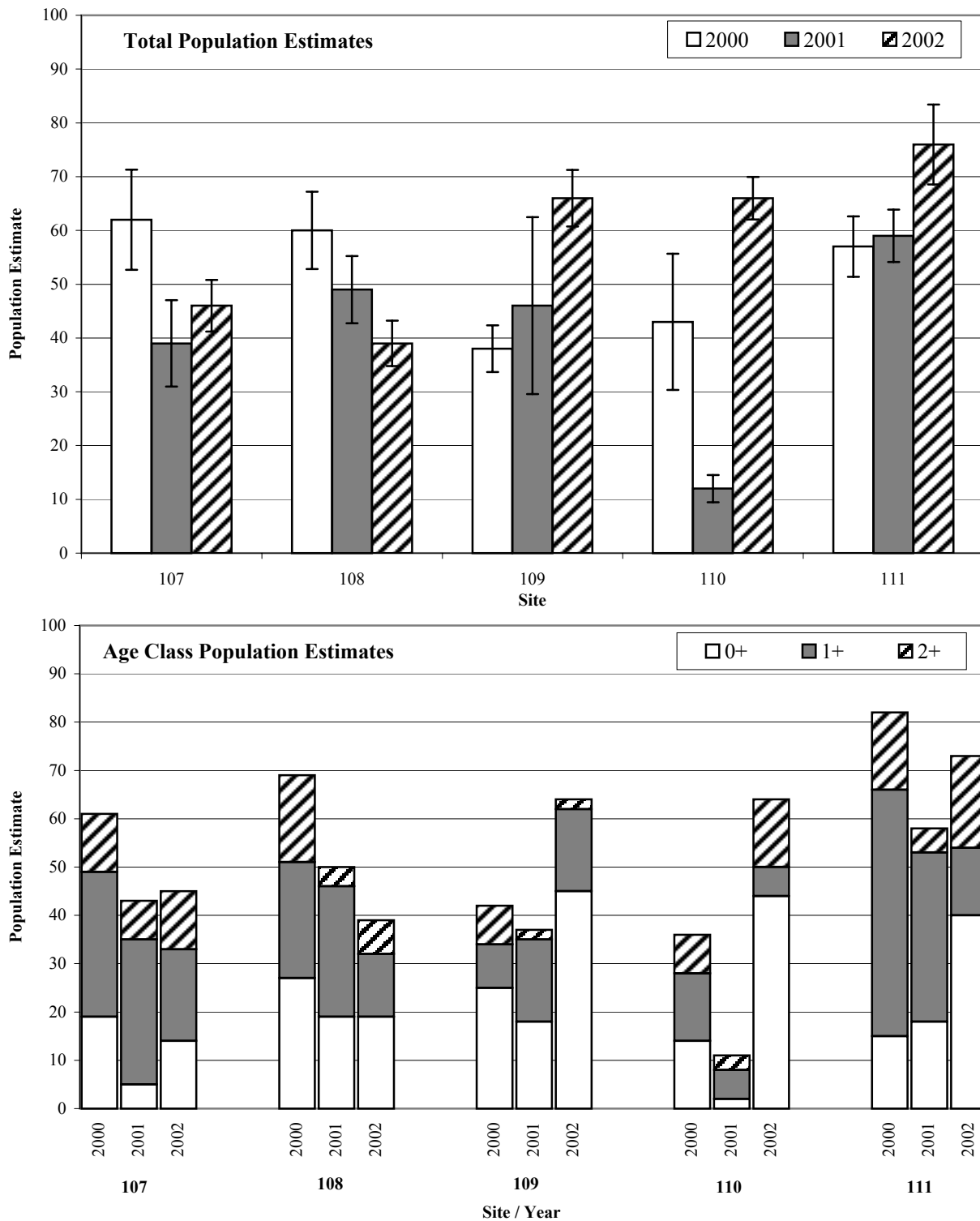


Figure 61. Rainbow Trout Population Estimates, Total and Age Class Specific, for Belden Reach Sites, Fall 2000, 2001, and 2002.

Adult (age class 2+ and older) rainbow trout exhibited the lowest age class percentages in Belden Reach sites. Age-specific age class 2+ population estimates ranged from 8 (site 109 *Queen Lily Campground – Upstream* and site 110 *Queen Lily Campground – Downstream*) to 18 fish (site 108 *Tunnel Addit Bridge – Downstream*) in 2000, from 2 (site 109 *Queen Lily Campground – Upstream*) to 8 fish (site 107 *Belden Dam – Downstream*) in 2001, and from 2 (site 109 *Queen Lily Campground – Upstream*) to 19 fish (site 111 *Siphon*) in 2002 (see Table 24).

4.3 Mainstem Population Estimates

Site 112: Mainstem – Belden Town Upstream

In 2000, estimated fish populations at this site were 8 rainbow trout, 4 Sacramento sucker, 2 Sacramento pikeminnow, and 275 sculpin (see Tables 18 through 20 and Figures 46 through 58). In 2001, the estimated rainbow trout population increased to 19 fish, Sacramento pikeminnow population increased to 12, and the sculpin population increased to 359. No Sacramento sucker were collected at this site in 2001. In 2002, the estimated rainbow trout population was 16 fish. Sacramento pikeminnow population was 16 fish, Sacramento sucker was 3 fish, and sculpin were estimated at 125 riffle sculpin and 30 prickly sculpin.

4.3.1 Rainbow Trout Population and Age Estimates

Site 112 *Mainstem* had the lowest rainbow trout populations of all study sites during the three years of study. Age-specific estimates of age class 0+ rainbow trout were 8, 6, and 6 fish, followed by age class 1+ estimates of 1, 6, and 3 fish, and age class 2+ estimates of 1, 6, and 5 fish for 2000, 2001, and 2002, respectively (see Table 24 and Figure 62).

In 2000, age class 0+ rainbow trout accounted for 71 percent of the estimated trout population, compared to 35 percent in 2001, and 43 percent in 2002. Age class 1+ trout accounted for 14 percent of the total population in 2000, 35 percent in 2001, and 21 percent in 2002. Age class 2+ trout accounted for 14, 29, and 36 percent of the totals in 2000, 2001, and 2002, respectively (see Tables 21 through 23).

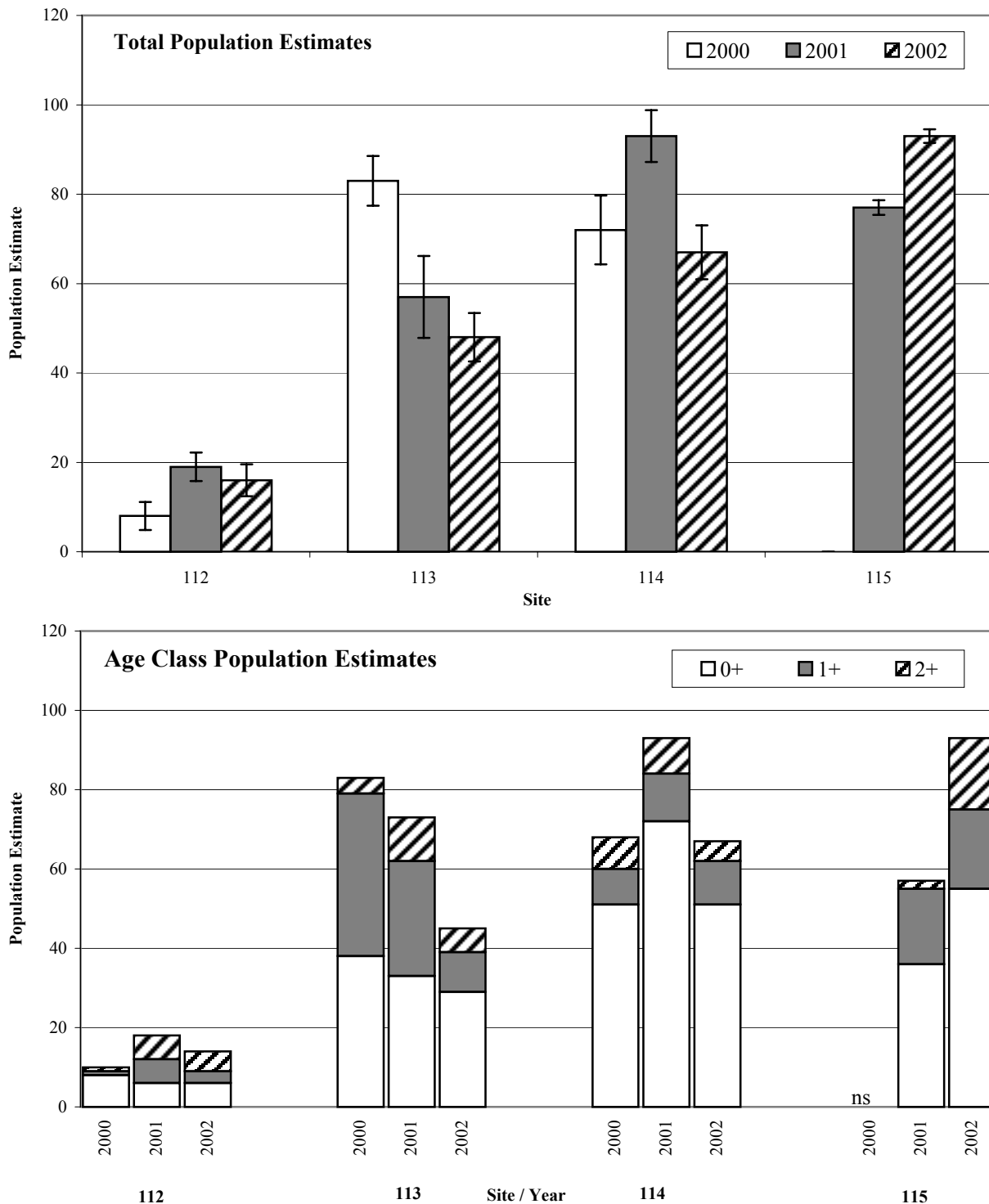


Figure 62. Rainbow Trout Population Estimates, Total and Age Class Specific, for Mainstem, Upper Butt Creek, Lower Butt Creek, & Mosquito Creek Sites, Fall 2000, 2001, and 2002.

4.4 Upper Butt Creek Population Estimates

Site 113: Upper Butt Creek

In 2000, estimated fish populations at this site were 83 rainbow trout, 13 brown trout, 76 Sacramento sucker, and 178 sculpin (see Tables 18 through 20 and Figures 46 through 58). In 2001, rainbow trout population declined to 57 fish, the Sacramento sucker population declined to 16 fish, and sculpin were estimated at 77 fish. The brown trout population remained at 13 fish (see Table 19). In 2002, the rainbow trout population further declined to 48 fish, Sacramento sucker population further declined to 7 fish, and riffle sculpin were estimated at 110 fish. The brown trout population remained relatively stable at 17 fish (see Table 20).

4.4.1 Rainbow Trout Population and Age Estimates

Rainbow trout age structure at Upper Butt Creek is summarized in Tables 21 through 23 and is presented graphically in Figure 62. Rainbow trout production in site 113 *Upper Butt Creek* was relatively high, with age class 0+ age accounting for 41.3 percent of the total population in 2000, 28.3 percent in 2001, and 61.9 percent in 2002. Age class 1+ rainbow trout was the most abundant age class in 2000 and 2001, with 53.3 and 58.7 percent, respectively, of the total population. In 2002, age class 1+ rainbow trout was 23.8 percent of the population. Age class 2+ rainbow trout represented only 5.3 percent of the total rainbow trout population in 2000, but increased to 13.0 percent for 2001, and further to 14.3 percent in 2002.

Age class 0+ rainbow trout age-specific population estimates were 38, 33, and 29 fish in 2000, 2001, and 2002, respectively (see Table 24). Age class 1+ age-specific rainbow trout population estimates were 41, 29, and 10 fish in 2000, 2001, and 2002. Adult (age class 2+ and older) age-specific rainbow trout population estimates were 4, 11, and 6 fish in 2000, 2001, and 2002, respectively.

4.4.2 Brown Trout Population and Age Estimates

Upper Butt Creek had the highest estimated brown trout populations of all sites sampled during the three years of study. Of the three tributary sites sampled, brown trout were only collected from Upper Butt Creek (see Tables 6, 8, and 10 and Figure 50).

Age class 0+ brown trout was the most abundant age group at Upper Butt Creek in 2000 and 2001, representing 53.8 and 61.5 percent of the total population (see Tables 25 through 27). However, in 2002, age class 0+ brown trout represented only 12.5 percent of the total population. Age class 1+ brown trout were the least abundant age class in 2000 and 2001, accounting for 7.7 percent for both years. However, in 2002, age class 1+ brown trout accounted for 37.5 percent of the population. Age class 2+ brown trout accounted for 38.5 percent in 2000, 30.8 percent in 2001, and 50.0 percent in 2002.

Age-specific brown trout population estimates for age class 0+ were 7 fish in 2000, 8 fish in 2001, and 2 fish in 2002 (see Table 28; Figure 63). Age-specific estimates for age class 1+ were 1 fish each for 2000 and 2001, and 6 fish in 2002. Age class 2+ estimates were 5 fish in 2000, 4 fish in 2001, and 9 fish in 2002.

4.5 Lower Butt Creek Population Estimates

Site 114: Lower Butt Creek

In 2000, estimated populations at this site were 72 rainbow trout and 136 sculpin (see Table 18 and Figures 46 through 58). In 2001, the estimated rainbow trout population increased to 93 fish and estimated sculpin population increased to 160 fish (see Table 19). In 2002, estimated rainbow trout population decreased to 67 fish, and estimated riffle sculpin population decreased to 90 fish (see Table 20).

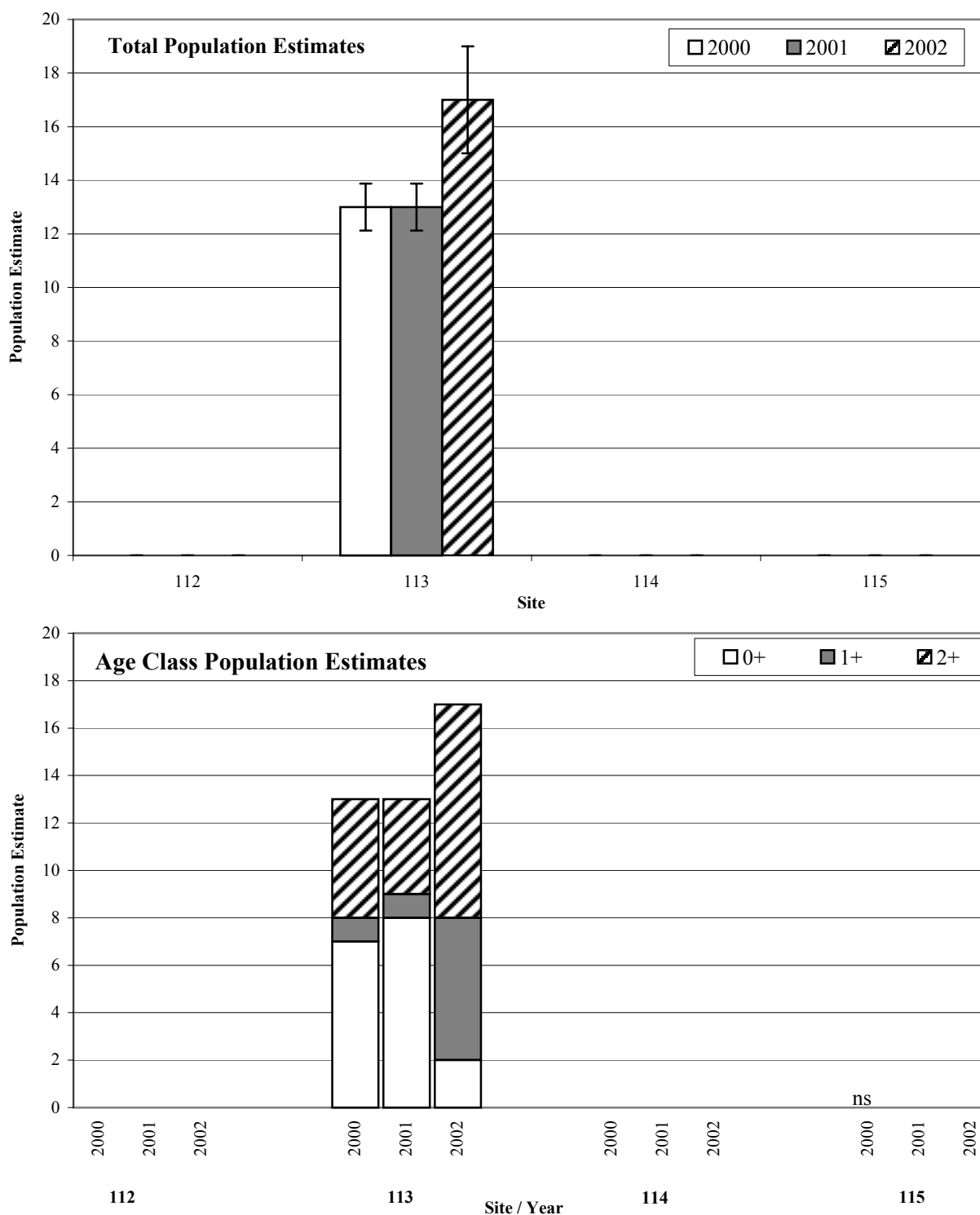


Figure 63. Brown Trout Population Estimates, Total and Age Class Specific, for Mainstem, Upper Butt Creek, Lower Butt Creek, & Mosquito Creek Sites, Fall 2000, 2001, and 2002.

4.5.1 Rainbow Trout Population and Age Estimates

Population age structure for Lower Butt Creek rainbow trout is summarized in Tables 21 through 23 and presented graphically in Figure 62. Age class 0+ rainbow trout was the most abundant age class, in 2000, 2001, and 2002 (72, 75, and 80 percent respectively). Age class 1+ rainbow trout accounted for 15, 14, and 12 percent of the total population in 2000, 2001, and 2002, while age class 2+ trout accounted for 13, 11, and 9 percent in 2000, 2001, and 2002, respectively.

Age-specific population estimates for age class 0+ rainbow trout were 51, 72 and 51 fish at Lower Butt Creek in 2000, 2001, and 2002, respectively (see Table 24). Age class 1+ trout estimates were 9, 12, and 11 fish in 2000, 2001, and 2002, and age class 2+ estimates were 8, 9, and 5 fish in 2000, 2001 and 2002 (see Table 24).

4.6 Mosquito Creek Population Estimates

Site 115: Mosquito Creek

No electrofishing was performed at Mosquito Creek during 2000. Estimated populations for this site in 2001 were 77 rainbow trout and 55 sculpin, and in 2002, 93 rainbow trout and 45 riffle sculpin (see Tables 19 and 20 and Figures 48 through 56).

4.6.1 Rainbow Trout Population and Age Estimates

Age class 0+ rainbow trout was the most abundant age class in Mosquito Creek, comprising 47 percent of the population in 2001 and 38 percent in 2002 (see Tables 22 and 23). Age class 1+ rainbow trout comprised 22 percent both in 2001 and 2002, and age class 2+ trout accounted for 30 percent and 20 percent of the total population in 2001 and 2002, respectively. Mosquito Creek age-specific population estimates were 36, 19, and 2 fish respectively, for age class 0+, age class 1+, and age class 2+ rainbow trout in 2001, and 55, 20 and 18 fish in 2002 (see Table 24 and Figure 62).

5.0 AGE AND GROWTH

5.1 Rainbow Trout Age and Growth

Seneca Reach

Rainbow trout mean lengths by age are presented for 2000, 2001, and 2002 in Figures 64 through 66. Rainbow trout length frequencies for all years are presented in Figure 67 through 69.

Mean lengths of age class 0+ rainbow trout were similar among all but one of the Seneca Reach sites; age class 0+ trout mean length was lowest at site 101 *Canyon Dam Weir – Downstream*. The mean length range for age class 0+ rainbow trout at the Seneca Reach sites for 2000 was 56 to 77 mm, 76 to 81 mm for 2001, and 74 to 88 mm in 2002. The overall length range for age class 0+ trout was 32 to 115 mm for 2000, 40 to 127 mm for 2001, and 39 to 107 mm for 2002 (see Tables 21 through 23). Site 101 *Canyon Dam Weir – Downstream* had fewer age class 0+ in 2000 and 2002 than the rest of the Seneca sites and none in 2001, indicating low trout production immediately below Canyon Dam.

Length ranges for age class 1+ rainbow trout were also similar for both years among Seneca Reach sites. Age class 1+ trout mean lengths ranged from 136 to 174 mm in 2000, from 146 to 160 mm in 2001, and from 136 to 157 mm in 2002. The total length range of age class 1+ trout was 111 to 200 mm in 2000, 105 to 189 mm in 2001, and from 100 to 190 mm in 2002.

The rainbow trout age class 2+ year class includes all trout 2 years and older (i.e., adults). Adult trout length ranges can vary considerably from site to site, but mean lengths were similar among all Seneca Reach sites during the three years of study. Adult trout mean length at site 101 *Canyon Dam Weir – Downstream* tended to be shorter, especially in 2001. The mean length range for 2000 was 205 to 248 mm, 198 to 249 mm for 2001, and 209 to 254 mm for 2002. The length range of age class 2+ rainbow trout was 175 to 460 mm in 2000, 175 to 390 mm in 2001, and 183 to 377 mm in 2002.

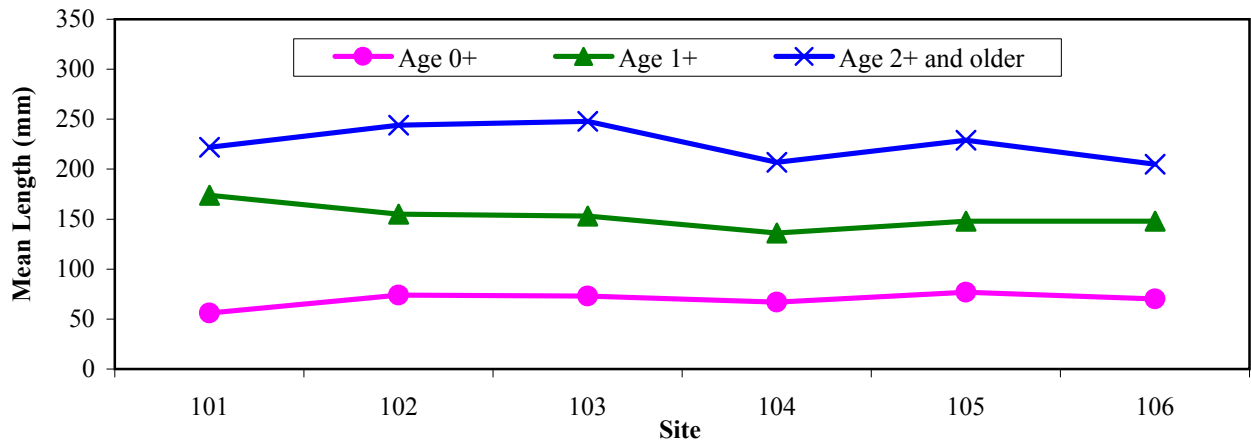


Figure 64. Rainbow Trout Mean Lengths by Age for Seneca Reach Sites, NFFR, Fall 2000.

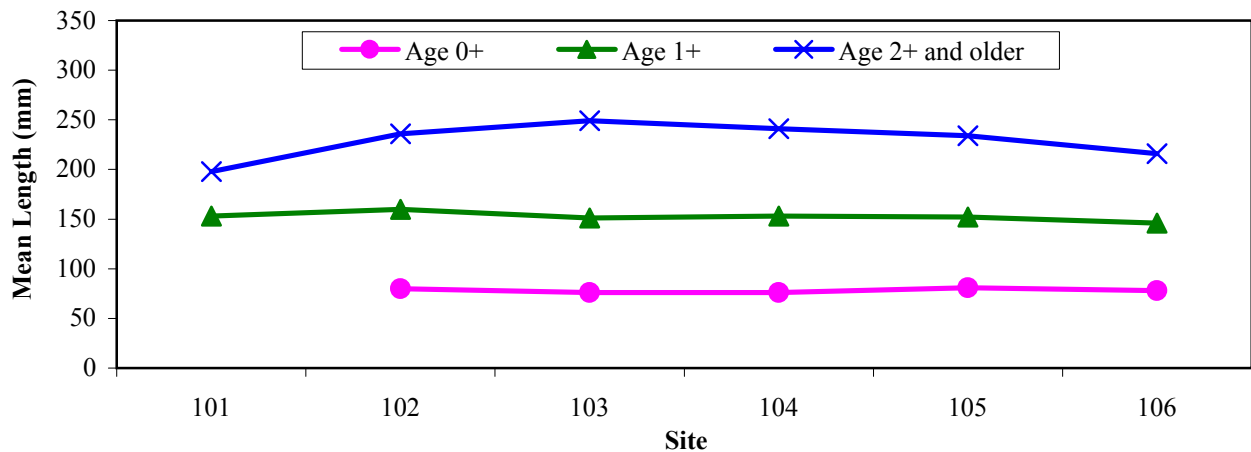


Figure 65. Rainbow Trout Mean Lengths by Age for Seneca Reach Sites, NFFR, Fall 2001.

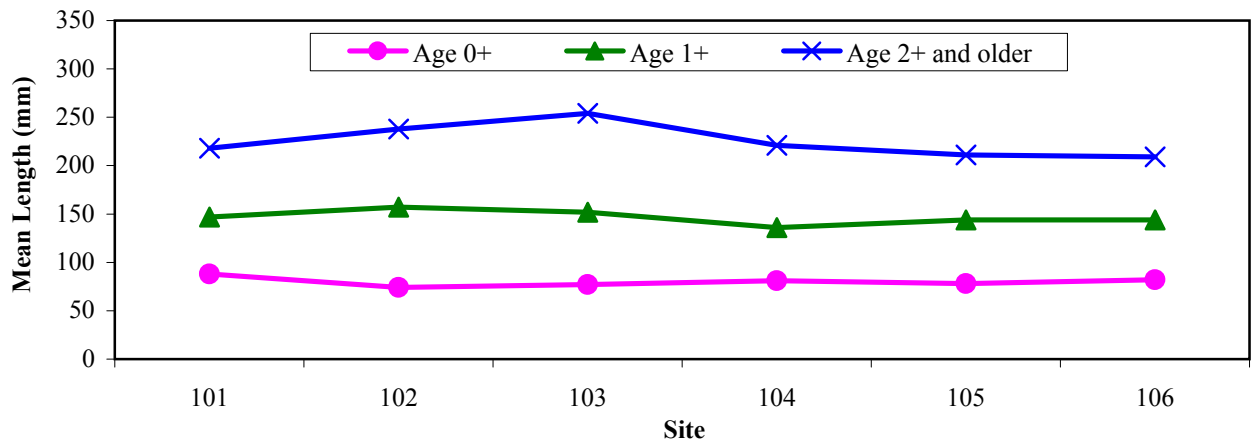


Figure 66. Rainbow Trout Mean Lengths by Age for Seneca Reach Sites, NFFR, Fall 2002.

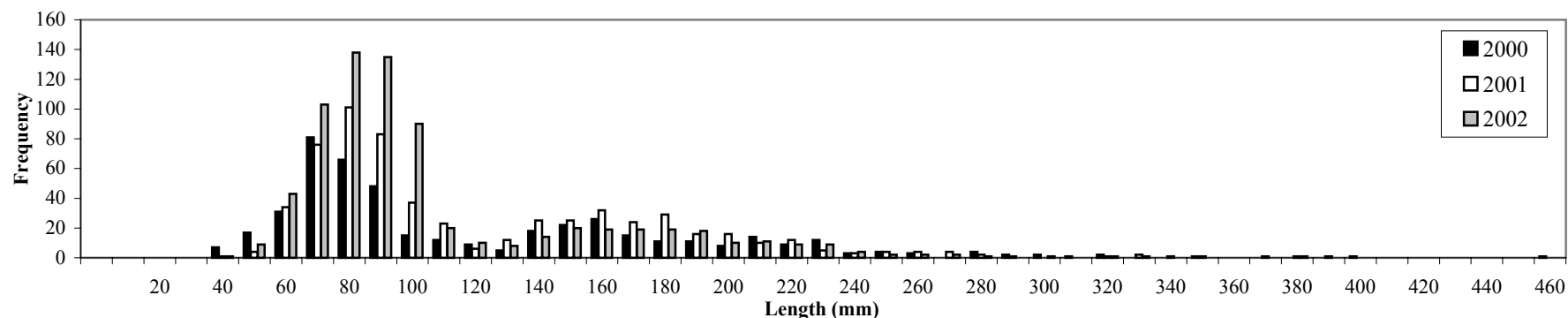


Figure 67. Rainbow Trout Length Frequency Histogram for Seneca Reach, NFFR, Fall 2000, 2001, and 2002.

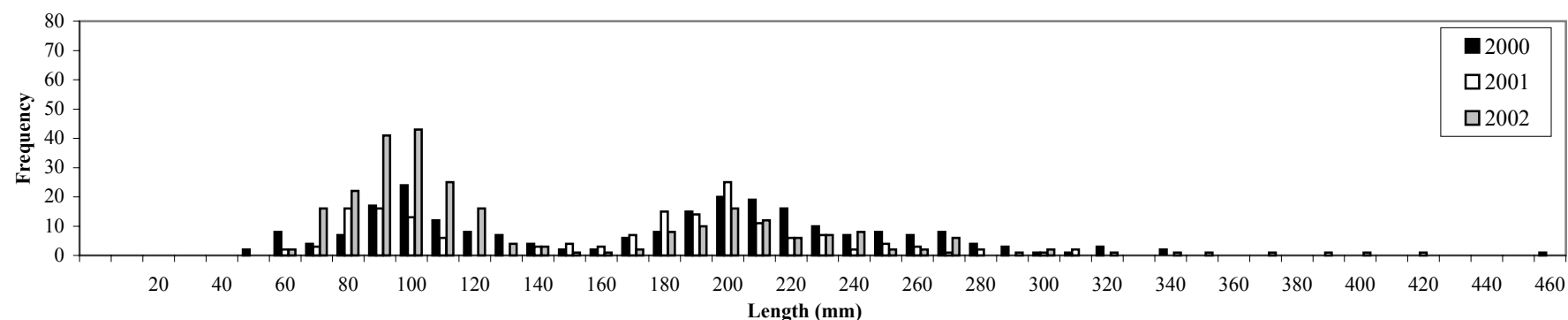


Figure 68. Rainbow Trout Length Frequency Histogram for Belden Reach, NFFR, Fall 2000, 2001, and 2002.

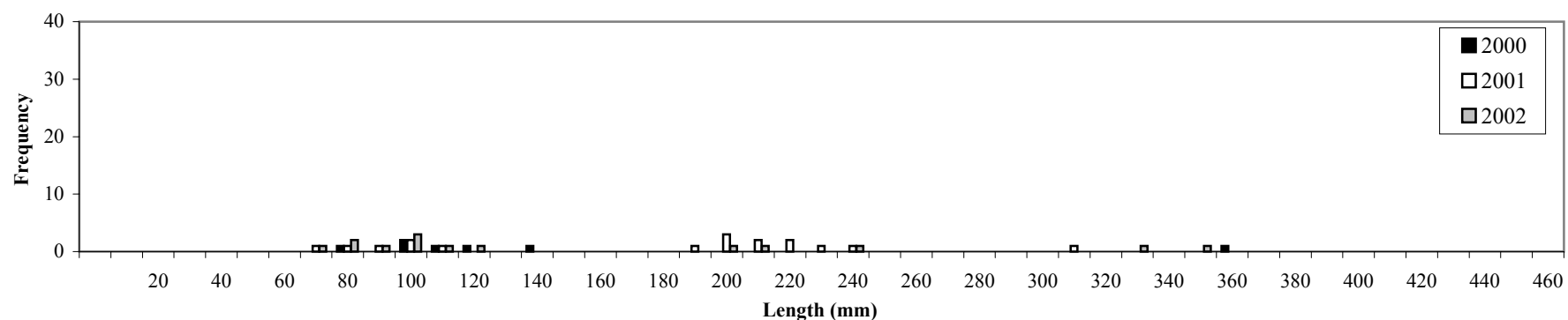


Figure 69. Rainbow Trout Length Frequency Histogram for Mainstem, NFFR, Fall 2000, 2001, and 2002.

Belden Reach

Mean lengths for rainbow trout age class 0+ were similar among all Belden Reach sites (Figures 70 through 72). Age class 0+ trout mean lengths ranged from 75 to 107 mm in 2000, from 77 to 95 mm in 2001, and from 84 to 90 mm in 2002 (see Tables 21 through 23). The overall length range for age class 0+ trout at Belden Reach sites was 46 to 137 mm for 2000, 55 to 105 mm in 2001, and 56 to 107 mm in 2002. Length frequencies for all years are presented in Figure 68.

Length ranges for age class 1+ rainbow trout were also similar at all Belden Reach sites for all years. Mean lengths ranged from 191 to 207 mm in 2000, from 180 to 202 mm in 2001, and from 125 to 182 mm in 2002. The total length range for age class 1+ trout was 140 to 235 mm in 2000, 133 to 225 mm in 2001, and 102 to 204 mm in 2002.

The mean lengths of age class 2+ trout vary widely, largely due to the low numbers of age class 2+ trout collected at several Belden Reach sites. Mean lengths ranged from 251 to 310 mm in 2000, from 238 to 328 mm in 2001, and from 221 to 279 mm in 2002. The length range of rainbow trout age class 2+ was 228 to 460 mm in 2000, 212 to 415 mm in 2001, and 195 to 392 mm in 2002.

Mainstem

Mean lengths for rainbow trout age class 0+ in the mainstem site were 97 mm in 2000 (overall length range was 80 to 120 mm), 87 mm in 2001 (67 to 109 mm), and 80 mm in 2002 (63 to 97 mm). Age class 1+ rainbow trout mean lengths were 140 mm (one fish) in 2000, 196 mm (188 to 203 mm) in 2001, and 106 mm (98 to 112 mm) in 2002. Age class 2+ and older rainbow trout mean lengths were 360 mm (one fish) in 2000, 238 mm (217 to 302 mm) in 2001, and 261 mm (200 to 347 mm) in 2002.

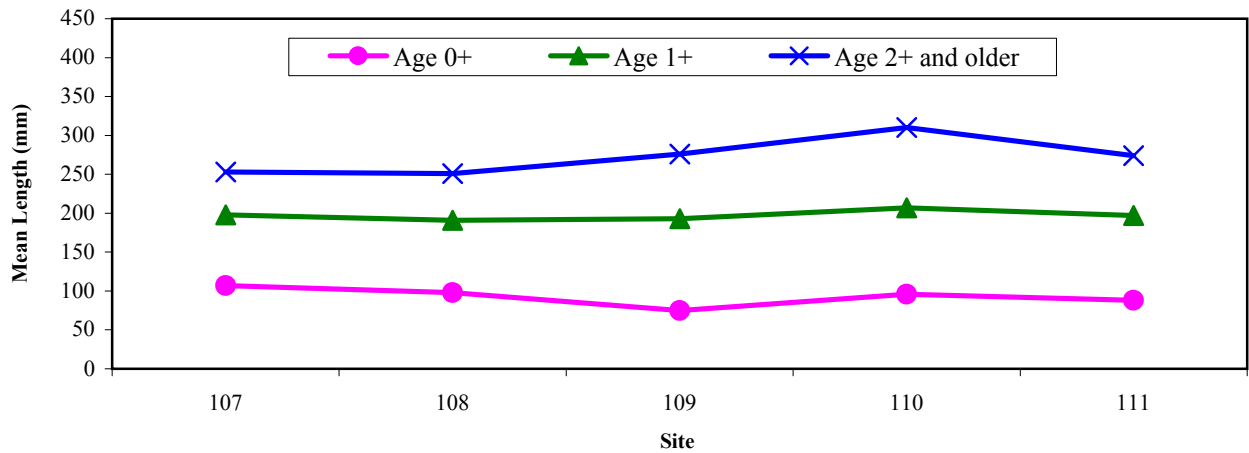


Figure 70. Rainbow Trout Mean Lengths by Age for Belden Reach Sites, NFFR, Fall 2000.

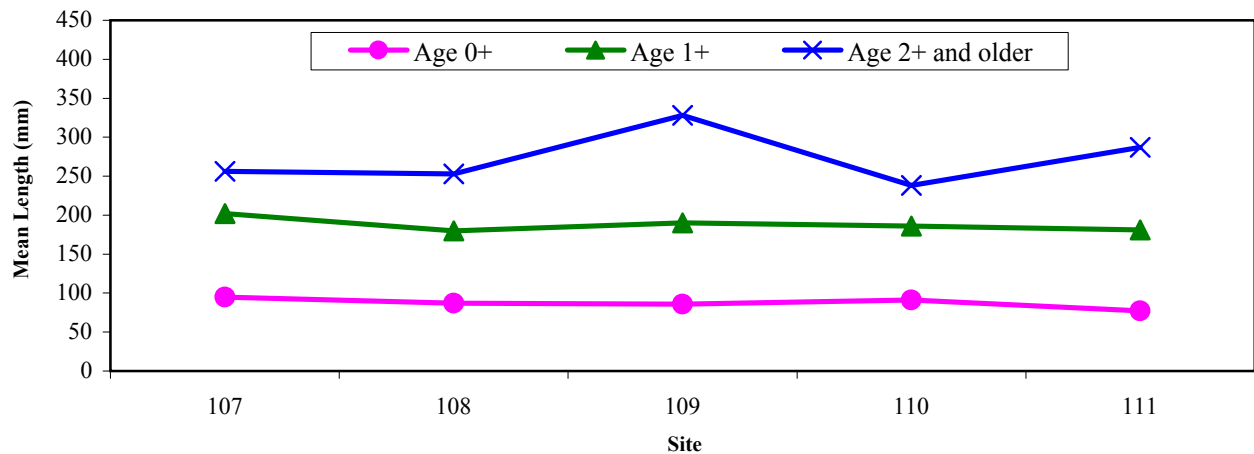


Figure 71. Rainbow Trout Mean Lengths by Age for Belden Reach Sites, NFFR, Fall 2001.

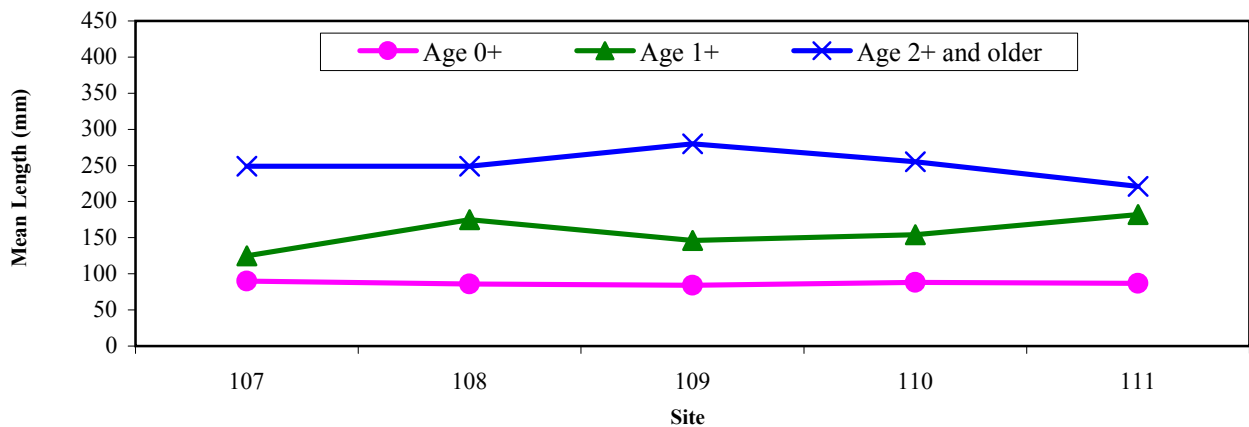


Figure 72. Rainbow Trout Mean Lengths by Age for Belden Reach Sites, NFFR, Fall 2002.

Tributary Sites

Rainbow trout length frequencies for tributary sites are present in Figures 73 through 75.

Rainbow trout mean lengths by age are presented for tributary sites in Figures 77 through 79.

Upper Butt Creek

Age class 0+ rainbow trout mean length in Upper Butt Creek was 72 mm in 2000, 64 mm in 2001 and 66 mm in 2002. The overall length range for age class 0+ trout for 2000 was 52 to 95 mm, 47 to 77 mm in 2001, and 42 to 84 mm in 2002.

Age class 1+ rainbow trout also tended to be smaller in year 2001 and 2002 than in year 2000. Age class 1+ mean length was 163 mm in 2000, 129 mm in 2001, and 128 mm in 2002. The length range of age class 1+ trout was 116 to 228 mm in 2000, 99 to 154 mm in 2001, and 106 to 147 mm in 2002.

Age class 2+ rainbow trout collected in 2000 and 2002 were smaller than those collected in 2001, probably a function of variability of length ranges among the adult population and of low numbers of age class 2+ fish collected. Adult trout mean length was 305 mm in 2000, 211 mm in 2001, and 196 mm in 2002. The length range of adult rainbow trout was 254 to 350 mm in 2000, 183 to 241 mm in 2001, and 177 to 219 mm in 2002.

Lower Butt Creek

The mean length for age class 0+ rainbow trout in Lower Butt Creek was 70 mm in 2000, 69 mm in 2001, and 73 mm in 2002. The length range for rainbow trout age 0+ was 48 to 94 mm for 2000, 44 to 103 mm in 2001, and 49 to 98 mm in 2002.

Length ranges for age class 1+ rainbow trout were also similar during the three years of study. The mean length was 120 mm in 2000, 122 mm in 2001, and 137 mm in 2002. The length range

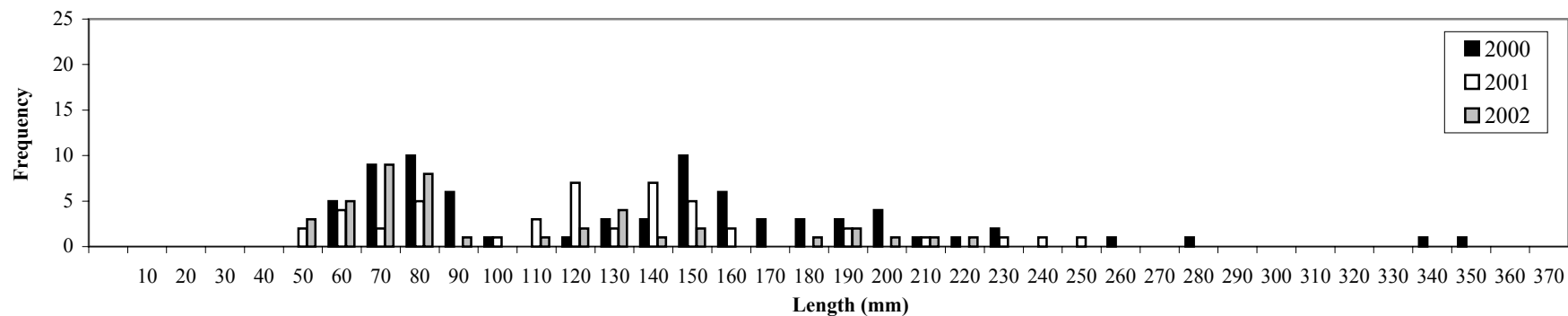


Figure 73. Rainbow Trout Length Frequency Histogram for Upper Butt Creek, NFFR, Fall 2000, 2001, and 2002.

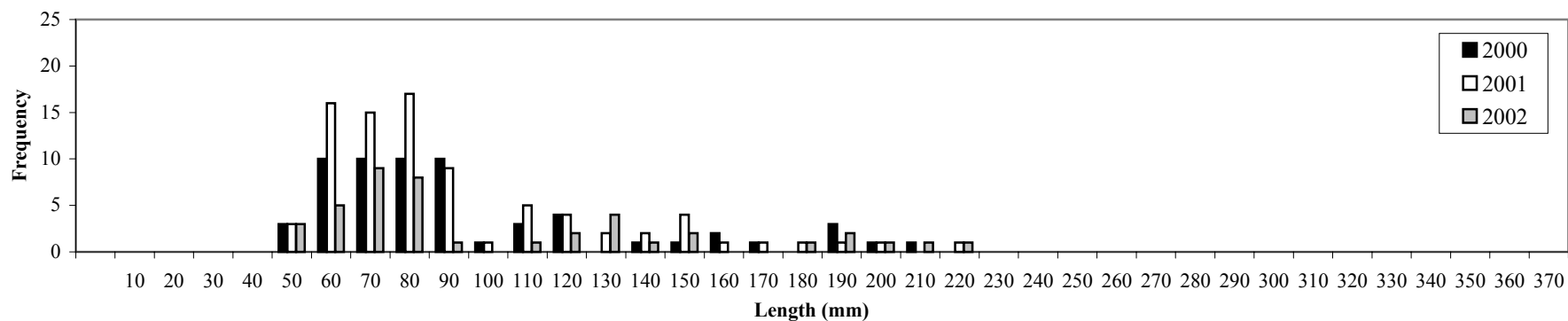


Figure 74. Rainbow Trout Length Frequency Histogram for Lower Butt Creek, NFFR, Fall 2000, 2001, and 2002.

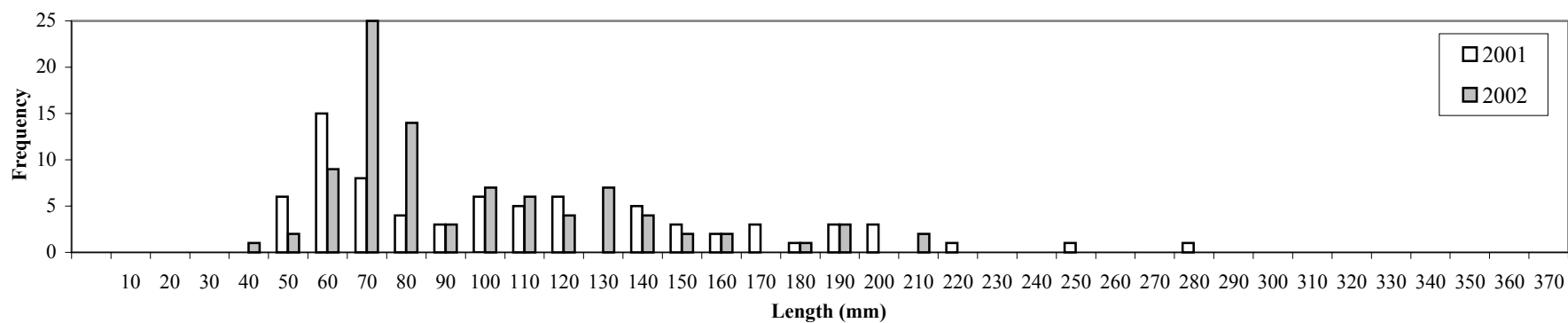


Figure 75. Rainbow Trout Length Frequency Histogram for Mosquito Creek, NFFR, Fall 2001 and 2002.

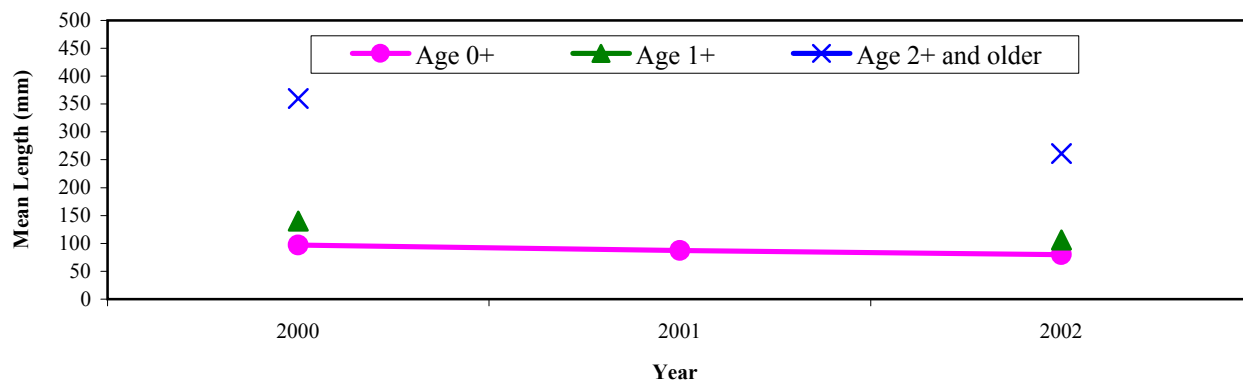


Figure 76. Rainbow Trout Mean Lengths by Age for Mainstem, NFFR, Fall 2000, 2001, and 2002.

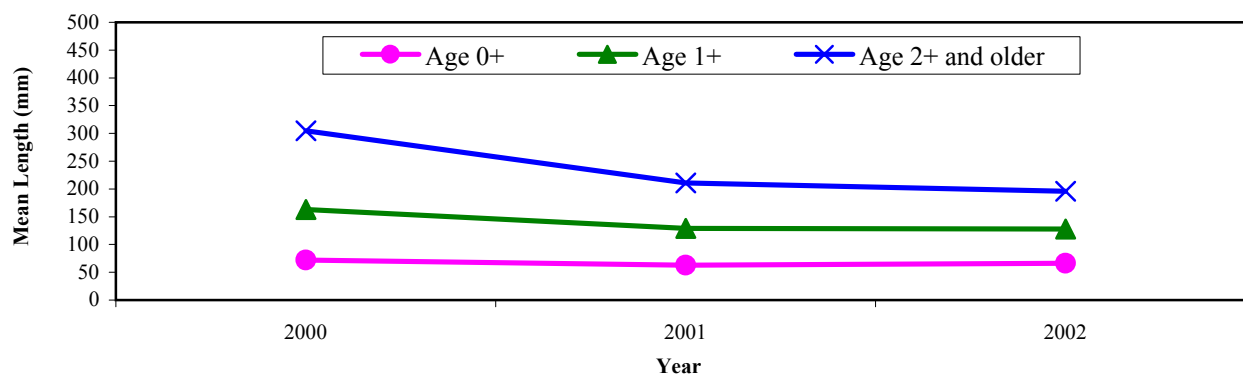


Figure 77. Rainbow Trout Mean Lengths by Age for Upper Butt Creek, NFFR, Fall 2000, 2001, and 2002.

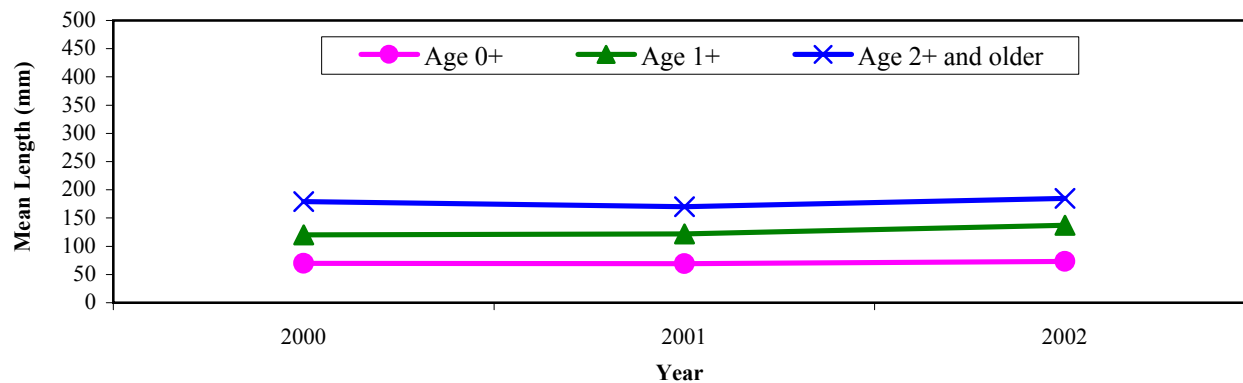


Figure 78. Rainbow Trout Mean Lengths by Age for Lower Butt Creek, NFFR, Fall 2000, 2001, and 2002.

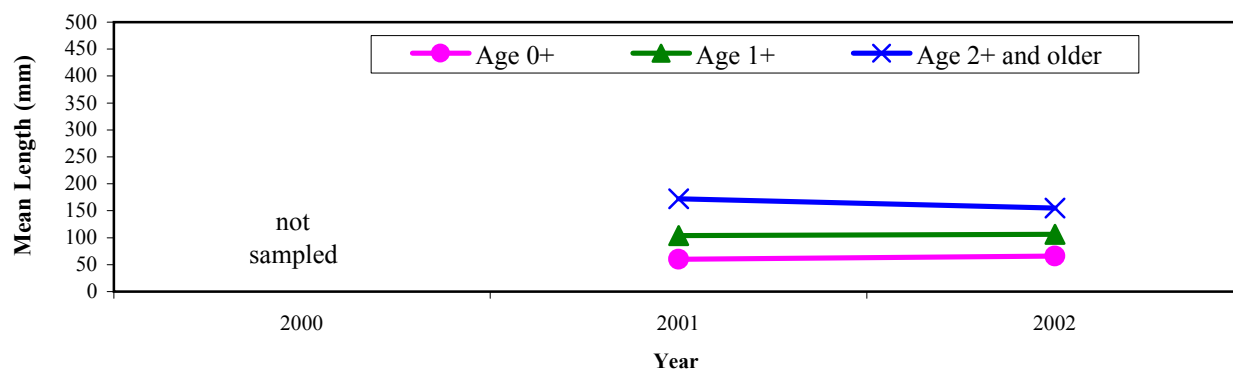


Figure 79. Rainbow Trout Mean Lengths by Age for Mosquito Creek, NFFR, Fall 2001 and 2002.

of age class 1+ rainbow trout was 107 to 145 mm in 2000, 108 to 142 mm in 2001, and 114 to 158 mm in 2002.

Length ranges for adult rainbow trout were also similar between years. Adult trout mean length was 179 mm in 2000, 170 mm in 2001, and 186 mm in 2002. The length range for adult rainbow trout was 152 to 208 mm in 2000, 143 to 211 mm in 2001, and 168 to 209 mm in 2002.

Mosquito Creek

Length ranges of Mosquito Creek rainbow trout were similar to those collected from Lower Butt Creek. The mean length of age class 0+ trout in 2001 was 60 mm, and was 66 mm in 2002. Age class 0+ rainbow trout ranged in length from 41 to 90 mm in 2001, and 40 to 85 mm in 2002. Age class 1+ rainbow trout ranged in length from 93 to 116 mm, with a mean length of 104 mm in 2001, and the range in 2002 was 91 to 123 mm with a mean length of 105 mm. Age class 2+ rainbow trout ranged in length from 133 to 272 mm, with a mean length of 172 mm in 2001. In 2002, age class 2+ rainbow trout length ranged from 125 to 205 mm with a mean length of 154 mm.

5.1.1 Rainbow Trout Condition Factor

Condition factor is a measure of fish health as a comparison between length and weight. Generally, a rainbow trout condition factor closer to 1 indicates good health (range 0.8 to 1.2). Age 0+ rainbow trout can have the largest variation in condition factor because of greater variation in body shape (i.e., length to weight ratios) at early life history stages.

Rainbow trout mean condition factors are presented by age class for all three years of study (See Tables 21 through 23). Overall, condition factors for age class 1+ and 2+ fish were generally within normal range (0.8 to 1.2), for all sites during all three years of study.

5.2 Brown Trout Age and Growth

Seneca Reach

Brown trout mean lengths by age are provided in Tables 25 through 27 and are presented graphically in Figures 80 through 82. Brown trout were only collected at three Seneca Reach sites (site 102 *Seneca Bridge – Upstream*, site 103 *Seneca Bridge – Downstream*, and site 105 *Butt Creek Confluence – Downstream*) in 2000, two sites (site 102 *Seneca Bridge – Upstream* and site 103 *Seneca Bridge – Downstream*) in 2001, and three sites (site 101 *Canyon Dam Weir – Downstream*, site 102 *Seneca Bridge – Upstream* and site 103 *Seneca Bridge – Downstream*) in 2002.

Brown trout length-frequencies are presented graphically for all three years of study in Figure 83. Age class 0+ brown trout ranged in length from 90 to 106 mm for 2000, 108 mm for 2001, and was 89 to 101 mm for 2002.

Few age class 1+ brown trout were collected during the three years of study. Age class 1+ brown trout mean lengths ranged from 190 to 198 mm in 2000, from 104 to 216 mm in 2001, and from 112 to 114 mm in 2002. The overall length range of age class 1+ brown trout was 190 to 200 mm in 2000, 104 to 226 mm in 2001, and 107 to 120 mm in 2002.

A small number of age class 2+ brown trout were collected at Seneca Reach sites during all three years. Age class 2+ brown trout mean lengths ranged from 359 to 401 mm in 2000, and 264 to 401 mm in 2002. A single age class 2+ trout collected in 2001 was 262 mm. Age class 2+ brown trout ranged from 301 to 500 mm in 2000, and from 264 to 401 mm in 2002.

Belden Reach

Brown trout were not collected in the Belden Reach during the three years of study.

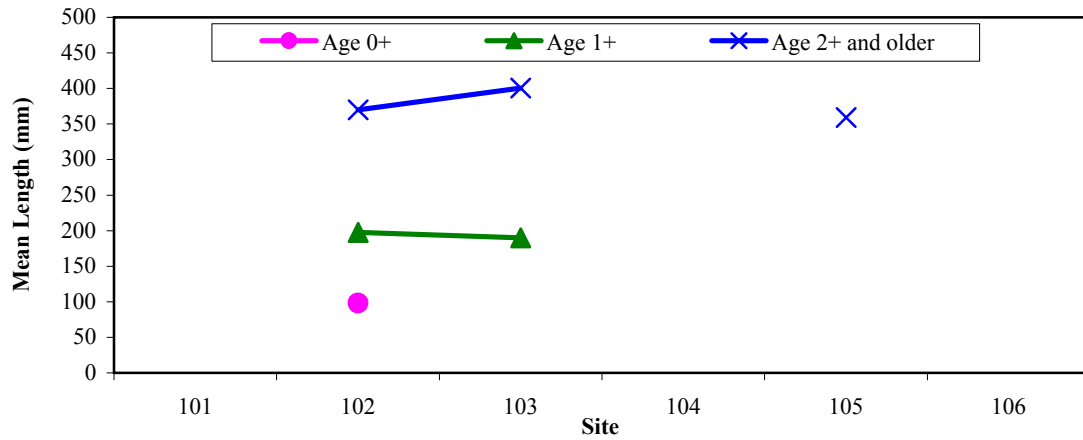


Figure 80. Brown Trout Mean Lengths by Age for Seneca Reach Sites, NFFR, Fall 2000.

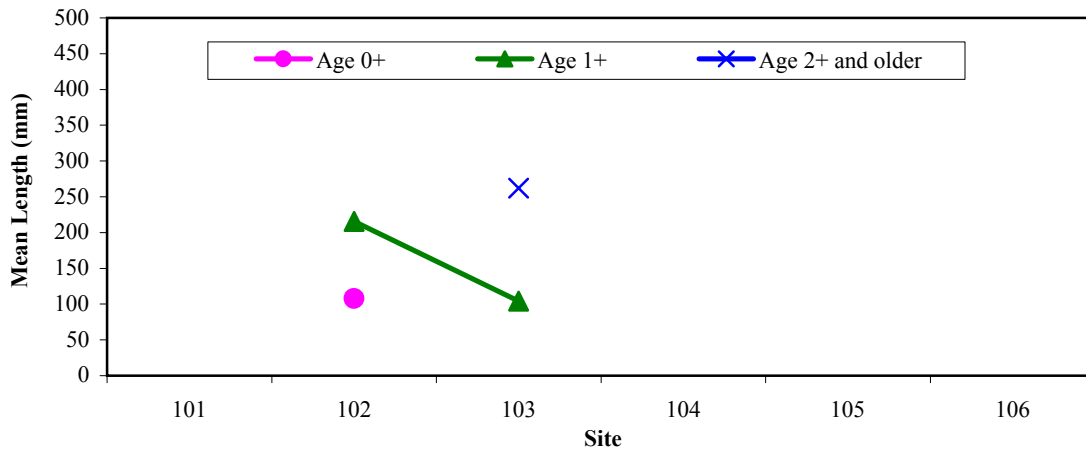


Figure 81. Brown Trout Mean Lengths by Age for Seneca Reach Sites, NFFR, Fall 2001.

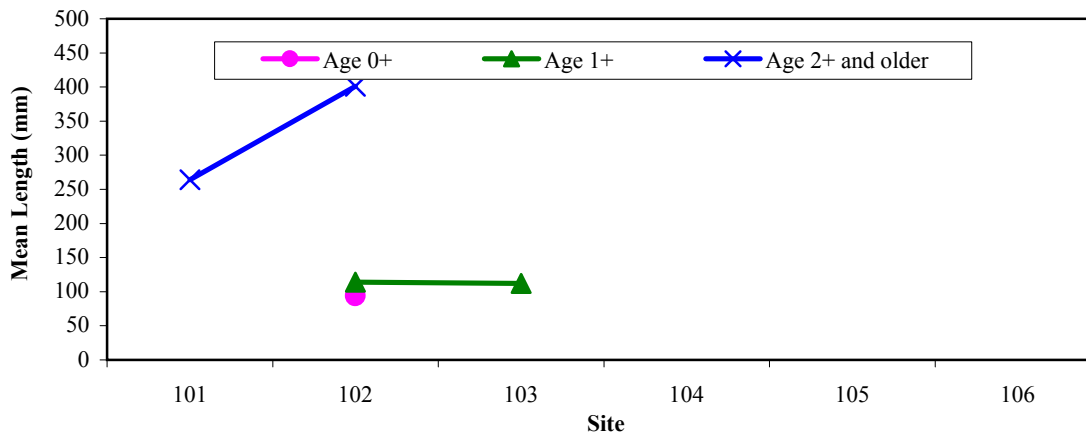


Figure 82. Brown Trout Mean Lengths by Age for Seneca Reach Sites, NFFR, Fall 2002.

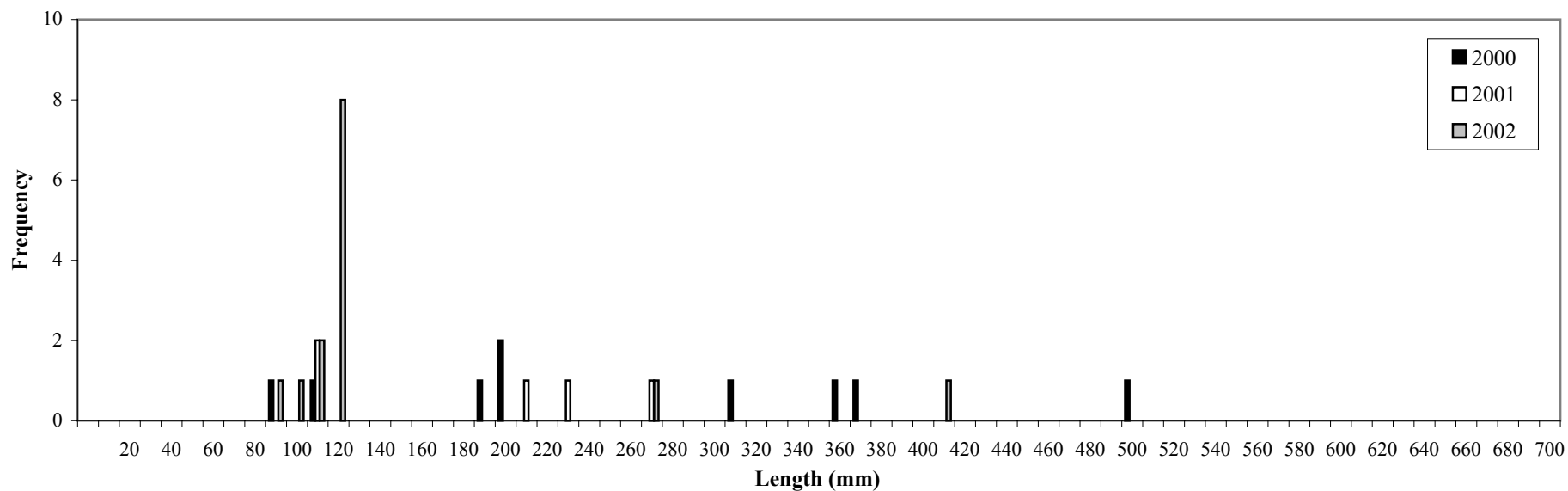


Figure 83. Brown Trout Length Frequency Histogram for Seneca Reach, NFFR, Fall 2000, 2001, and 2002.

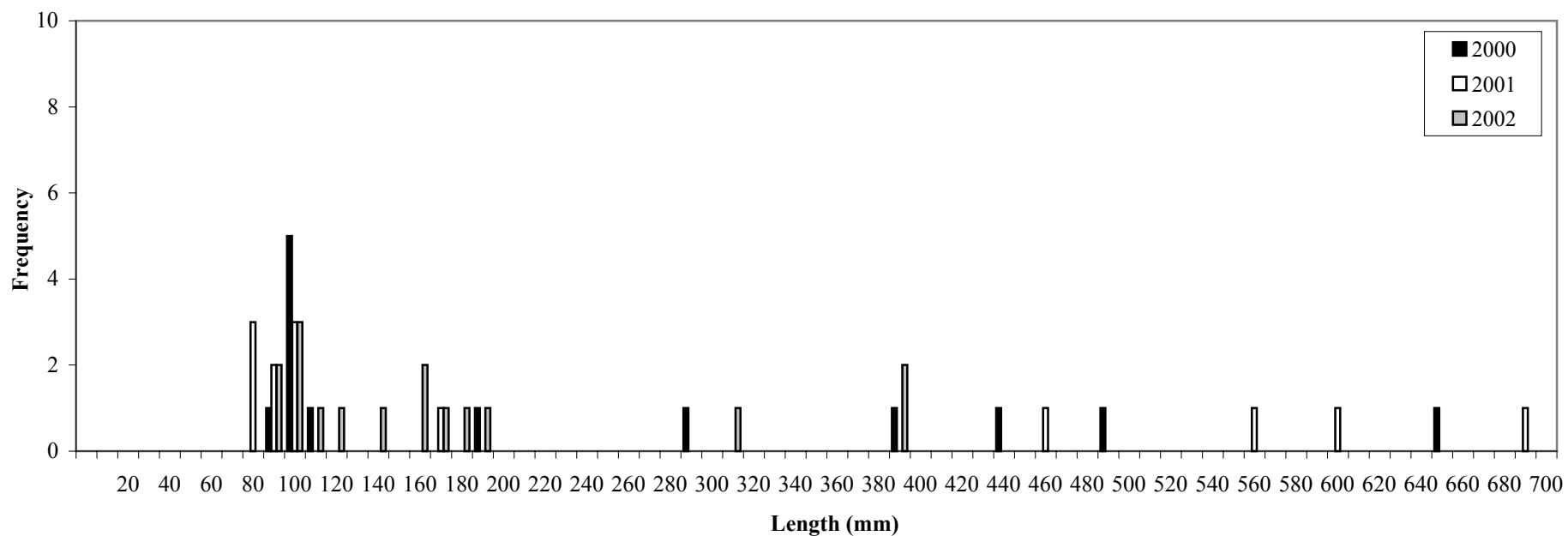


Figure 84. Brown Trout Length Frequency Histogram for Upper Butt Creek, NFFR, Fall 2000, 2001, and 2002.

Upper Butt Creek

Site 113 *Upper Butt Creek* was the only tributary from which brown trout were collected.

Thirteen fish were collected both in 2000 and 2001, and sixteen fish collected in 2002. Brown trout mean lengths by age for 2000, 2001, and 2002 are presented in Figure 85. Mean lengths of age class 0+ brown trout were slightly smaller in 2001. The mean length range for age class 0+ brown trout was 97 mm in 2000, 86 mm in 2001, and 89 mm in 2002. The overall length range for age class 0+ brown trout at the Upper Butt Creek site was 88 to 104 mm in 2000, 71 to 99 mm in 2001, and 89 to 90 mm in 2002.

One age class 1+ brown trout was collected both in 2000 and 2001 at site 113 *Upper Butt Creek*; their lengths were 185 mm in 2000, and 164 mm in 2001. Six age class 1+ brown trout were collected in 2002. The mean length for age class 1+ brown trout was 104 mm, with a length range of 91 to 132 mm in 2002.

Age class 2+ brown trout were larger in 2001 than in 2000 and 2002. Age class 2+ brown trout ranged from 287 to 650 mm in 2000, from 455 to 688 mm in 2001, and from 156 to 390 mm in 2002, with mean lengths of 450 mm in 2000, 576 mm in 2001, and 242 mm in 2002.

5.2.1 *Brown Trout Condition Factor*

Condition factor analysis is limited since no brown trout were collected in 3 of 6 sites in 2000, and 4 of 6 sites in 2001 and 2002. However, condition factors are presented in Tables 25 through 27 at the sites where brown trout were collected.

Condition factors for age class 0+ brown trout in the Seneca Reach were variable among sites during all years. Age class 1+ and 2+ brown trout condition factor values were generally within the normal range.

No brown trout were collected at Belden Reach sites during all three years of sampling.

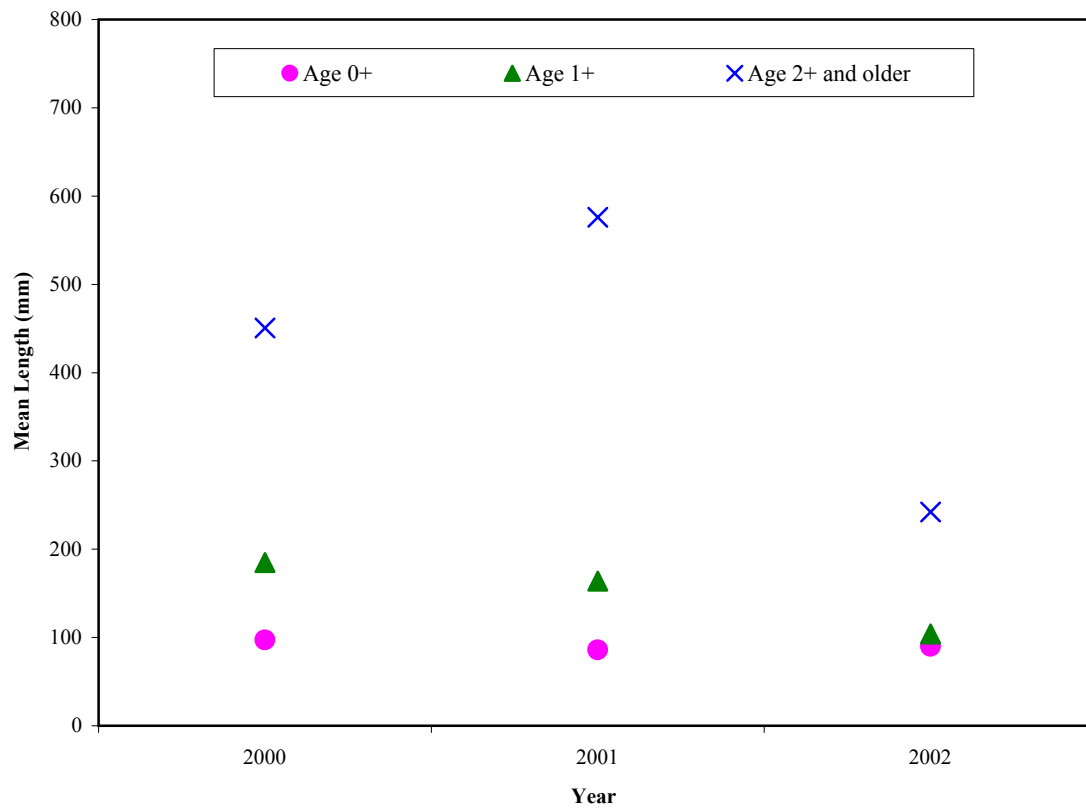


Figure 85. Brown Trout Mean Lengths by Age for Upper Butt Creek, NFFR, Fall 2000, 2001, and 2002.

Brown trout were only collected at one of the three tributary sites, site 113 *Upper Butt Creek*, and the brown trout condition factor was similar between years at that site. Age class 0+, age class 1+, and age class 2+ condition factor values were within normal range.

5.3 Other Species Age and Growth

Mean lengths for Sacramento sucker and sculpin for all project sites during all three years of study are presented in Tables 29 and 30. Mean lengths and frequencies for Sacramento sucker are presented graphically in Figures 86 through 92.

5.3.1 Sacramento Sucker and Sculpin Species

Two species of sculpin were collected in the NFFR; prickly sculpin (*Cottus asper*), and riffle sculpin (*C. gulosus*). Although the majority of sculpin were riffle sculpin, both species are presented together as sculpin for 2000 and 2001. Species differentiation was made for the 2002 surveys. The age structures were not determined for either Sacramento sucker or sculpin. Consequently, analyses were completed for the entire populations.

Seneca Reach

Sacramento sucker and sculpin were collected at all Seneca Reach sites with the exception that Sacramento sucker were not collected from site 102 *Seneca Bridge – Upstream* in 2000, or in site 101 *Canyon Dam Weir – Downstream* in 2002. Site-specific mean lengths for Sacramento sucker ranged from 27 to 307 mm in 2000, 35 to 361 mm in 2001, and 64 to 385 mm in 2002. The length range for Sacramento sucker was 22 to 460 mm in 2000, 32 to 433 mm in 2001, and 38 to 396 mm in 2002. Sculpin were identified to species level in 2002 with riffle sculpin being the most abundant species collected. The mean lengths of riffle sculpin in 2002 ranged from 63 to 95 mm, with a length range of 30 to 152 mm. Prickly sculpin, only captured at Site 101 *Canyon Dam Weir – Downstream*, had a mean length of 77 mm and length range of 36 to 117 mm.

Table 29. Sacramento Sucker Population Summary Statistics for the UNFFR Project Electrofishing Sites, Fall 2000, 2001 and 2002.

Reach	Site No.	Year	Number	Length Range (mm)	Mean Length (mm)	Mean Weight (g)	Mean Condition (Factor)
Seneca Reach	101	2000	6	138 - 460	307.0	572.5	1.109
		2001	3	199 - 433	360.7	943.2	1.500
		2002	0				
	102	2000	0				
		2001	1	335	335.0	567.6	1.510
		2002	4	70 - 350	271.3	418.1	1.405
	103	2000	1	27	27.0	1.0	5.081
		2001	4	50 - 365	193.0	195.4	1.210
		2002	6	38 - 138	93.2	17.3	1.287
	104	2000	3	22 - 45	34.3	2.0	8.421
		2001	3	32 - 58	43.7	1.3	1.513
		2002	2	52 - 106	79.0	8.7	1.322
	105	2000	1	170	170.0	53.0	1.079
		2001	1	35	35.0	0.5	1.166
		2002	2	40 - 88	64.0	4.9	1.207
	106	2000	7	124 - 210	165.3	60.7	1.264
		2001	6	162 - 365	314.2	471.6	1.327
		2002	4	367 - 396	385.3	802.5	1.374
	107	2000	39	58 - 348	225.7	164.3	1.240
		2001	12	138 - 344	267.4	311.0	1.365
		2002	12	53 - 359	184.4	138.4	1.322
	108	2000	101	51 - 495	323.5	447.0	1.224
		2001	53	52 - 465	242.5	314.1	1.248
		2002	45	48 - 419	148.1	144.9	1.285
	109	2000	26	51 - 750	389.2	846.4	1.105
		2001	22	50 - 470	354.5	682.7	1.313
		2002	27	52 - 429	267.6	469.0	1.342
	110	2000	16	223 - 465	349.7	475.3	1.053
		2001	38	46 - 460	374.0	772.3	1.348
		2002	48	53 - 468	361.1	759.3	1.356
	111	2000	14	64 - 460	231.1	329.2	1.387
		2001	3	122 - 403	221.0	301.3	1.220
		2002	5	52 - 450	225.4	396.7	1.342
Mainstem	112	2000	4	79 - 455	224.0	233.3	1.054
		2001	0				
		2002	3	79 - 460	207.0	402.6	1.516
Upper Butt Creek	113	2000	50	129 - 510	400.9	1,371.5	1.756
		2001	16	171 - 508	405.3	1,038.0	1.346
		2002	7	161 - 478	341.7	762.8	1.388
Lower Butt Creek	114	2000	0				
		2001	0				
		2002	0				
Mosquito Creek	115	2000	Not sampled				
		2001	0				
		2002	0				

Table 30. Sculpin Population Summary Statistics for the UNFFR Project Electrofishing Sites, Fall 2000, 2001, and 2002.

Reach	Site No.	Year	Species	Number	Length Range (mm)	Mean Length (mm)	Mean Weight (g)	Mean Condition Factor
Seneca Reach	101	2000	Sculpin	164	26 - 110	79.3	*	*
		2001	Sculpin	125	34 - 110	69.5	6.0	1.204
		2002	Prickly	94	36 - 117	77.2	7.0	1.280
			Riffle	11	57 - 111	94.9	13.0	1.370
	102	2000	Sculpin	383	20 - 149	77.2	*	*
		2001	Sculpin	302	30 - 148	77.4	9.2	1.034
		2002	Prickly	0				
			Riffle	207	31 - 152	77.8	9.4	1.297
	103	2000	Sculpin	144	11 - 140	88.5	*	*
		2001	Sculpin	110	28 - 144	83.0	9.9	1.240
		2002	Prickly	0				
			Riffle	102	32 - 138	84.2	10.6	1.287
	104	2000	Sculpin	221	22 - 141	56.9	*	*
		2001	Sculpin	152	32 - 149	77.9	7.3	1.260
		2002	Prickly	0				
			Riffle	247	32 - 130	63.8	5.4	1.234
	105	2000	Sculpin	104	32 - 142	71.4	*	*
		2001	Sculpin	152	34 - 132	79.9	9.5	1.356
		2002	Prickly	0				
			Riffle	118	34 - 138	71.7	7.7	1.376
	106	2000	Sculpin	73	35 - 154	78.8	*	*
		2001	Sculpin	71	36 - 129	71.6	6.8	1.218
		2002	Prickly	0				
			Riffle	89	30 - 152	74.5	8.1	1.258
Belden Reach	107	2000	Sculpin	86	40 - 130	100.3	*	*
		2001	Sculpin	55	43 - 123	94.3	12.0	1.332
		2002	Prickly	16	37 - 115	78.5	8.7	1.261
			Riffle	86	40 - 131	95.4	14.5	1.376
	108	2000	Sculpin	111	38 - 127	79.4	*	*
		2001	Sculpin	64	43 - 135	90.6	10.8	1.251
		2002	Prickly	1	92	92.0	10.2	1.310
			Riffle	55	29 - 132	79.5	8.3	1.235
	109	2000	Sculpin	73	26 - 125	67.4	*	*
		2001	Sculpin	60	42 - 126	79.6	8.3	1.318
		2002	Prickly	0				
			Riffle	143	37 - 126	83.4	9.3	1.308
	110	2000	Sculpin	136	39 - 130	80.7	*	*
		2001	Sculpin	46	44 - 123	80.7	8.3	1.271
		2002	Prickly	2	44 - 110	77.0	9.0	1.061
			Riffle	138	36 - 122	75.1	7.2	1.268
	111	2000	Sculpin	205	36 - 131	80.6	*	*
		2001	Sculpin	92	32 - 147	85.6	9.7	1.285
		2002	Prickly	0				
			Riffle	129	35 - 128	82.0	9.0	1.283
Mainstem	112	2000	Sculpin	99	34 - 110	77.6	*	*
		2001	Sculpin	283	51 - 112	81.7	7.5	1.264
		2002	Prickly	26	65 - 114	88.2	9.6	1.365
			Riffle	111	50 - 110	84.1	8.4	1.312
Upper Butt Creek	113	2000	Sculpin	125	27 - 141	93.6	*	*
		2001	Sculpin	63	33 - 147	84.0	11.2	1.207
		2002	Prickly	0				
			Riffle	78	31 - 144	77.6	9.8	1.218
Lower Butt Creek	114	2000	Sculpin	115	33 - 158	86.0	*	*
		2001	Sculpin	133	25 - 146	83.5	10.7	1.185
		2002	Prickly	0				
			Riffle	85	38 - 152	83.1	8.9	1.205
Mosquito Creek	115	2000	Sculpin	ns	ns	ns	ns	ns
		2001	Sculpin	35	60 - 130	96.1	12.9	1.198
		2002	Prickly	0				
			Riffle	45	35 - 139	87.1	11.2	1.188

* fish were weighed in groups, therefore, mean weights and mean condition factors are not available.

ns - not sampled

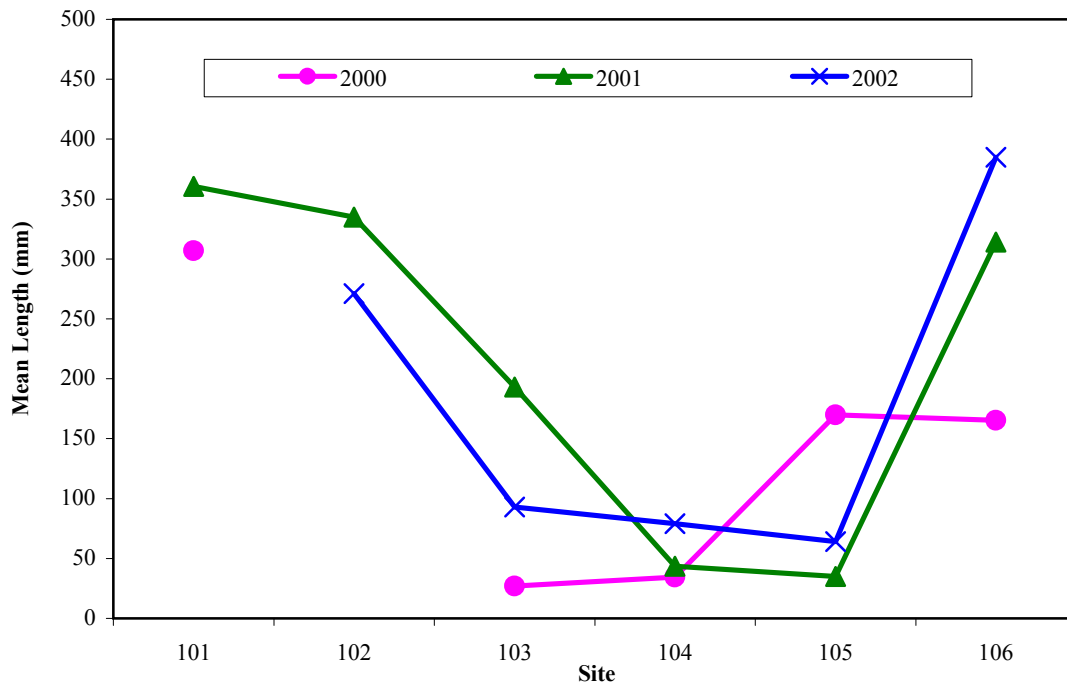


Figure 86. Sacramento Sucker Mean Lengths for Seneca Reach Sites, NFFR, Fall 2000, 2001, and 2002.

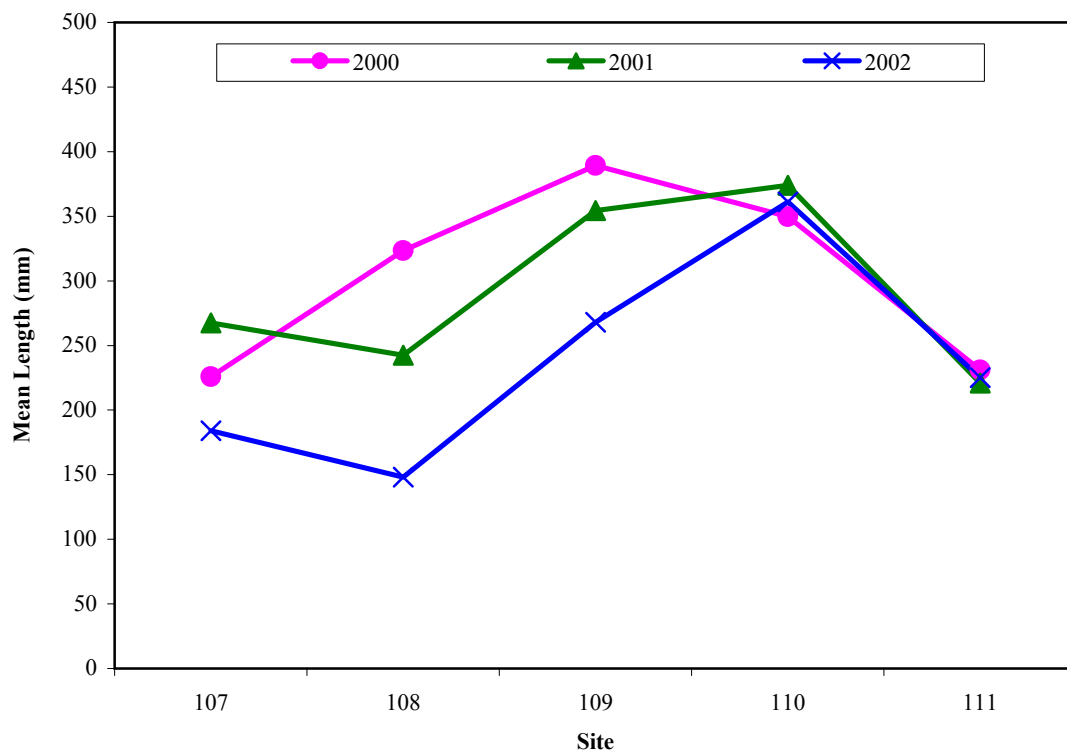


Figure 87. Sacramento Sucker Mean Lengths for Belden Reach Sites, NFFR, Fall 2000, 2001, and 2002.

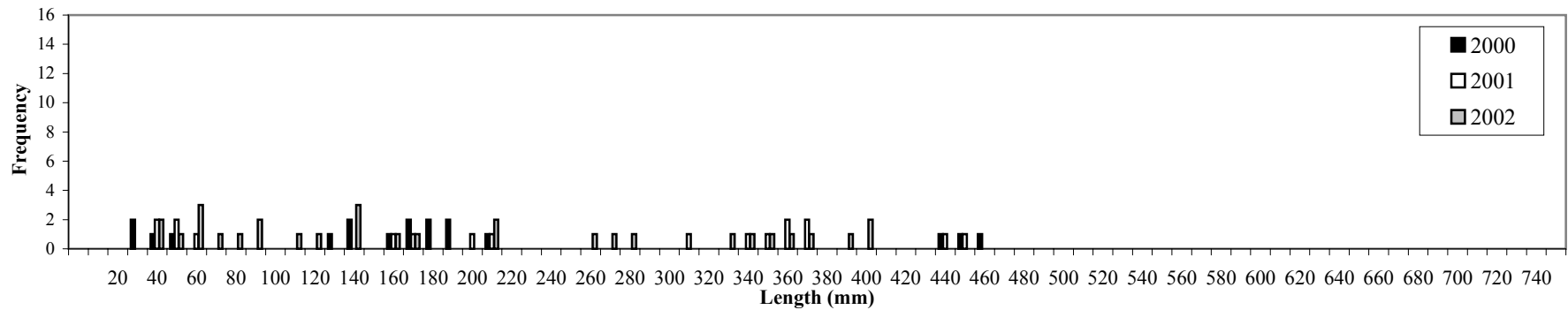


Figure 88. Sacramento Sucker Length Frequency Histogram for Seneca Reach, NFFR, Fall 2000, 2001, and 2002.

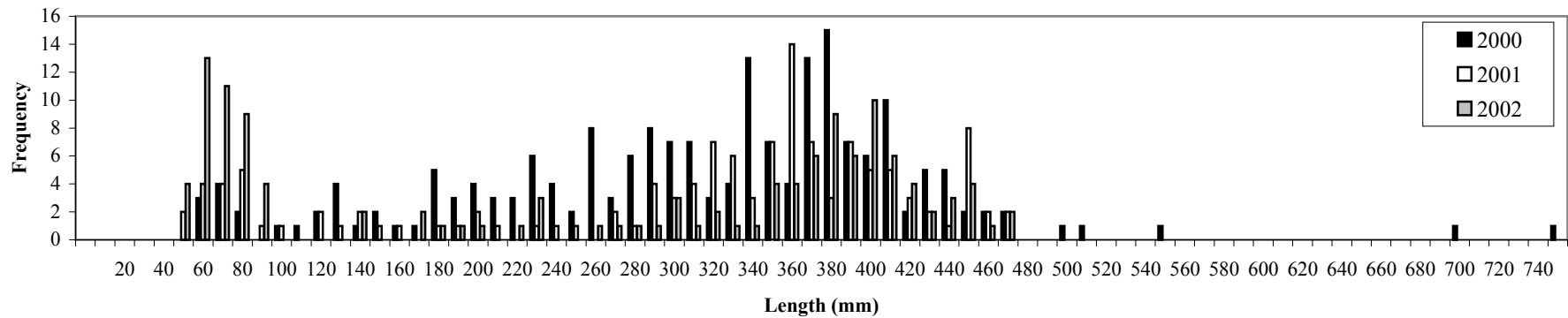


Figure 89. Sacramento Sucker Length Frequency Histogram for Belden Reach, NFFR, Fall 2000, 2001, and 2002.

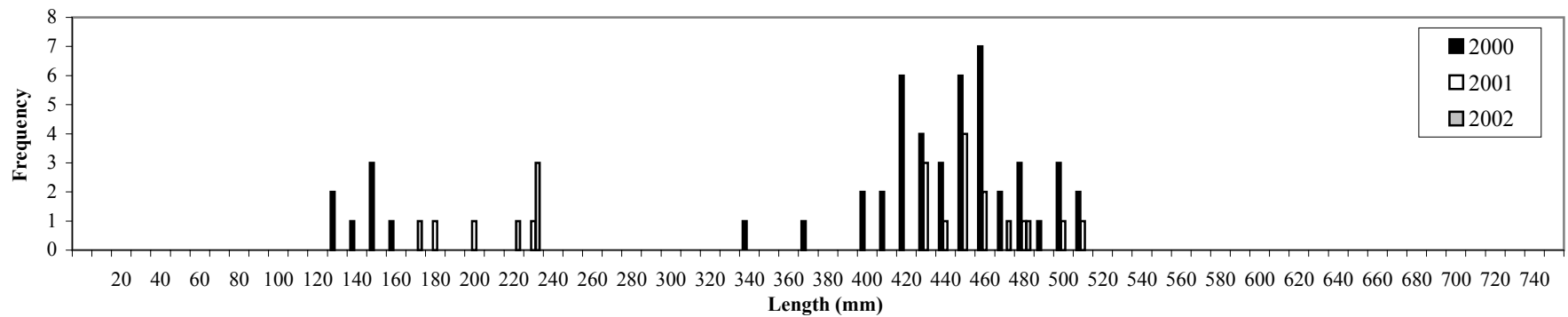


Figure 90. Sacramento Sucker Length Frequency for Upper Butt Creek, NFFR, Fall 2000, 2001, and 2002.

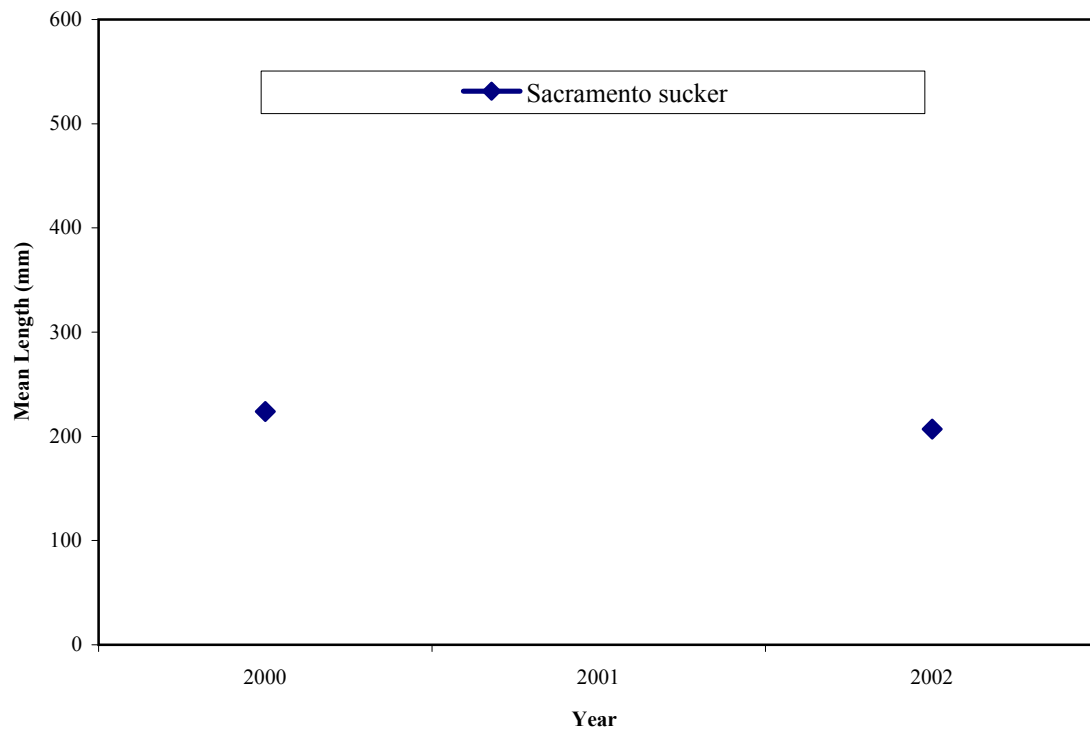


Figure 91. Sacramento Sucker Mean Lengths for Mainstem, NFFR, Fall 2000, 2001, and 2002.

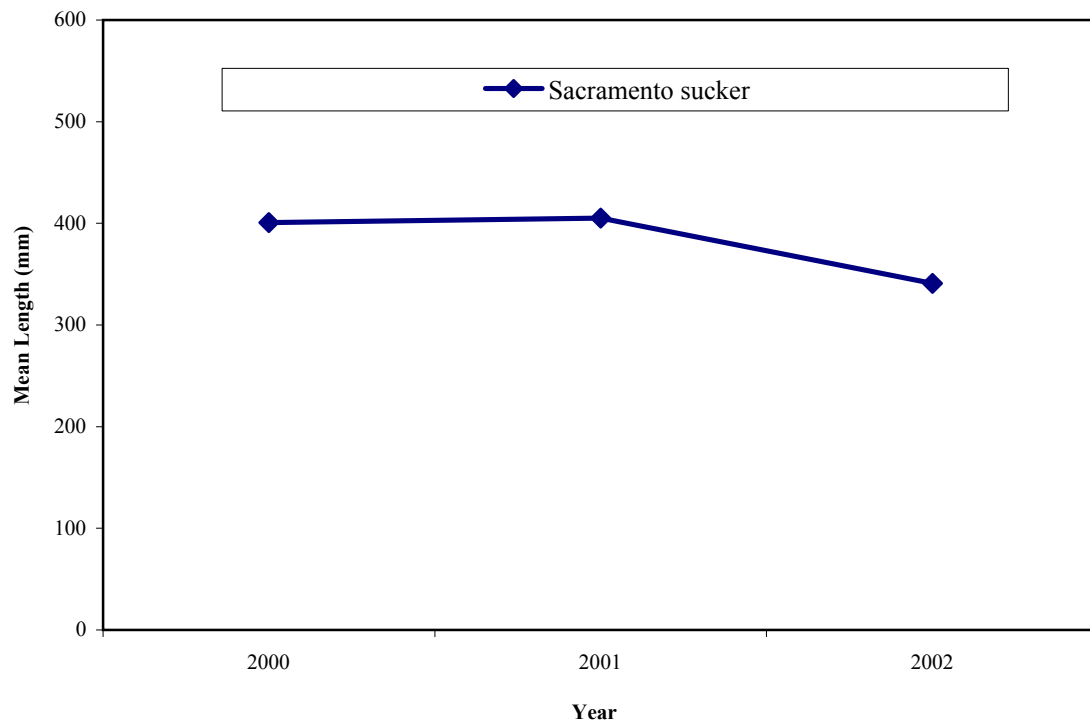


Figure 92. Sacramento Sucker Mean Lengths for Upper Butt Creek, NFFR Fall 2000, 2001 and 2002.

Belden Reach

Sacramento sucker and sculpin were collected at all Belden Reach sites during the three years of study. Site-specific mean lengths of Sacramento sucker ranged from 226 to 389 mm in 2000, from 221 to 374 mm in 2001, and from 148 to 361 mm in 2002. The length range for Sacramento sucker was 51 to 750 mm in 2000, 46 to 470 mm in 2001, and 48 to 468 mm in 2002. The mean length range of riffle sculpin in 2002 was 75 to 95 mm, and overall length range was 29 to 132 mm. Prickly sculpin mean length range was 77 to 92 mm, and overall length range was 37 to 115 mm in 2002.

Mainstem

Only four Sacramento sucker were collected from the mainstem site in 2000, none in 2001, and three sucker in 2002. Mean lengths were 224 mm (overall length range was 79 to 445 mm) in 2000, and 207 mm (79 to 460 mm) in 2002.

In 2000 and 2001, combined riffle and prickly sculpin mean lengths were 78 mm (overall length range was 34 to 110 mm), and 82 mm (51 to 112 mm), respectively. In 2002, prickly sculpin mean length was 88 mm (65 to 114 mm), and riffle sculpin mean length was 84 mm (50 to 110 mm).

Tributary Sites

Upper Butt Creek

Sacramento sucker lengths ranged from 129 to 510 mm in 2000, with a mean length of 401 mm. In 2001, Sacramento sucker lengths ranged from 171 to 508 mm, with a mean length of 405 mm, and in 2002 ranged from 161 to 478 mm, with a mean length of 342 mm. In 2002, all sculpin collected were identified as riffle sculpin. Riffle sculpin lengths ranged from 31 to 144 mm, with a mean length of 78 mm in 2002. Although sculpin were not separated by species in 2000 or 2001, we believe that all sculpin collected from Upper Butt Creek in those years were riffle

sculpin, based on the absence of prickly sculpin in 2002. In 2000, sculpin ranged in length from 27 to 141 mm, with a mean length of 94 mm, and in 2001 ranged in length from 33 to 147 mm, with a mean length of 84 mm.

Lower Butt Creek

No Sacramento sucker were collected from Lower Butt Creek during any of the three study years. All sculpin in Lower Butt Creek were determined to be riffle sculpin and ranged from 33 to 158 mm in 2000, with a mean length of 86 mm, and from 25 to 146 mm in 2001, with a mean length of 84 mm. In 2002, riffle sculpin ranged in length from 38 to 152 mm with a mean length of 83 mm.

Mosquito Creek

Mosquito Creek was not sampled in 2000. No Sacramento suckers were collected from Mosquito Creek in 2001 or 2002. All sculpin in Mosquito Creek were determined to be riffle sculpin, and ranged from 60 to 130 mm in 2001, with a mean length of 96 mm. In 2002, riffle sculpin ranged in length from 35 to 139 mm, with a mean length of 87 mm.

5.3.2 Condition Factor

Sculpin condition factor for 2000 could not be calculated because individual weights were not collected (i.e., all individuals were weighed as a group for each pass). Calculated condition factors for Sacramento suckers (years 2000, 2001, and 2002) and sculpin (years 2001 and 2002) are listed in Table 29 and Table 30, respectively.

6.0 RESERVOIR STUDIES

6.1 Gillnet Surveys

The site-specific and species-specific catch is displayed in Appendices E and F. A total of 111 fish were collected during the Lake Almanor gill net study effort in 2000, representing 8 species (Table 31). A total of 44-gill net sets were deployed, 29 of which were set horizontally, and fifteen of which were set vertically. Most of the catch occurred in the horizontal net configuration (107 fish), accounting for 97 percent of the total catch. Only 1 brown trout and 1 carp were collected from the lake, and only from the vertical set configuration. The majority of fish (59 fish), accounting for 52 percent of the total catch, was caught at the Southeast (SE) Shore site (Figure 93). The catch at Hamilton Branch (25 fish) accounted for 23 percent of the total catch, while the combined catch from the four other sites accounted for 25 percent of the total catch.

Smallmouth bass was the most abundant fish species collected, accounting for 59 percent of the total catch (66 fish) (Figure 94). Sacramento pikeminnow was the second most abundant species, accounting for 17 percent of the total catch (19 fish). Six other fish species (brown bullhead, Sacramento sucker, rainbow trout, Sacramento perch, brown trout, and carp) accounted for 24 percent of the total catch.

Length-frequencies of all species from all sites combined are summarized in Figure 95. Fish captured by gill net ranged in length from 75 mm (Sacramento perch) to over 525 mm (Sacramento pikeminnow).

6.2 Reservoir Boat Electrofishing

Smallmouth bass dominated the boat electrofishing surveys catch conducted in both Lake Almanor and Belden Forebay. A total of 1,516 fish was collected by boat electrofishing at 29 sites in Lake Almanor (Table 32). Smallmouth bass accounted for 54 percent of the total catch, pond smelt accounted for 31 percent of the catch, and prickly sculpin accounted for 10 percent

Table 31. Catch Summary for 6 Lake Almanor Gill Netting Sites, UNFFR Project, August 8 to 10, 2000.

Species	Catch	Percentage of Catch	Number of Stations	Min. Length (mm)	Max. Length (mm)	Mean Length (mm)
Rainbow trout	5	5	3	218	490	391
Brown trout	1	1	1	510	510	510
Smallmouth bass	66	59	3	127	408	219
Sacramento sucker	7	6	3	128	475	401
Brown bullhead	10	9	3	130	225	168
Sacramento pikeminnow	19	17	6	116	620	427
Sacramento perch	2	2	2	75	119	97
Carp	1	1	1	355	355	355
Total	111					

Table 32. Catch Summary for 29 Boat Electrofishing Sites, Lake Almanor, UNFFR Project, August 1 to 3, 2000.

Species	Catch	Percentage of Catch	Number of Stations	Min. Length (mm)	Max. Length (mm)	Mean Length (mm)
Rainbow trout	14	0.9	4	103	430	235
Brown trout	4	0.3	3	125	180	147
Smallmouth bass	820	54.0	23	36	335	112
Largemouth bass	24	1.6	3	67	130	95
Pond smelt	477	31.5	15	27	82	47
Prickly sculpin	148	9.8	20	27	135	69
Sacramento sucker	13	0.9	7	55	500	253
Brown bullhead	16	1.0	3	94	148	122
Total	1,516					

Table 33. Catch Summary for 3 Boat Electrofishing Sites, Belden Forebay, UNFFR Project, August 7, 2000.

Species	Catch	Percentage of Catch	Number of Stations	Min. Length (mm)	Max. Length (mm)	Mean Length (mm)
Rainbow trout	8	8.4	3	118	402	204
Smallmouth bass	40	42.1	3	25	288	114
Pond smelt	2	2.1	1	53	97	75
Prickly sculpin	29	30.5	2	45	120	69
Sacramento sucker	16	16.8	2	33	404	240
Total	95					

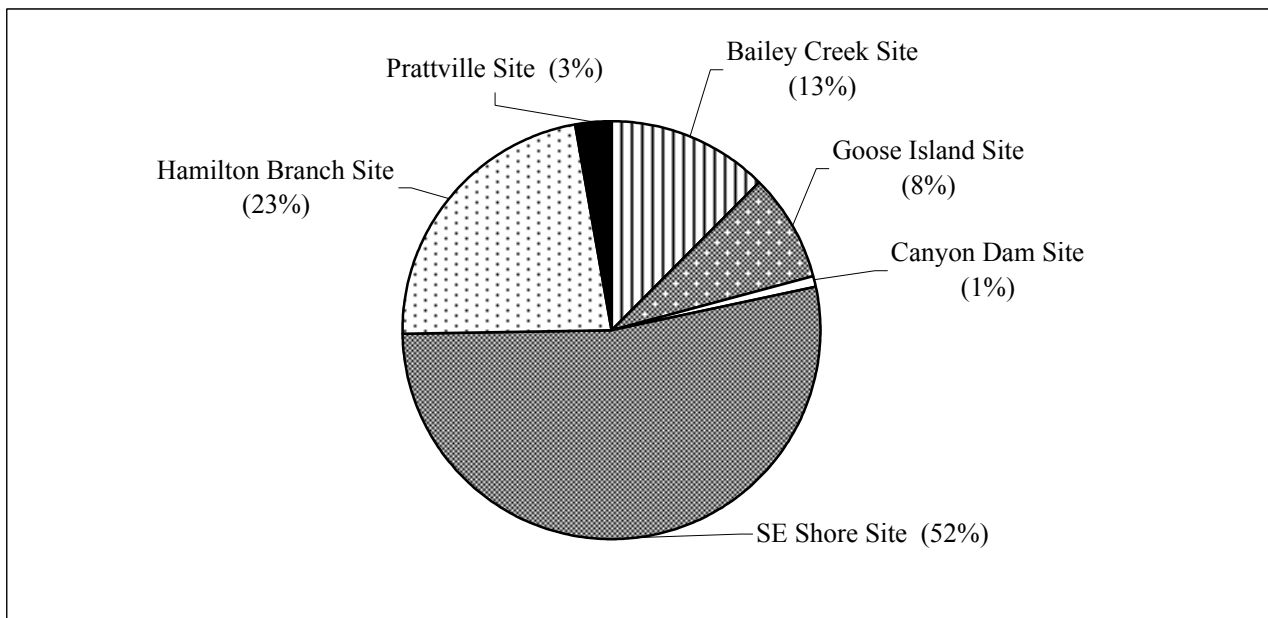


Figure 93. Percent of Total Catch by Site, Lake Almanor Gill Netting, August 2000.

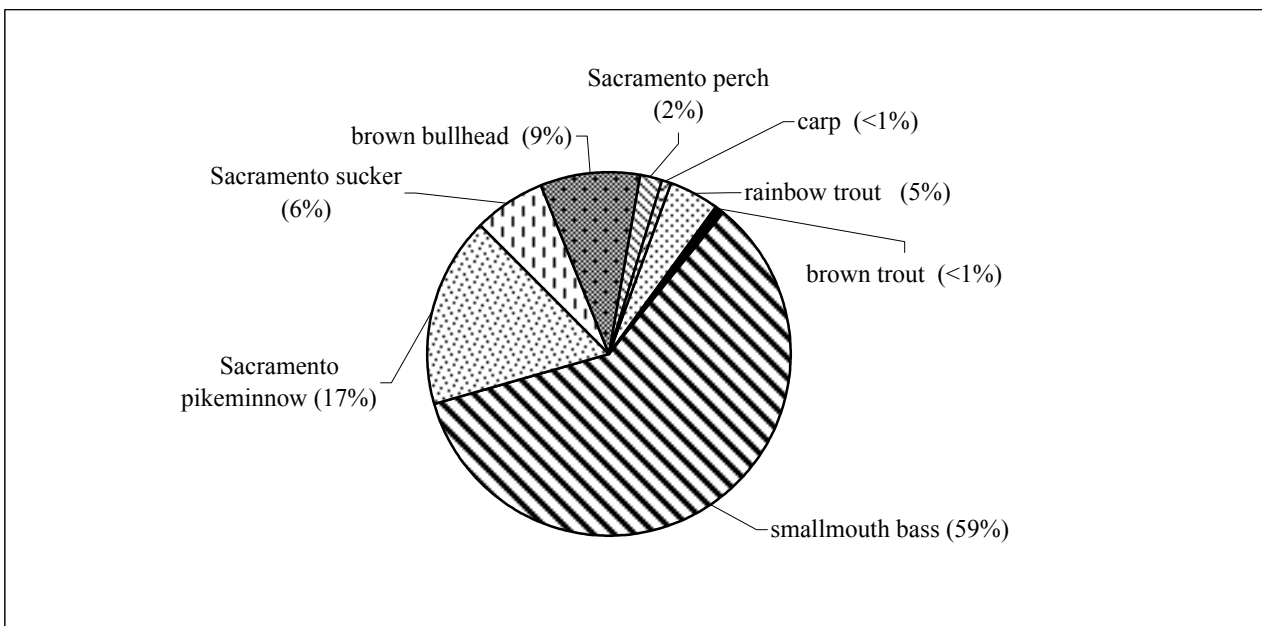


Figure 94. Total Catch, by Species, Lake Almanor Gill Netting, August 2000.

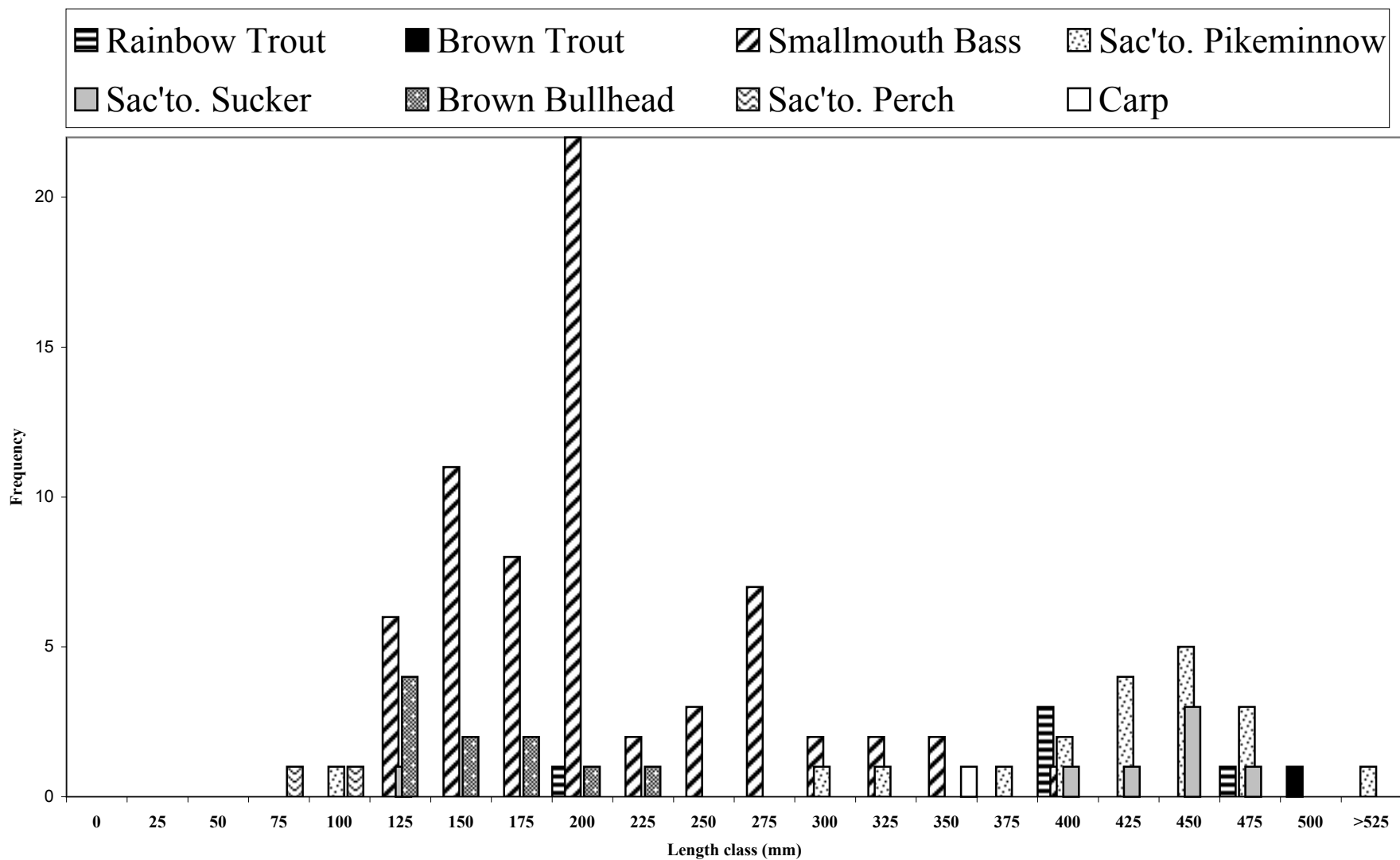


Figure 95. Length Frequencies of all Species, all Sites Combined, Lake Almanor Gill Net Survey, August 8-10, 2000.

(Figure 96). Fourteen rainbow trout and 4 brown trout were also collected, together accounting for about 1 percent of the catch. Smallmouth bass were the most numerous and most widely distributed, occurring at 23 sampling sites. The distribution of the other fish species in declining order were: prickly sculpin (20 sites), pond smelt (15 sites), Sacramento sucker (7 sites), rainbow trout (4 sites); and brown trout, largemouth bass, and bullhead (3 sites each). Length-frequency histograms for rainbow trout, smallmouth bass, and largemouth bass are presented in Figures 97 through 99.

A total of 95 fish, representing 5 different species was collected at 3 sampling sites in Belden Forebay (Table 33). Smallmouth bass was again the dominant species at 42 percent (Figure 100), followed by sculpin (31 percent), Sacramento sucker (17 percent), rainbow trout (8 percent), and pond smelt (2 percent). Although brown trout were not collected during this effort, they were present in past sampling efforts, as well as a subsequent study collection effort in Belden Forebay using gill nets to collect fish for tissue analysis of PCB's, methyl mercury, and silver in August, 2001 (reported in PG&E's FERC Exhibit E Document). Smallmouth bass, rainbow trout, and Sacramento sucker were found at all three sampling sites, sculpin were found at two sampling sites, and pond smelt were found at only one site. Length frequency histograms for rainbow trout, smallmouth bass, and Sacramento sucker are presented in Figures 101 to 103. Rainbow trout lengths ranged from 118 to 402 mm and averaged 204 mm, and smallmouth bass lengths ranged from 25 to 288 mm and averaged 114 mm long.

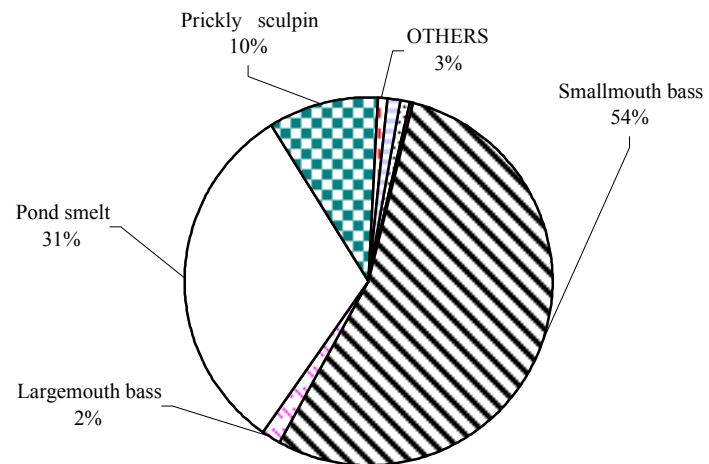


Figure 96. Total Catch, by species for Lake Almanor Boat Electrofishing, August 2000.

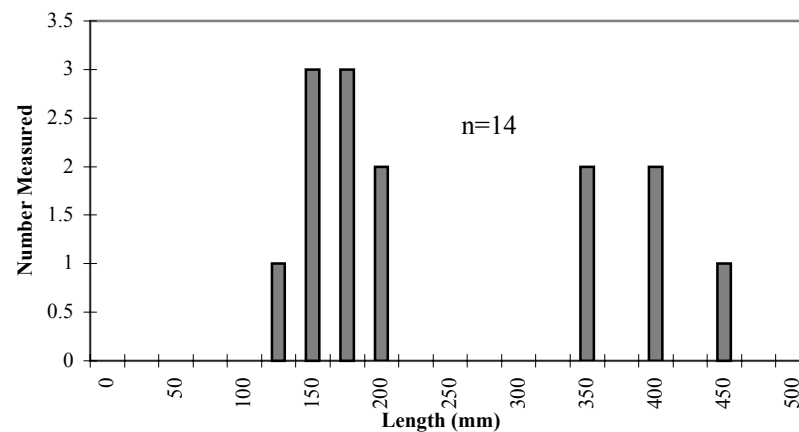


Figure 97. Rainbow Trout Length Frequency Histogram for Lake Almanor, August 2000.

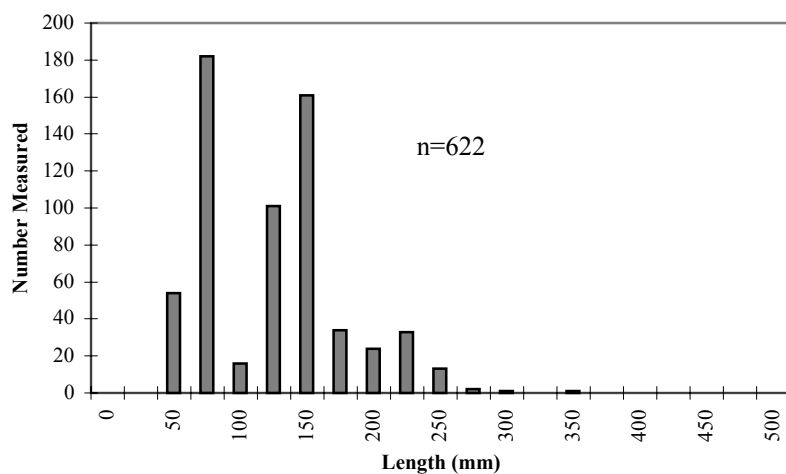


Figure 98. Smallmouth Bass Length Frequency Histogram for Lake Almanor, August 2000.

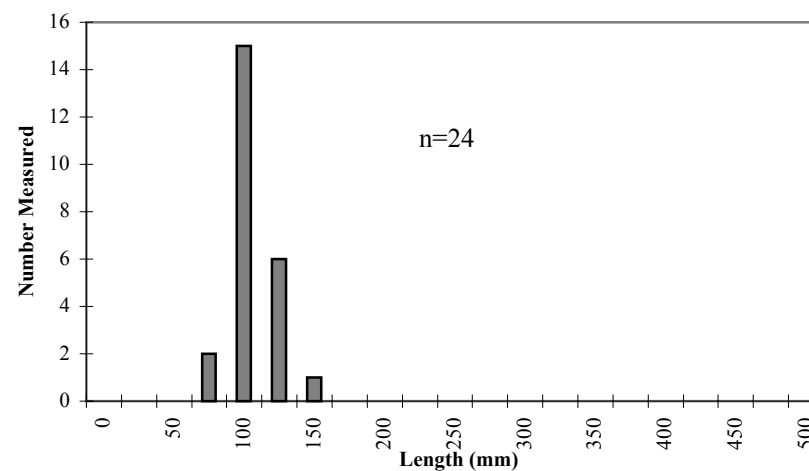


Figure 99. Largemouth Bass Length Frequency Histogram for Lake Almanor, August 2000.

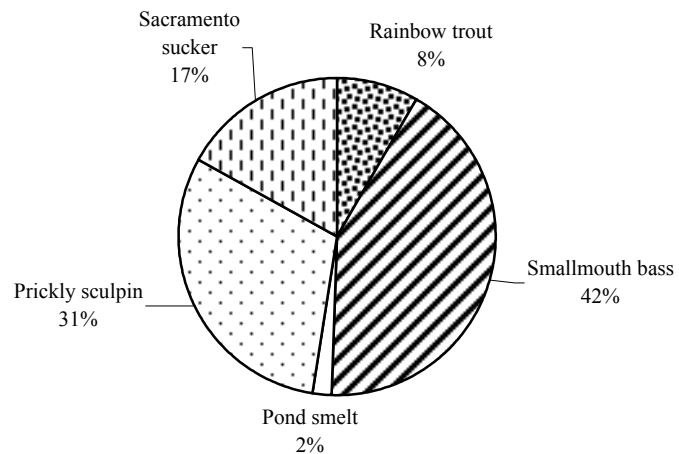


Figure 100. Total Catch, by Species for Belden Forebay Boat Electrofishing, August 2000.

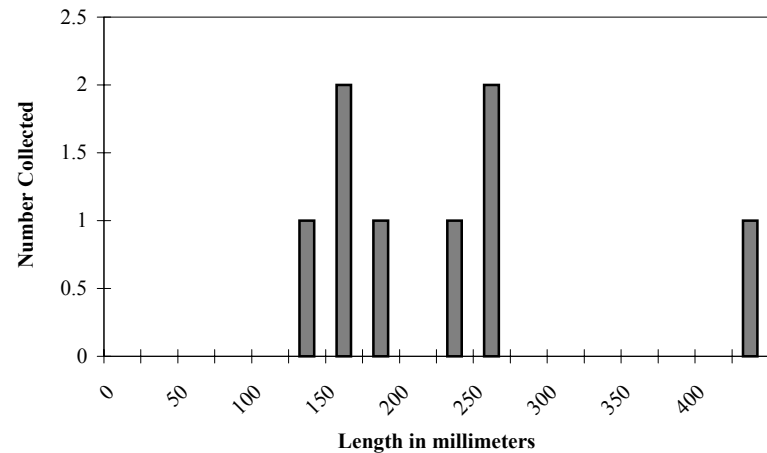


Figure 101. Rainbow Trout Length Frequency Histogram for Belden Forebay, August 2000.

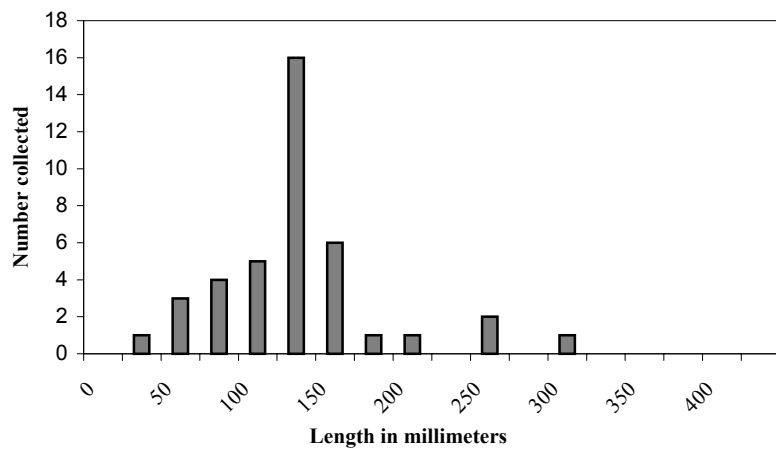


Figure 102. Smallmouth Bass Length Frequency Histogram for Belden Forebay, August 2000.

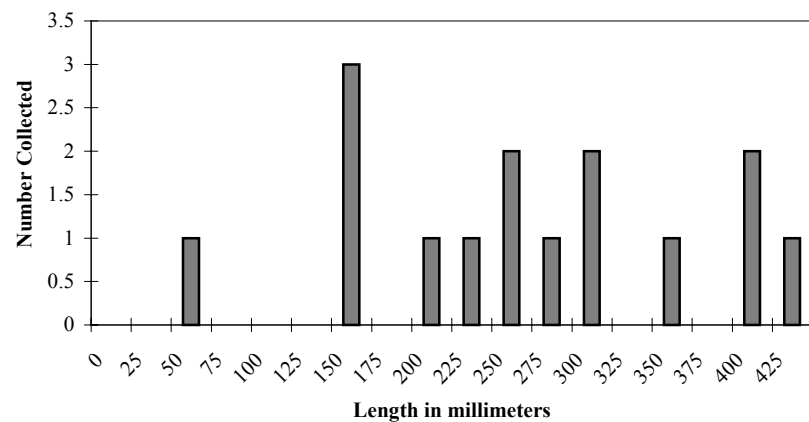


Figure 103. Sacramento Sucker Length Frequency Histogram for Belden Forebay, August 2000.

7.0 DISCUSSION

7.1 Species Summaries by Reach

Seneca Reach

A total of 1,577 fish was collected from the six quantitative sampling sites in 2000, 1,488 fish in 2001, and 1,620 in 2002. Four species of fish were collected each year, and in the same order of relative abundance: sculpin, 69, 58, and 54 percent (for 2000, 2001, and 2002, respectively); rainbow trout, 29, 40, and 44 percent; and brown trout and Sacramento sucker combined made up about 2 percent in all years. The percent of total biomass of fish collected for each species in 2000 through 2002, respectively was: rainbow trout, 54, 60, and 57 percent; sculpin, 24, 19, and 22 percent; Sacramento sucker, 12, 19, and 16 percent; and brown trout, 10, 1, and 5 percent.

Rainbow trout were collected at all six sites during each year of survey. Site 101 *Canyon Dam Weir-Downstream*, the most upstream quantitative station (located about 0.5 mile below Canyon Dam), had the smallest estimated rainbow trout population of all the sites in the Seneca Reach. The sites in the middle of the reach tended to have greater population estimates than either of the uppermost and lowermost sites. This may be the result of the proximity of the upper station to Canyon Dam and a combination of lower quality habitat and less available food production between the dam and the station; and the lower population estimate at the lowermost station may be the result from greater fishing pressure. This area is subject to greater fishing presence than most of the reach because of its proximity to campgrounds. It is also much more accessible than most of the mid-portions of the reach.

Site 101 *Canyon Dam Weir – Downstream* had limited recruitment presumably unsuitable due to substrate characteristics. The substrate is boulder-cobble dominated with a low percentages of gravel suitable for spawning. The riffle areas are short with limited gravels and fines. In addition, the water quality may be degraded by the presence of H₂S. The Seneca Reach sites downstream of this site have better spawning habitat, and this is indicated by greater percentage of age class 0+ fish at these downstream sites.

Brown trout were found to be only a very small component of the overall fish population, making up less than 1 percent of the overall fish population. During all years, brown trout were collected at the more remote, middle sites of the reach. Sculpin, by number, were the most commonly collected species during all three years of study. Although sculpin dominated the fish assemblage by numbers at almost all sites, they made up less than 25 percent of the total biomass in each year.

Sacramento sucker was a minor component of the overall fish population, making up less than 2 percent during each year. Far fewer suckers were collected in the Seneca Reach than in the Belden Reach. This is presumably due to the generally narrower and higher gradient stream channel, and the smaller/shallower pools that occur in the Seneca Reach.

Direct observation snorkel sites were sampled during each year to supplement the information collected by backpack electrofishing, especially in the deeper pool areas not otherwise accessible for sampling. Rainbow trout, Sacramento sucker, and sculpin were observed at all sites in all years, but in 2001 and 2002, smallmouth bass were also observed near Davis Creek. The results generally reflected what was observed in the electrofishing results; that rainbow trout were much more abundant than Sacramento sucker in this reach. The number of Sacramento sucker in pool habitat in the Seneca Reach is approximately only 10 percent of the number of suckers per 100 m of pool habitat in the Belden Reach.

Belden Reach

A total of 1,045 fish was collected from the five quantitative sampling sites above the Gansner Bar fish barrier in 2000, 613 in 2001, and 986 in 2002; 112, 309, and 170 fish were collected in 2000, 2001, and 2002, respectively, at the single mainstem site located below the barrier. Five species of fish were collected each survey year in the reach above the fish barrier, and in the same order of relative abundance: sculpin (riffle and prickly, combined), 59, 52, and 58 percent (for 2000, 2001, and 2002, respectively); rainbow trout, 21, 27, and 26 percent; Sacramento sucker, 19, 21, and 14 percent, and Sacramento pikeminnow, 0.2, 0, and 1 percent. The same

five species of fish were also collected at the single mainstem site, and in the same relative abundance: sculpin (riffle and prickly, combined), 88, 92, and 81 percent (2000, 2001, and 2002, respectively); rainbow trout, 6 percent in both 2000 and 2001, and 8 percent in 2002; Sacramento pikeminnow, 2, 3, and 9 percent; and Sacramento sucker, 4, 0, and 2 percent. The percent of total fish biomass for each species during each survey year (2000-2002) for the sites above the fish barrier, respectively, was: rainbow trout, 16, 16, and 8 percent; sculpin, 5, 4, and 7 percent; Sacramento sucker, 79, 80, and 75 percent; and Sacramento pikeminnow (less than 1 percent each year).

Rainbow trout were collected at all six sites during the three years of study. Site 110 had the largest estimated population decrease (72 percent) in 2001, but the population rebounded in 2002 (550 percent increase). Site 109 had the greatest increase (21 percent) for all sites above the barrier in 2001, and again 2002 (31 percent). The single mainstem site showed at least a 100 percent increase in its mean estimated population from 2000 through 2002. All of these sites are easily accessible by the Caribou Powerhouse road to fishing, and sites 109 to 111 are located adjacent to several nearby USFS campgrounds, likely accounting for variable population size among years. This area is also planted with hatchery rainbow trout by CDFG during the regular trout season, which may also affect the wild rainbow trout populations.

Sculpin were the most commonly collected species in 2000, 2001, and 2002. Although sculpin dominated the fish assemblage in relative abundance, they only made up between 4 and 7 percent of the total biomass during the three years of study.

Sacramento sucker was the third most abundant fish in the Belden Reach above the fish barrier during all three years of study. Sacramento sucker was also the third most abundant fish below the barrier in 2000, but was not collected in 2001 and only incidentally in 2002. Sacramento sucker biomass was dominant over all of the other fish species combined at sites above the fish barrier. Sacramento sucker made up about 79 percent of the biomass in 2000, 80 percent in 2001, and 75 percent in 2002 above the fish barrier.

Few Sacramento pikeminnow were collected either above the barrier in Belden Reach or the mainstem (below the barrier), and made up about 1 percent (or less) of the total at both locations during the three years of study.

Two direct observation snorkel sites were sampled in 2000, and 6 sites in 2001 and 2002 to supplement the information collected by backpack electrofishing, especially in the deeper pool areas not otherwise accessible. Rainbow trout and Sacramento sucker were observed at all sites during all three years of the study. Sculpin were only incidentally observed due to their small size and cryptic coloration. Rainbow trout and Sacramento sucker were similarly abundant in this reach. On average, the number of rainbow trout and Sacramento sucker per 100 m of pool habitat in the Belden Reach was greater than in the Seneca Reach. This is in contrast to electrofishing results, where rainbow trout were more abundant in the Seneca Reach.

Upper Butt Creek

Two hundred sixty-three fish were collected in 2000, 138 were collected in 2001, and 143 were collected in 2002 from Upper Butt Creek. Four species of fish were collected each year: sculpin (48, 46, and 55 percent), rainbow trout (28, 33, and 29 percent), Sacramento sucker (19, 12, and 5 percent), and brown trout (5, 9, and 11 percent). However, Sacramento sucker accounted for a higher percentage of biomass (85, 57, and 58 percent), followed by brown trout (9, 37, and 24 percent), rainbow trout (5, 5, and 10 percent), and sculpin (2, 2, and 8 percent).

Upper Butt Creek also has a boulder–cobble dominated substrate, which can limit spawning. The presence of large fish at this site may also decrease trout recruitment due to predation. There were many large predatory brown trout at this site, which may have preyed upon young trout. In addition, the presence of large Sacramento suckers may have adversely affected trout populations through disturbance of spawning areas.

Lower Butt Creek

One hundred seventy-six fish were collected in 2000, 217 were collected in 2001, and 144 were collected in 2002 from Lower Butt Creek. Only two species of fish were collected each year, and in the same order of relative abundance: sculpin (65, 61, and 59 percent) and rainbow trout (35, 39, and 41 percent). Sculpin was the dominant species by biomass in 2000 and 2001, accounting for 61 and 59 percent of the total biomass, whereas rainbow trout accounted for 39 and 41 percent of the total biomass. In 2002, rainbow trout biomass was slightly higher than sculpin biomass (52 and 48 percent, respectively). Age 0+ rainbow trout were the dominant age class collected at this site. Based on the high number of rainbow trout redds observed in this reach (57 in about 1/3 of a mile) as part of another study element (habitat suitability criteria development as part of the IFIM Study, published under separate cover), Lower Butt Creek is an important spawning tributary for fish from the Seneca Reach.

Mosquito Creek

Because of its size, accessibility to spawning fish, year-round flow, and location above the fish barrier, Mosquito Creek was identified as potentially providing important off channel spawning habitat in the Belden Reach, and was consequently added to the second year of fish studies. One hundred eleven fish were collected in 2001, and 138 fish were collected in 2002 from this site. Rainbow trout made up 68 percent of the fish collected in 2001 and 67 percent in 2002, and sculpin accounted for 32 percent in 2001 and 33 percent in 2002. Rainbow trout biomass was dominant during both years, accounting for 80 percent and 72 percent (2001 and 2002, respectively) of the total fish biomass.

7.2 Reservoir Species Summaries

Eleven of the twenty-four species of fish listed as historically occurring in Lake Almanor (Appendix F) were collected during this study effort. Rainbow trout, prickly sculpin, Sacramento pikeminnow, and Sacramento sucker are all native species, and were most likely present in the NFFR river system prior to any development. Smallmouth and largemouth bass,

brown trout, brown bullhead, pond smelt, carp, and Sacramento perch were all introduced into Lake Almanor following its construction, along with many other fish species not collected during this effort.

The lack of collection of the other species does not mean that they are no longer present in Lake Almanor. Although boat electrofishing and gill netting are effective sampling methods, it is difficult to collect all life stages or all species that may occur in any lake or river system. Some of the species previously reported as occurring in Lake Almanor may either not be readily collected by either of the sampling techniques employed in this study, or may occur in such low numbers that it would require a very extensive study effort in order to document them.

Chinook salmon, not collected by either of the sampling techniques employed during this study effort, were documented in the Powerhouse Entrainment Evaluation and Angler Creel Survey Study (both produced under separate cover). Other species, such as kokanee, silver, and chum salmon, bluegill, and Lahontan redbreast are likely no longer present in the lake; and green sunfish, brook trout, and channel catfish are rare (R. Decoto, CDFG, in personal communication to S. Running, PG&E).

These sampling results from Lake Almanor indicate that the habitat within this reservoir is well-suited for smallmouth bass (an introduced game fish), pond smelt (an introduced forage fish), sculpin (a native non-game fish), and Sacramento pikeminnow (a native non-game fish). All of these species are maintaining self-reproducing populations. Rainbow and brown trout combined made up only 2% of the gamefish collected, and rainbow trout are heavily stocked into the lake by CDFG to help maintain this fishery. Rainbow and brown trout, along with Chinook salmon are probably more abundant in the lake than indicated from this study due to their preference for deeper, colder waters and/or pelagic nature which may have made them less susceptible to boat electrofishing and near-shore gillnet sampling.

The number of species between sampling sites also varied considerably. This is to be expected, because the 29 boat electrofishing sites were spread out over most of the lake and represented many different habitat types, and were not necessarily appropriate for all species at any one site.

Station No. 18 had seven of the eight species collected during this sampling effort, was located at the mouth of Bailey Creek, and provided a rich assortment of different habitat types. Sites 14 and 19 had six and five species respectively, and also were located in areas with a lot of cover (rip-rap, stumps, downed snags, and/or submerged rocks). All three of these site are located in the northern part of the western half of Lake Almanor. Four species were collected at three sites (4, 5, and 20); three species were collected at nine sites (sites 2, 3, 7, 9, 10, 11, 16, 17, and 28); two species were collected at seven sites (sites 1, 6, 13, 15, 21, 23, and 29) and only one species was collected at seven sites (sites 8, 12, 22, 24, 25, 26, and 27). Smallmouth bass which were collected at the two sites with the most number of species (sites 18 and 14), was also the species most often collected by itself (sites 8, 24, 25, 26, and 27). The only other fish collected as a single species was pond smelt (site 12).

7.3 Comparisons With Other California Trout Streams

In an effort to compare the results of these fish studies to other data sources (in particular, Gerstung 1973), estimates of the number of trout (rainbow and brown trout combined) per mile were generated for sites in both Seneca and Belden reaches for each of the three years of study. In order to make comparisons, some extrapolations were required. In his analysis, Gerstung only included fish with lengths greater than six inches, whereas the current studies included all fish in the analyses. Specifically, the current study classified salmonids into three age classes: 0+, 1+, and 2+. Age class 1+ included fish between approximately five inches and seven inches. To compare data between the current study and Gerstung (1973), a percentage of all trout 6 inches in length and greater (per site) to the total number of trout collected (per site) was calculated. That ratio was then applied to the total trout population estimate for that site to get an estimate of numbers of adult trout per site, which was then extrapolated to numbers of adult trout per mile. Thus, numbers of adult trout per mile were generated for each site in both Seneca and Belden Reaches, as well as for upper and Lower Butt Creek sites (Table 34).

Table 34. Adult Trout Population Estimates (Fish/Mile) for 2000, 2001, and 2002 at UNFFR
Project Electrofishing Sites.

Reach/Site No.	Total No. per mile 2000	Total No. per mile 2001	Total No. per mile 2002	Gerstung Ranking (%) 2000	Gerstung Ranking (%) 2001	Gerstung Ranking (%) 2002
Seneca						
101	64	448	353	Bottom 32	17	46
102	691	2425	608	17	2	17
103	632	706	333	17	17	46
104	162	255	229	68	46	46
105	580	903	571	17	2	17
106	293	344	300	46	46	46
Weighted Mean	409	801	402	17	2	17
Belden						
107	659	506	252	17	17	46
108	483	394	323	17	46	46
109	204	382	163	46	46	68
110	402	158	278	17	68	46
111	605	610	565	17	17	17
Weighted Mean	466	412	314	17	17	46
Butt Creek						
113	629	248	252	17	46	46
114	185	106	110	68	68	68

Based on Table 2 in Gerstung (1973), the six sites sampled in the Seneca Reach in 2000, 2001, and 2002 ranged from the bottom 32 percent to the top 2 percent of California trout streams (see Table 34). The uppermost site located below Canyon Dam, Site 101 *Canyon Dam Weir – Downstream*, fell in the bottom 32 percent range in 2000, but showed dramatic improvement in 2001 when it moved up to the top 17 percent. In 2002, Site 101 fell into the top 46 percent. Site 102 *Seneca Bridge-Upstream*, fell in the top 17 percent in 2000, and in the top 2 percent in 2001 with an estimate of 2,425 adult trout per mile. In 2002, site 102 fell into the top 17 percent. Site 103 *Seneca Bridge-Downstream*, fell in the top 17 percent in 2000 and 2001, and in the top 46 percent in 2002. Site 104 *Butt Creek Confluence-Upstream*, was in the top 68 percent in 2000, but improved to the top 46 percent in 2001 and 2002. Site 105 *Butt Creek Confluence-Downstream*, was ranked in the top 17 percent in 2000, and improved to the top 2 percent in 2001 with an estimate of 903 trout per mile. In 2002, site 105 fell into the top 17 percent. Site 106 *Caribou Powerhouse-Upstream*, was ranked in the top 46 percent for all three years. The average number of trout per mile for all stations combined in the Seneca Reach in 2000 and 2002 fell within the top 17 percent of California trout streams, but in 2001 fell into the top 2 percent.

The population estimates within the Belden Reach are generally lower than in the Seneca Reach. Site 107 *Belden Dam-Downstream* had population estimates in 2000 and 2001 within the top 17%, but decreased to the top 46% in 2002. Site 108 *Tunnel Addit Bridge – Downstream* had population estimates in the 17 to 46 percent range during the three years of study. Site 109 *Queen Lily-Upstream* had population estimates in the 46 to 68 percent range for the three years of study. Site 110 *Queen Lily-Downstream* had variable population estimates during the three years of study, ranging from the top 17 to 68 percent of California trout streams. However, site 111 population estimates were relatively stable during the three years of study, and remained in the top 17 percent of California trout streams for all three years. The average number of trout per mile for all stations combined in the Belden Reach in 2000 and 2001 fell within the top 17 percent of California trout streams, and in 2002 fell into the top 46 percent. The generally lower ranking of all sites in the Belden Reach is probably due to the presence of several dozen campsites in this area and the easy access provided by the road that parallels most of the river in this reach, resulting in heavier fishing pressure than in the upstream Seneca Reach.

Estimated trout populations at Site 113 *Upper Butt Creek*, fell within the top 17 percent of California trout streams in 2000, and within the top 46 percent in 2001 and 2002. Site 114 *Lower Butt Creek* was ranked within the top 68 percent for all three years of study. Site 114 is an important spawning and rearing site, and young of the year trout were especially abundant during all years of study.

According to a separate study conducted by Thomas Payne and Associates (see Appendix E3.1-11 in Vol. 7 of the Exhibit E) in the Seneca and Belden reaches, the estimated population densities of adult rainbow trout in the Seneca and upper Belden (above the Gansner Bar fish barrier) reaches were relatively uniform at 600 to 900 fish/mile. Compared to the Gerstung (1973) data, the Seneca and upper Belden reaches were within the top 17 percent of California trout streams, with several sites being within the top 2 percent. The lower Belden Reach (on the mainstem NFFR below the fish barrier) had a population density estimate of 178 fish per mile, placing it within the top 68 percent of California trout streams.

Recruitment can be measured by comparing the ratio of young-of the year (age class 0+) trout to juveniles and adults. Currently, age class 0+ trout in the Seneca Reach averaged 10 percent composition by weight in 2000, 11 percent in 2001, and 18 percent in 2002. Age class 0+ trout accounted for 61 percent (range of 33 to 74 percent) of the total number of trout collected in the Seneca Reach during 2000, 61 percent (range of 0 to 83 percent) in 2001, and 72 percent (range of 44 to 82 percent) in 2002. Age class 0+ trout in the Belden Reach averaged 6 percent composition by weight in 2000, 4 percent in 2001, and 9 percent in 2002. Age class 0+ trout accounted for 42 percent (range of 30 to 67 percent) of the total number of trout collected in the Belden Reach during 2000, 33 percent (16 to 48 percent) in 2001, and 55 percent (range of 27 to 69 percent) in 2002. Gerstung (1973) found YOY in the NFFR constituted 5 percent composition by weight in the Seneca Reach and 0 percent in the Belden Reach. However, it is unclear whether Gerstung's biomass estimates are based on actual numbers sampled or population estimates. It is also unclear whether or not the studies Gerstung based his analysis on collected any YOY in the Belden Reach. Regardless, the current data from 2000, 2001, and 2002 studies demonstrate that recruitment is occurring within both of these reaches. Substantial numbers of YOY trout were collected in each reach during all three years of sampling.

8.0 REFERENCES

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LIST OF APPENDICES

Appendix A – Catch Summaries

Table A-1 – Stream Electrofishing Catch Summary, UNFFR Project, Fall 2000.

Table A-2 – Stream Electrofishing Catch Summary, UNFFR Project, Fall 2001.

Table A-3 – First Pass Electrofishing Catch Summary Comparing Data From
Canyon Dam Weir-Upstream With Other Seneca Reach Sampling
Sites, Fall 2001.

Table A-4 – Stream Electrofishing Catch Summary, UNFFR Project, Fall 2002.

Appendix B – Biomass Histograms

Figure B-1 – Rainbow Trout Biomass – Seneca Reach, UNFFR Project, Fall
2000, 2001, and 2002.

Figure B-2 – Rainbow Trout Biomass – Belden Reach, UNFFR Project, Fall
2000, 2001, and 2002.

Figure B-3 – Rainbow Trout Biomass – Mainstem, Upper and Lower Butt
Creek, and Mosquito Creek, UNFFR Project Fall 2000, 2001, and
2002.

Figure B-4 – Brown Trout Biomass – Seneca Reach, UNFFR Project, Fall 2000,
2001, and 2002.

Figure B-5 – Brown Trout Biomass – Mainstem, Upper and Lower Butt Creek,
and Mosquito Creek, UNFFR Project, Fall 2000, 2001, and 2002.

Appendix C – Electrofishing and Snorkel Sites by Year, UNFFR Project, Fall 2000, 2001, and 2002.

Appendix D – Catch Summary from Lake Almanor Gill Netting Sites, August 8- 10, 2000.

Appendix E – Site-Specific Gill Netting Results, August 8-10, 2000.

- Figure E-1 – Catch Composition at Bailey Creek Site, Lake Almanor Gill Netting, August 2000.
- Figure E-2 – Catch Composition at Goose Island Site, Lake Almanor Gill Netting, August 2000.
- Figure E-3 – Catch Composition at SE Shore Site, Lake Almanor Gill Netting, August 2000.
- Figure E-4 – Catch Composition at Canyon Dam Site, Lake Almanor Gill Netting, August 2000.
- Figure E-5 – Catch Composition at Hamilton Branch Site, Lake Almanor Gill Netting, August 2000.
- Figure E-6 – Catch Composition at Prattville Intake Site, Lake Almanor Gill Netting, August 2000.
- Figure E-7 – Smallmouth Bass Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-8 – Sacramento Pikeminnow Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-9 – Brown Bullhead Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-10 – Sacramento Sucker Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-11 – Rainbow Trout Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-12 – Sacramento Perch Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-13 – Brown Trout Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-14 – Carp Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

Appendix F – Historical Catch Data

Table F-1 – Seneca and Belden Reaches – Historical CDFG Station Locations.

Table F-2 – Seneca and Belden Reaches – Historical CDFG Fish Data.

Table F-3 – Fish Species Reported to Occur in the Upper North Fork Feather
River Project Area.

Table F-4 – Fish Species Reported to Occur in Lake Almanor.

Table F-5 – Fish Species Reported to Occur in the Butt Valley Reservoir.

APPENDIX A – Catch Summaries

Table A-1 – Stream Electrofishing Catch Summary, UNFFR Project, Fall 2000.

Table A-2 – Stream Electrofishing Catch Summary, UNFFR Project, Fall 2001.

Table A-3 – First Pass Electrofishing Catch Summary Comparing Data From Canyon
Dam Weir-Upstream With Other Seneca Reach Sampling Sites, Fall 2001.

Table A-4 – Stream Electrofishing Catch Summary, UNFFR Project, Fall 2002.

Table A-1. Stream Electrofishing Catch Summary, UNFFR Project, Fall 2000.

	Rainbow trout				Brown trout				Sacramento sucker				Prickly sculpin				Sacramento pikeminnow				
Reach, site no.	Pass 1	Pass2	Pass3	Pass4	Pass 1	Pass2	Pass3	Pass4	Pass 1	Pass2	Pass3	Pass4	Pass 1	Pass2	Pass3	Pass4	Pass 1	Pass2	Pass3	Pass4	Total
Seneca																					
101	3	2	1	-	0	0	0	-	5	1	0	-	67	59	38	-	0	0	0	-	176
102	70	40	33	-	4	1	0	-	0	0	0	-	151	151	81	-	0	0	0	0	531
103	55	15	15	9	1	1	1	0	0	0	1	0	65	41	23	15	0	0	0	0	242
104	30	22	6	-	0	0	0	-	1	1	1	-	104	74	43	-	0	0	0	-	282
105	34	34	16	7	1	0	0	0	0	0	1	0	41	30	22	11	0	0	0	0	197
106	33	26	10	-	0	0	0	-	3	1	3	-	43	23	7	-	0	0	0	-	149
Belden																					
107	18	14	15	3	0	0	0	0	21	12	4	2	43	29	9	5	0	0	0	0	175
108	27	15	10	-	0	0	0	-	48	42	11	-	50	36	25	-	2	0	0	-	266
109	18	13	5	-	0	0	0	-	17	3	6	-	31	23	19	-	0	0	0	-	135
110	13	12	6	-	0	0	0	-	9	7	0	-	75	37	24	-	0	0	0	-	183
111	29	18	12	8	0	0	0	0	3	3	4	4	83	65	42	15	0	0	0	0	286
112	4	3	-	-	0	0	-	-	4	0	-	-	54	45	-	-	1	1	-	-	112
Butt Creek																					
113	46	16	13	-	8	4	1	-	21	18	11	-	49	58	18	-	0	0	0	-	263
114	30	11	11	9	0	0	0	0	0	0	0	0	53	28	18	16	0	0	0	0	176
TOTALS	410	241	153	36	14	6	2	0	132	88	42	6	909	699	369	62	3	1	0	0	3,173

'-' indicates that no data was collected

Table A-2. Stream Electrofishing Catch Summary, UNFFR Project, Fall 2001.

Reach, site no.	Rainbow trout				Brown trout				Sacramento sucker				Prickly sculpin				Sacramento pikeminnow				Total
	Pass 1	Pass2	Pass3	Pass4	Pass 1	Pass2	Pass3	Pass4	Pass 1	Pass2	Pass3	Pass4	Pass 1	Pass2	Pass3	Pass4	Pass 1	Pass2	Pass3	Pass4	
101	16	10	5		0	0	0		3	0	0		68	44	13		0	0	0		159
102	45	58	35		1	1	1		1	0	0		139	94	69		0	0	0		444
103	39	26	15	18	1	0	0	1	1	1	1	1	46	26	26	12	0	0	0	0	214
104	74	31	12		0	0	0		1	1	1		81	50	21		0	0	0		272
105	54	38	32		0	0	0		0	0	1		42	32	34		0	0	0		233
106	39	39	11		0	0	0		1	4	1		30	27	14		0	0	0		166
Belden Reach																					
107	13	5	10	3	0	0	0	0	5	3	0	4	26	16	7	6	0	0	0	0	98
108	21	15	6		0	0	0		34	13	6		42	12	10		0	0	0		159
109	13	11	7		0	0	0		14	7	1		37	15	8		0	0	0		113
110	4	6	1		0	0	0		28	9	1		30	15	1		0	0	0		95
111	27	22	4		0	0	0		0	2	1		56	25	11		0	0	0		148
112	9	5	3		0	0	0		0	0	0		139	97	47		3	4	2		309
Butt Creek																					
113	23	14	9		8	4	1		11	3	2		32	20	11		0	0	0		138
114	45	32	7		0	0	0		0	0	0		70	41	22		0	0	0		217
Mosquito Creek																					
115	53	20	3		0	0	0		0	0	0		14	13	8		0	0	0		111
TOTALS	475	332	160	21	10	5	2	1	99	43	15	5	852	527	302	18	3	4	2	0	2,876

'-' indicates that no data were collected

Table A-3. First Pass Electrofishing Catch Summary Comparing Data From Canyon Dam Weir-Upstream With Other Seneca Reach Sampling Sites, Fall 2001.

Site No. - Site Name	Site Length (m)	Rainbow trout	Brown trout	Sacramento sucker	Prickly sculpin	Total
		Pass 1	Pass 1	Pass 1	Pass 1	
116 - Canyon Dam Weir-Upstream ¹	200	49	0	13	263	325
101 - Canyon Dam Weir-Downstream	100	16	0	3	68	87
102 - Seneca Bridge-Upstream	110	45	1	1	139	186
103 - Seneca Bridge-Downstream	100	39	1	1	46	87
104 - Butt Creek Confluence-Upstream	104	74	0	1	81	156
105 - Butt Creek Confluence-Downstream	100	54	0	0	42	96
106 - Caribou Powerhouse- Upstream	110	39	0	1	30	70
Average of sites 101 through 106		44.5	0.3	1.2	67.7	121.3

¹We estimate that half the sampling effort was expended throughout this 200 meter station, as compared to the other stations.

Table A-4. Steam Electrofishing Catch Summary, UNFFR Project, Fall 2002.

Reach, site no.	Rainbow trout					Brown trout					Sacramento sucker					Prickly sculpin					Total	Grand Total
	Pass 1	Pass2	Pass3	Pass4	Pass 5	Pass 1	Pass2	Pass3	Pass4	Pass 5	Pass 1	Pass2	Pass3	Pass4	Pass 5	Pass 1	Pass2	Pass3	Pass4	Pass 5		
101	20	12	7	3	3	1	0	0	0	0	0	0	0	0	0	45	34	9	4	2	140	151
102	131	69	41			8	4	0			2	1	1			0	0	0			257	464
103	75	35	16			1	0	0			1	4	1			0	0	0			133	235
104	56	38	8			0	0	0			2	0	0			0	0	0			104	351
105	57	54	21			0	0	0			0	2	0			0	0	0			134	252
106	33	23	14	4		0	0	0	0		4	0	0	0		0	0	0	0		78	167
Belden Reach																						
107	23	11	7			0	0	0			8	3	1			10	2	4			69	156
108	16	17	2			0	0	0			39	6	0			1	0	0			81	142
109	29	12	13	5		0	0	0	0		13	6	5	3		0	0	0	0		86	233
110	25	16	10	7	3	0	0	0	0	0	27	19	1	0	1	1	1	0	0	0	111	253
111	18	19	18	9	1	0	0	0	0	0	2	2	0	1	0	0	0	0	0	0	70	202
Mainstem																						
112	5	8	1			0	0	0			2	1	0			12	11	3			43	170
Butt Creek																						
113	18	22	2			8	7	1			6	1	0			0	0	0			65	143
114	32	19	8			0	0	0			0	0	0			0	0	0			59	144
Mosquito Creek																						
115	62	15	12	3		0	0	0	0		0	0	0	0		0	0	0	0		92	138
TOTALS	600	370	180	31	7	18	11	1	0	0	106	45	9	4	1	69	48	16	4	2	1,522	3,201

Table A-4 (continued). Stream Electrofishing Catch Summary, UNFFR Project, Fall 2002.

Reach, site no.	Riffle Sculpin					Sacramento pikeminnow					Hatchery Rainbow trout					Total	Grand Total
	Pass 1	Pass2	Pass3	Pass4	Pass 5	Pass 1	Pass2	Pass3	Pass4	Pass 5	Pass 1	Pass2	Pass3	Pass4	Pass 5		
Seneca Reach																	
101	3	3	2	0	3	0	0	0	0	0	0	0	0	0	0	11	151
102	106	64	37			0	0	0			0	0	0			207	464
103	52	30	20			0	0	0			0	0	0			102	235
104	172	53	22			0	0	0			0	0	0			247	351
105	55	43	20			0	0	0			0	0	0			118	252
106	48	28	13	0		0	0	0	0		0	0	0	0		89	167
Belden Reach																	
107	51	23	12			0	1	0			0	0	0			87	156
108	25	22	8			3	3	0			0	0	0			61	142
109	65	49	25	4		0	1	0	0		1	1	1	0		147	233
110	60	36	28	7	7	1	1	1	0	0	0	1	0	0	0	142	253
111	50	42	21	9	7	0	0	0	0	0	1	1	0	0	1	132	202
Mainstem																	
112	62	35	14			11	4	1			0	0	0			127	170
Butt Creek																	
113	31	35	12			0	0	0			0	0	0			78	143
114	55	19	11			0	0	0			0	0	0			85	144
Mosquito Creek																	
115	30	7	6	2		0	0	0	0		0	1	0	0		46	138
TOTALS	865	489	251	22	17	15	10	2	0	0	2	4	1	0	1	1,679	3,201

APPENDIX B – Biomass Histograms

Figure B-1 – Rainbow Trout Biomass – Seneca Reach, UNFFR Project, Fall 2000, 2001, and 2002.

Figure B-2 – Rainbow Trout Biomass – Belden Reach, UNFFR Project, Fall 2000, 2001, and 2002.

Figure B-3 – Rainbow Trout Biomass – Mainstem, Upper and Lower Butt Creek, and Mosquito Creek, UNFFR Project Fall 2000, 2001, and 2002.

Figure B-4 – Brown Trout Biomass – Seneca Reach, UNFFR Project, Fall 2000, 2001, and 2002.

Figure B-5 – Brown Trout Biomass – Mainstem, Upper and Lower Butt Creek, and Mosquito Creek, UNFFR Project, Fall 2000, 2001, and 2002.

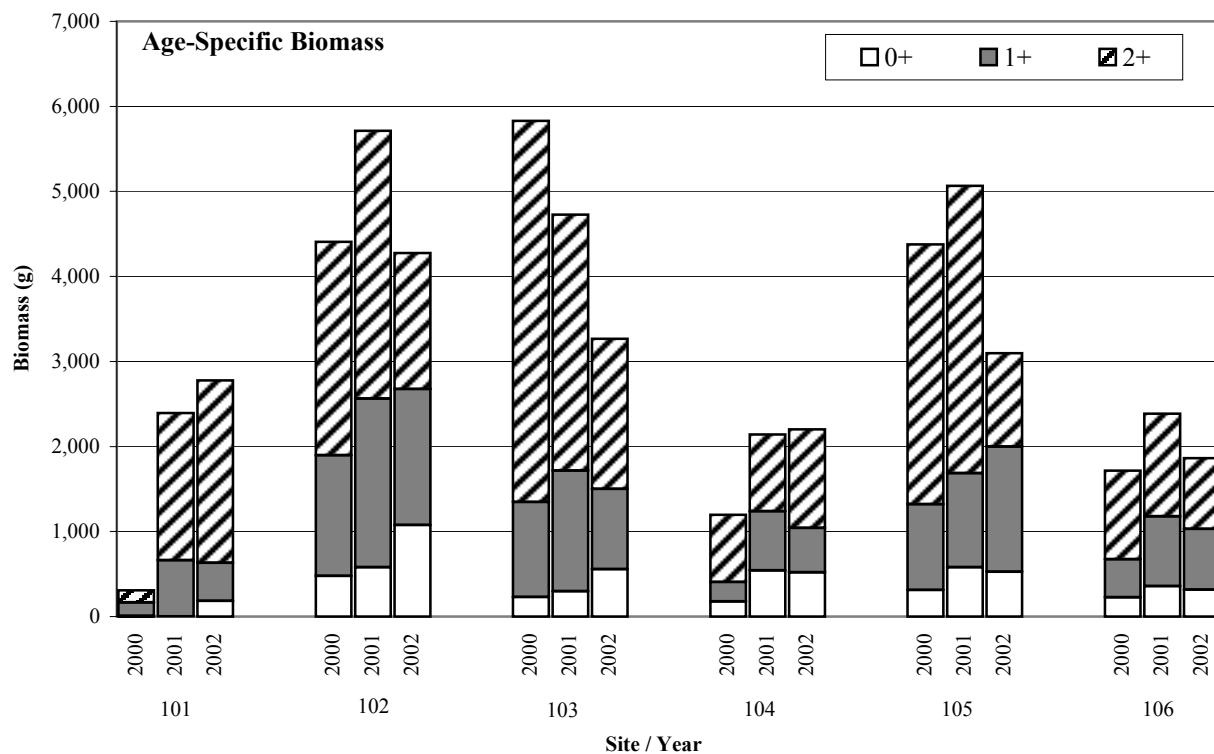
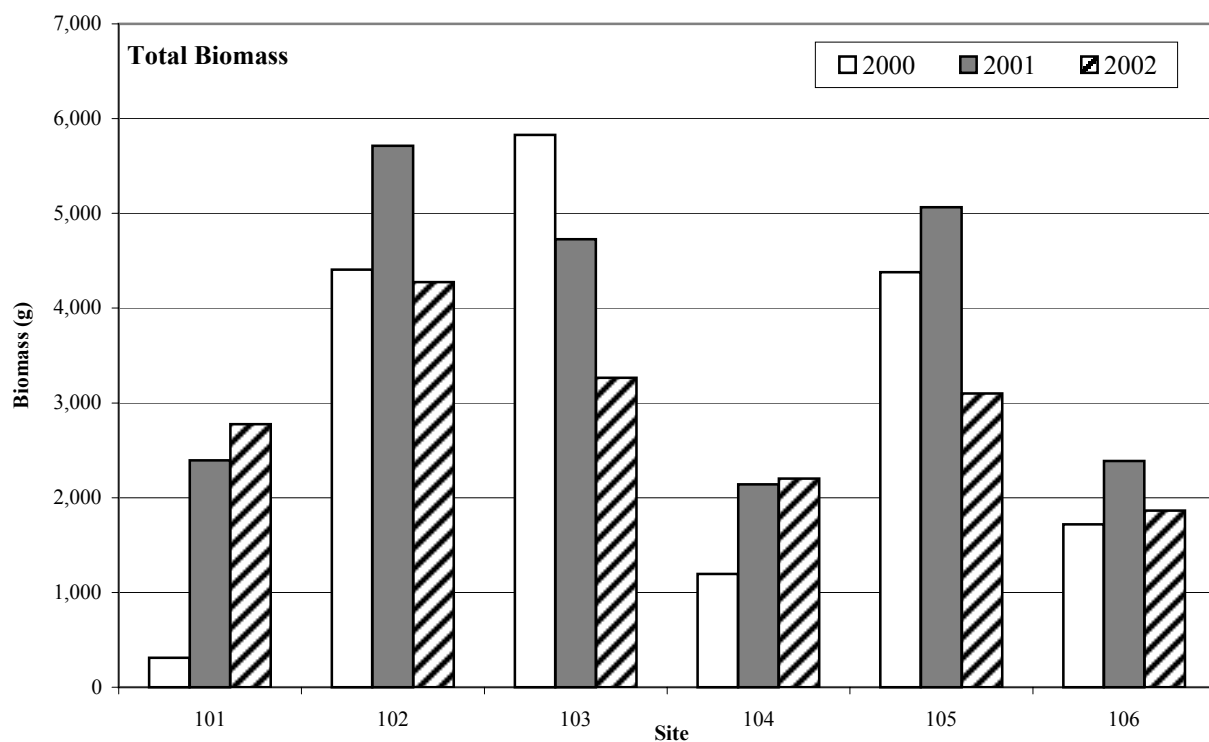


Figure B-1. Rainbow Trout Biomass - Seneca Reach, UNFFR Project, Fall 2000, 2001, and 2002.

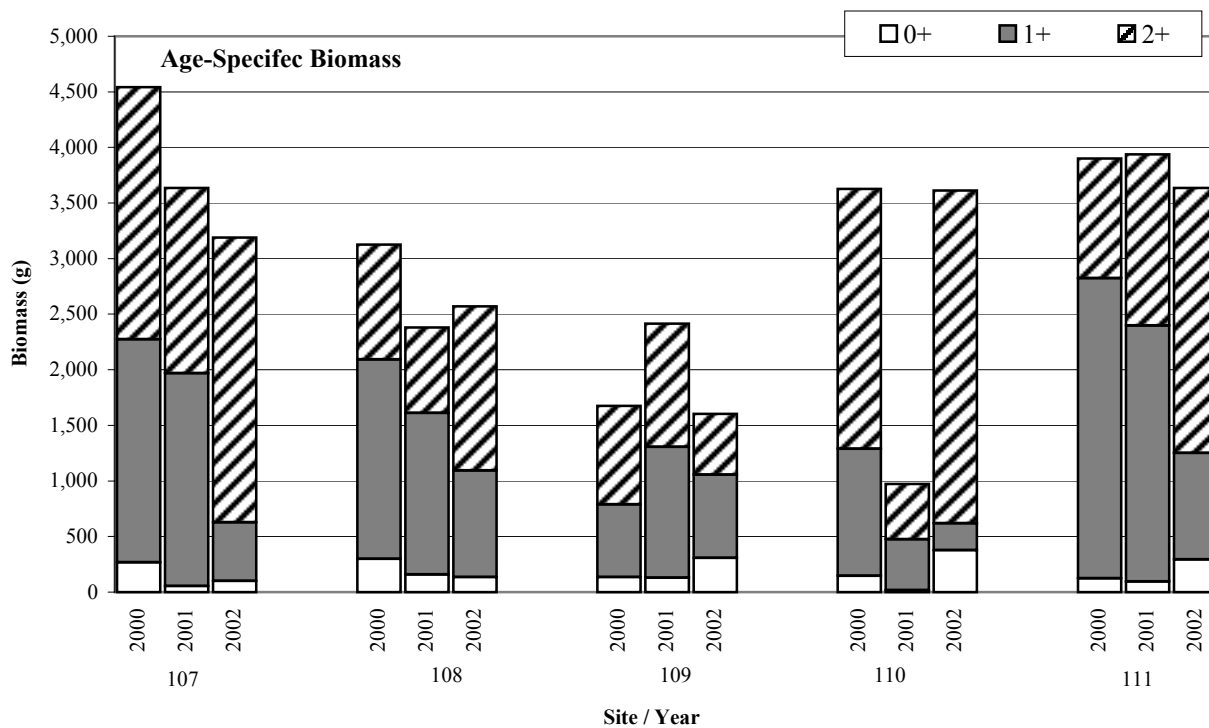
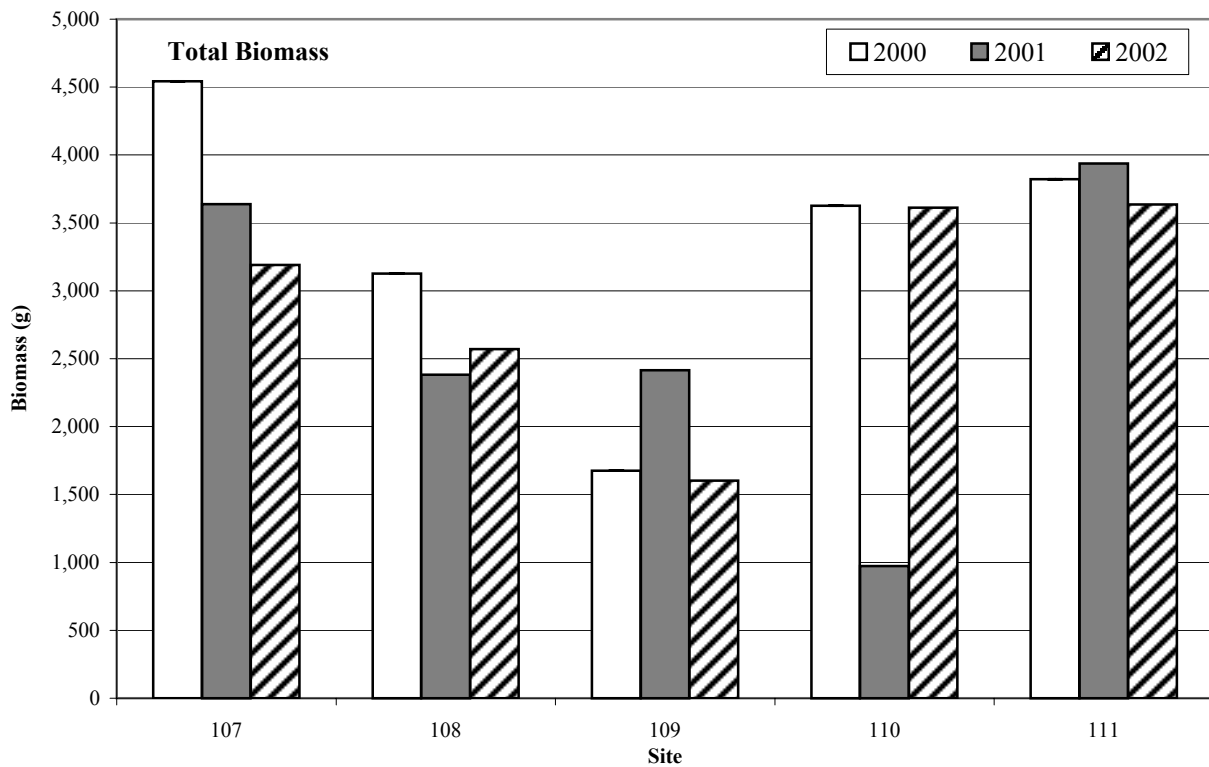


Figure B-2. Rainbow Trout Biomass - Belden Reach, UNFFR Project, Fall 2000, 2001, and 2002.

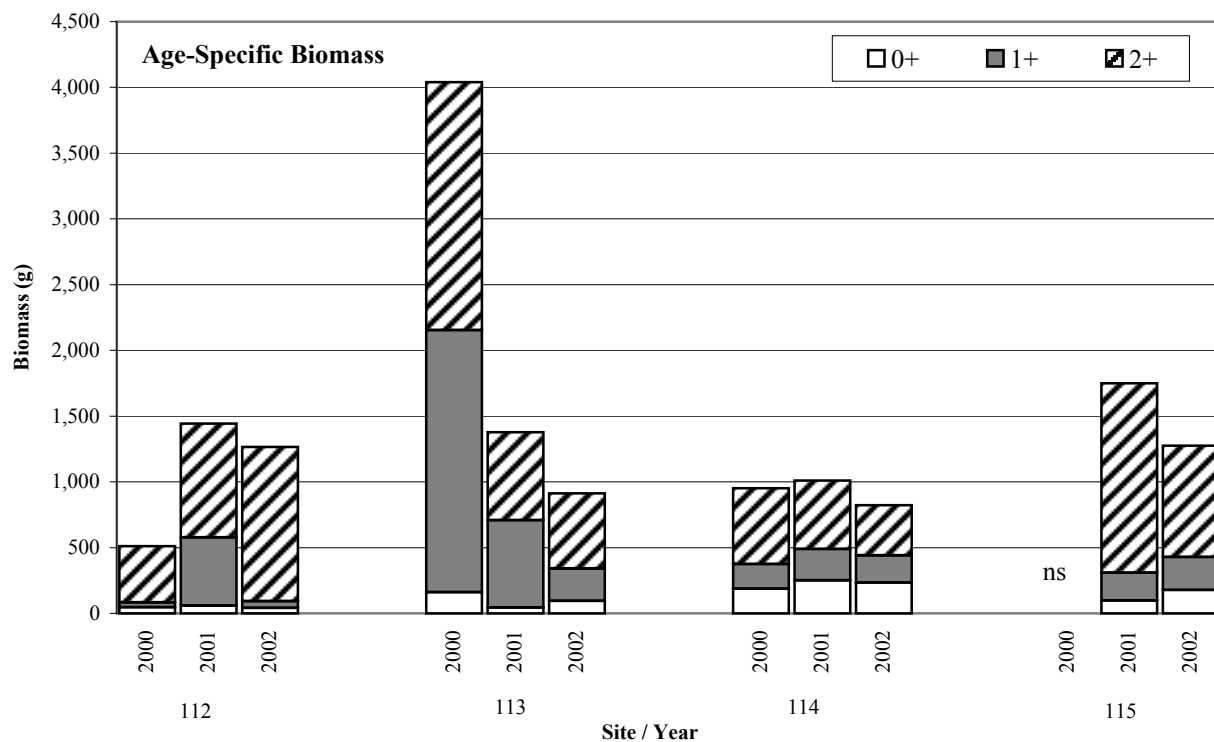
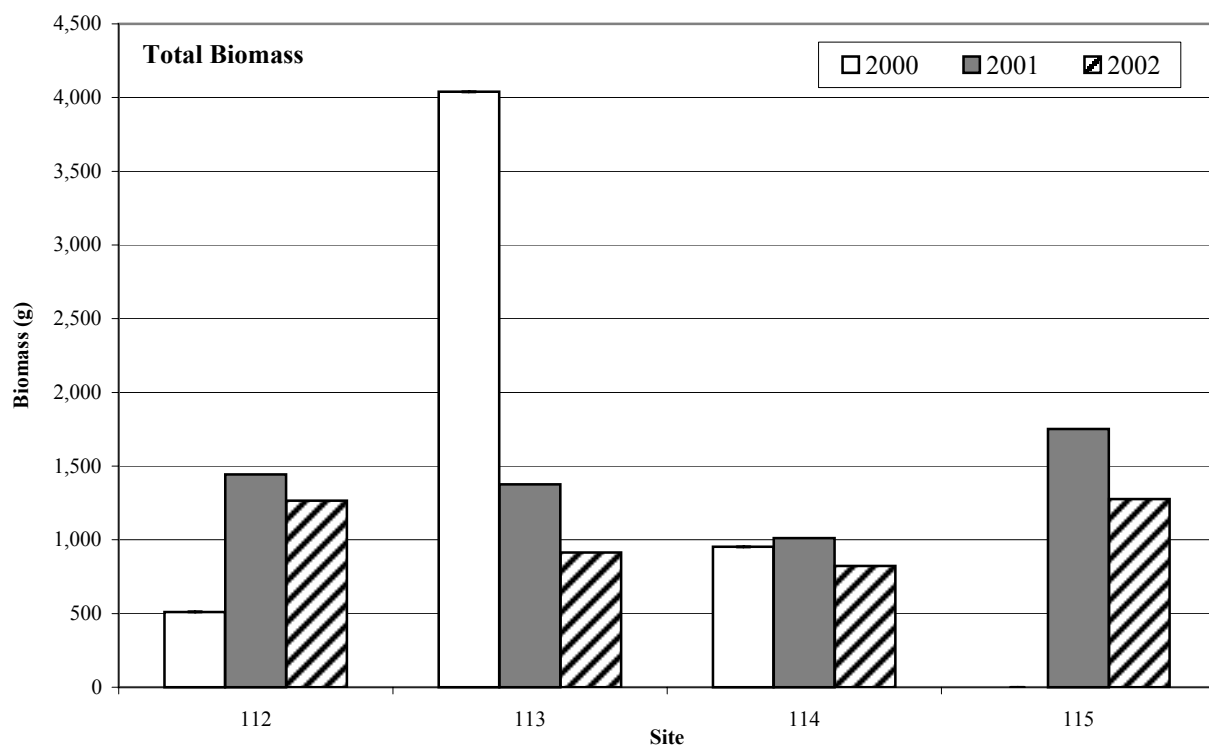


Figure B-3. Rainbow Trout Biomass - Mainstem, Upper and Lower Butt Creek, and Mosquito Creek, UNFFR Project, Fall 2000, 2001, and 2002.

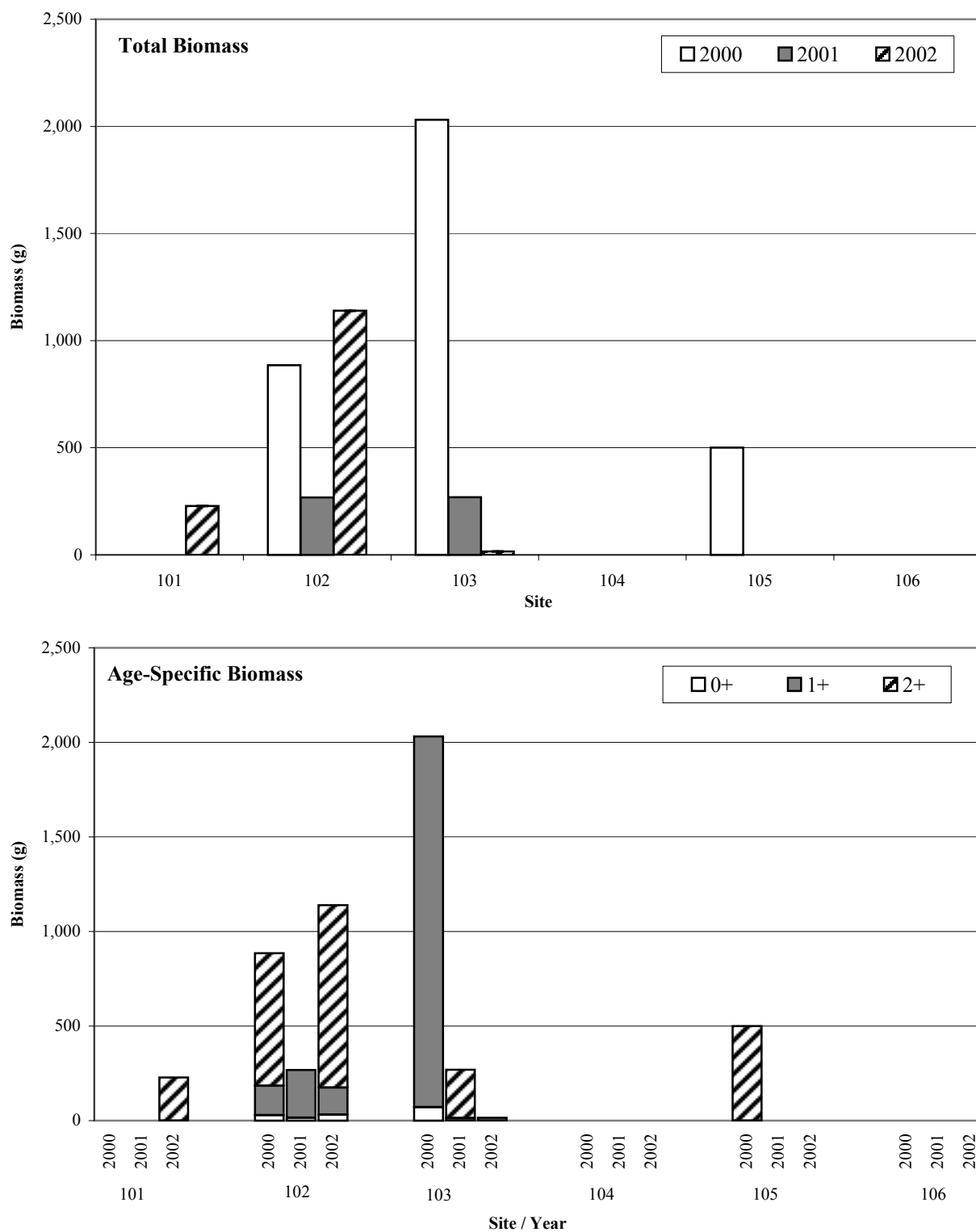


Figure B-4. Brown Trout Biomass - Seneca Reach, UNFFR Project, Fall 2000, 2001, and 2002.

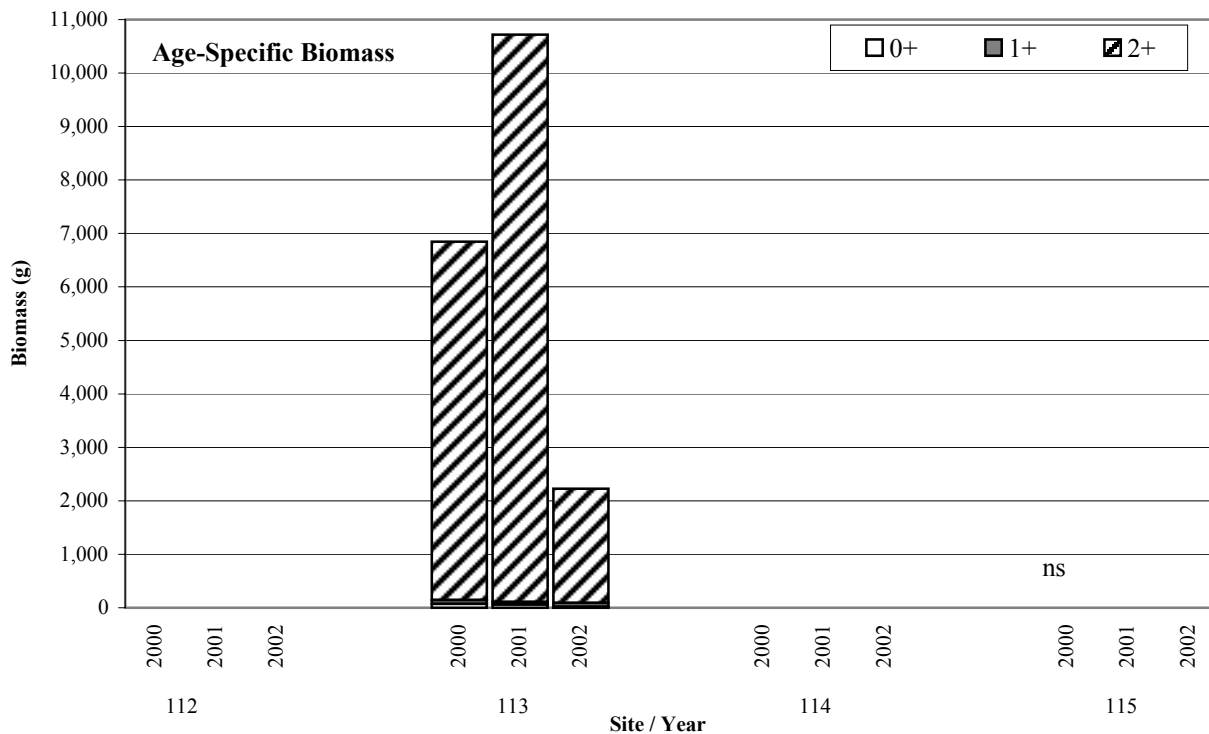
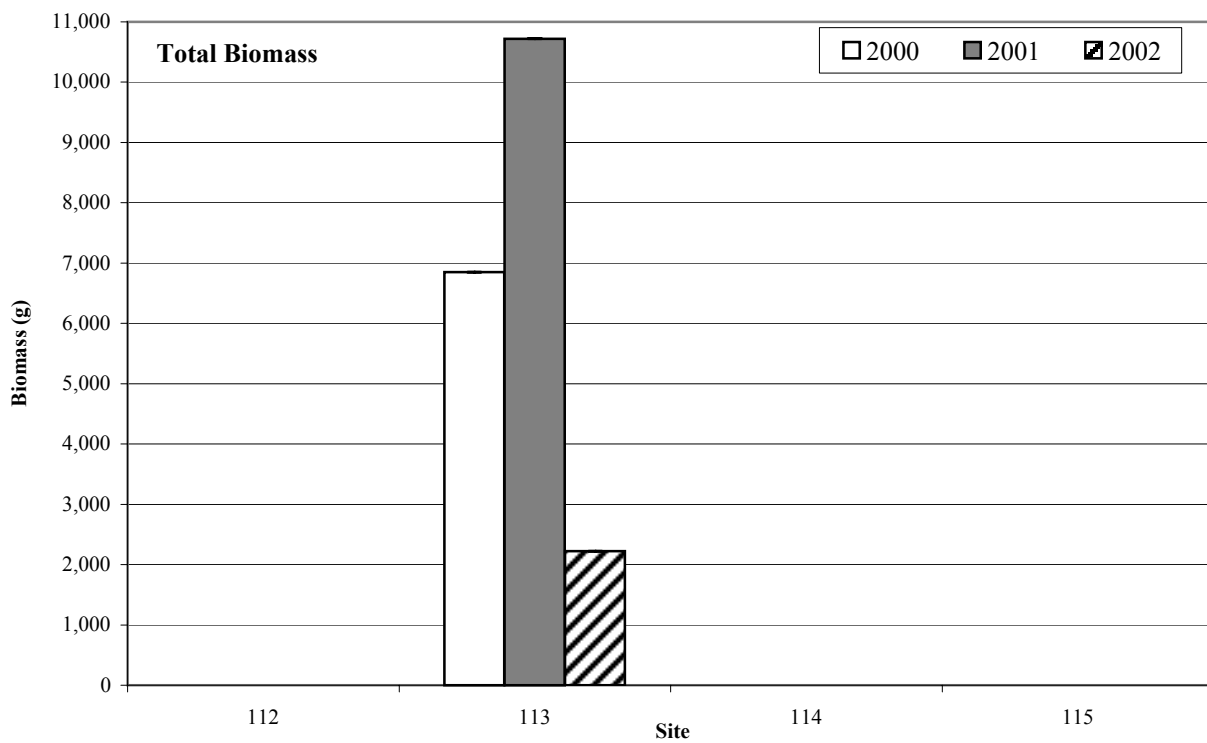


Figure B-5. Brown Trout Biomass - Mainstem, Upper and Lower Butt Creek, and Mosquito Creek, UNFFR Project, Fall 2000, 2001, and 2002.

APPENDIX C

Electrofishing and Snorkel Sites By Year, UNFFR Project, Fall 2000, 2001, and 2002.

Electrofishing and Snorkel Sites By Year, UNFFR Project, Fall 2000, 2001, and 2002.

Reach/Site No.	Site Name	Site Location	Coordinates (UTM)	Year Sampled					
				Electrofishing			Snorkeling		
				2000	2001	2002	2000	2001	2002
<u>Electrofishing Sites</u>									
Seneca									
101	Canyon Dam Weir - Downstream	10T 0662334	UTM 4447782	✓	✓	✓			
102	Seneca Bridge - Upstream	10T 0663321	UTM 4442351	✓	✓	✓			
103	Seneca Bridge - Downstream	10T 0663430	UTM 4441820	✓	✓	✓			
104	Butt Creek Confluence - Upstream	10T 0659935	UTM 4439918	✓	✓	✓			
105	Butt Creek Confluence - Downstream	10 T 0659310	UTM 4439550	✓	✓	✓			
106	Caribou Powerhouse - Upstream	10T 0658188	UTM 4438887	✓	✓	✓			
116	Canyon Dam Weir - Upstream	10T 0662625	UTM 4448468		✓				
Belden									
107	Belden Dam - Downstream	10T 0656629	UTM 4437573	✓	✓	✓			
108	Tunnel Addit Bridge - Downstream	10T 0650272	UTM 4429923	✓	✓	✓			
109	Queen Lily Campground - Upstream	10T 0652404	UTM 4434394	✓	✓	✓			
110	Queen Lily Campground - Downstream	10T 0652038	UTM 4434142	✓	✓	✓			
111	Siphon	10T 0651899	UTM 4432507	✓	✓	✓			
112	Mainstem	10T 0650349	UTM 4429923	✓	✓	✓			
Butt Creek									
113	Upper Butt Creek	10T 0654394	UTM 4449770	✓	✓	✓			
114	Lower Butt Creek	10T 0659322	UTM 4439737	✓	✓	✓			
Mosquito Creek									
115	Mosquito Creek	10T 0653328	UTM 4436325		✓	✓			
<u>Snorkle Sites</u>									
Seneca									
301	Skinner Flat Pool 1	10T 0662419	UTM 4446279				✓	✓	✓
302	Skinner Flat Pool 2	10T 0662470	UTM 4446475				✓	✓	✓
303	Davis Creek Confluence Pool 1 - Upstream	10T 066 2574	UTM 4443401				✓		
304	Davis Creek Confluence Pool	10T 0662814	UTM 4443268				✓		
305	Butt Creek Confluence Pool 1 - Downstream	10T 0658812	UTM 4439398				✓	✓	✓
306	Butt Creek Confluence Pool 2 - Downstream	10T 0658810	UTM 4439318				✓	✓	✓
307	Butt Creek Confluence Pool 3 - Downstream	10T 0658806	UTM 4439262				✓	✓	✓
308	Caribou Powerhouse Pool 1 - Upstream	10T 0658452	UTM 4439222				✓	✓	✓
309	Caribou Powerhouse Pool 2 - Upstream	10T 0658285	UTM 4439164				✓	✓	✓
316	Salmon Falls	10T 0662353	UTM 4444221					✓	✓
317	Davis Creek Confluence Pool 2 - Upstream							✓	✓
318	Davis Creek Confluence Pool 3 - Upstream							✓	✓
Belden									
310	Mosquito Creek Confluence - Downstream	10T 0652100	UTM 4432030				✓	✓	✓
311	Queen Lily Camground - Downstream	10T 0652126	UTM 4433961				✓	✓	✓
312	Queen Lily Campground Pool 1 - Upstream	10T 0652215	UTM 4434272					✓	✓
313	Queen Lily Campground Pool 2 - Upstream	10T 0652086	UTM 4435078					✓	✓
314	Mosquito Creek Pool 1	10T 0653857	UTM 4436095					✓	✓
315	Mosquito Creek Pool 2	10T 0654390	UTM 4436167					✓	✓

APPENDIX D

Catch Summary from Lake Almanor Gill Netting Sites, August 8-10, 2000.

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Catch Summary from Lake Almanor Gill Netting Sites, August 8-10, 2000.

					Fish species								
Station / Net No.	Set No.	Date	Hour	Depth (m)	Rainbow trout	Brown trout	Smallmouth bass	Sacramento pikeminnow	Sacramento sucker	Brown bullhead	Sacramento perch	Carp	Total Fish
Bailey Creek													
1	1	08/08/00	19:40-20:40	2.4-2.7	0	0	0	0	0	0	0	0	0
	2	08/08/00	20:50-21:45	shoreline-4.3	0	0	0	0	0	0	0	0	0
	3	08/08/00	21:50-22:45	shoreline-2.4	0	0	0	1	1	0	0	0	2
2	1	08/08/00	20:00-21:00	3.0-3.7	0	0	0	0	0	0	0	0	0
	2	08/08/00	21:15-21:55	1.5	0	0	0	2	0	0	0	0	2
	3	08/08/00	22:00-23:00	1.5	0	0	0	0	0	0	0	0	0
3	1	08/08/00	20:10-21:30	shoreline-2.4	2	0	0	3	0	2	0	0	7
	2	08/08/00	21:40-22:10	shoreline-3.7	0	0	0	0	0	0	0	0	0
	3	08/08/00	22:15-23:00	shoreline-4.3	0	0	0	2	0	1	0	0	3
SUBTOTAL					2	0	0	8	1	3	0	0	14
Goose Island													
1	1	08/09/00	00:10-01:20	12.2	2	1	0	0	0	0	0	1	4
	2	-	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-	-
2	1	08/09/00	00:15-00:55	1.5-3.7	0	0	1	0	0	0	0	0	1
	2	08/09/00	01:00-01:35	1.5-3.7	0	0	0	0	0	0	0	0	0
	3	-	-	-	-	-	-	-	-	-	-	-	-
3	1	08/09/00	00:25-01:05	1.5-3.7	0	0	1	1	0	1	0	0	3
	2	08/09/00	01:10-01:45	1.5-3.7	0	0	0	0	0	1	0	0	1
	3	-	-	-	-	-	-	-	-	-	-	-	-
SUBTOTAL					2	1	2	1	0	2	0	1	9
SE Shore													
1	1	08/09/00	19:35-20:35	0.6-7.6	1	0	20	0	0	0	0	0	21
	2	08/09/00	20:40-21:40	0.6-5.8	0	0	4	1	1	1	0	0	7
	3	08/09/00	21:55-23:08	0.6-7.6	0	0	1	1	0	2	0	0	4
2	1	08/09/00	19:40-20:45	15.2	0	0	0	0	0	0	0	0	0
	2	08/09/00	20:50-22:00	18.3	0	0	0	0	0	0	0	0	0
	3	08/09/00	20:50-22:00	16.5	0	0	0	0	0	0	0	0	0
3	1	08/09/00	19:45-21:05	0.6-6.1	0	0	17	0	1	0	0	0	18
	2	08/09/00	21:20-22:20	3.7-9.8	0	0	2	2	1	2	1	0	8
	3	08/09/00	22:45-23:50	0.6-7.6	0	0	0	1	0	0	0	0	1
SUBTOTAL					1	0	44	5	3	5	1	0	59

Catch Summary from Lake Almanor Gill Netting Sites, August 8-10, 2000 (continued).

					Fish species								
Station / Net					Rainbow	Brown	Smallmouth	Sacramento	Sacramento	Brown	Sacramento		
No.	Set No.	Date	Hour	Depth (m)	trout	trout	bass	pikeminnow	sucker	bullhead	perch	Carp	Total Fish
Canyon Dam													
1	1	08/09/00	23:20-00:20		0	0	0	0	0	0	0	0	0
	2	08/10/00	00:40-01:40	14.9	0	0	0	0	0	0	0	0	0
	3	08/10/00	01:05-02:05	0.9-14.0	0	0	0	0	0	0	0	0	0
2	1	08/09/00	23:25-01:40	0.9-9.4	0	0	0	0	0	0	0	0	0
	2	08/09/00	23:50-01:50	0.9-8.5	0	0	0	1	0	0	0	0	1
	3	-	-	-	-	-	-	-	-	-	-	-	-
3	1	08/10/00	00:00-01:00	0-4.6	0	0	0	0	0	0	0	0	0
	2	-	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-	-
SUBTOTAL					0	0	0	1	0	0	0	0	1
Hamilton Branch													
1	1	08/10/00	19:20-20:20	3.0-7.3	0	0	2	0	0	0	0	0	2
	2	08/10/00	21:05-22:05	1.2-5.8	0	0	0	0	1	0	1	0	2
	3	-	-	-	-	-	-	-	-	-	-	-	-
2	1	08/10/00	19:25-20:25	1.2-7.6	0	0	15	1	0	0	0	0	16
	2	08/10/00	20:55-22:00	0.9-5.2	0	0	3	0	2	0	0	0	5
	3	-	-	-	-	-	-	-	-	-	-	-	-
3	1	08/10/00	19:35-20:40	0-15.2	0	0	0	0	0	0	0	0	0
	2	08/10/00	20:50-21:50	0-15.2	0	0	0	0	0	0	0	0	0
	3	-	-	-	-	-	-	-	-	-	-	-	-
SUBTOTAL					0	0	20	1	3	0	1	0	25
Prattville Intake													
1	1	08/10/00	22:35-23:35	0-15.2	0	0	0	0	0	0	0	0	0
	2	8/10-11/2000	23:35-00:35	0-16.5	0	0	0	0	0	0	0	0	0
	3	8/10-11/2000	00:40-01:40	0-13.7	0	0	0	0	0	0	0	0	0
2	1	08/10/00	22:40-23:40	0-15.2	0	0	0	0	0	0	0	0	0
	2	8/10-11/2000	23:45-00:45	0-15.2	0	0	0	0	0	0	0	0	0
	3	8/10-11/2000	00:45-01:45	0-17.1	0	0	0	0	0	0	0	0	0
3	1	08/10/00	22:50-23:50	1.2-7.3	0	0	0	0	0	0	0	0	0
	2	8/10-11/2000	23:50-00:50	1.2-6.1	0	0	0	3	0	0	0	0	3
	3	8/10-11/2000	01:00-02:00	0.9-2.1	0	0	0	0	0	0	0	0	0
SUBTOTAL					0	0	0	3	0	0	0	0	3
TOTAL FISH CAUGHT					5	1	66	19	7	10	2	1	111

**APPENDIX E – SITE-SPECIFIC GILL NETTING RESULTS,
AUGUST 8-10, 2000.**

- Figure E-1 – Catch Composition at Bailey Creek Site, Lake Almanor Gill Netting, August 2000.
- Figure E-2 – Catch Composition at Goose Island Site, Lake Almanor Gill Netting, August 2000.
- Figure E-3 – Catch Composition at SE Shore Site, Lake Almanor Gill Netting, August 2000.
- Figure E-4 – Catch Composition at Canyon Dam Site, Lake Almanor Gill Netting, August 2000.
- Figure E-5 – Catch Composition at Hamilton Branch Site, Lake Almanor Gill Netting, August 2000.
- Figure E-6 – Catch Composition at Prattville Intake Site, Lake Almanor Gill Netting, August 2000.
- Figure E-7 – Smallmouth Bass Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-8 – Sacramento Pikeminnow Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-9 – Brown Bullhead Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-10 – Sacramento Sucker Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-11 – Rainbow Trout Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-12 – Sacramento Perch Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-13 – Brown Trout Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.
- Figure E-14 – Carp Length-Frequency, All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

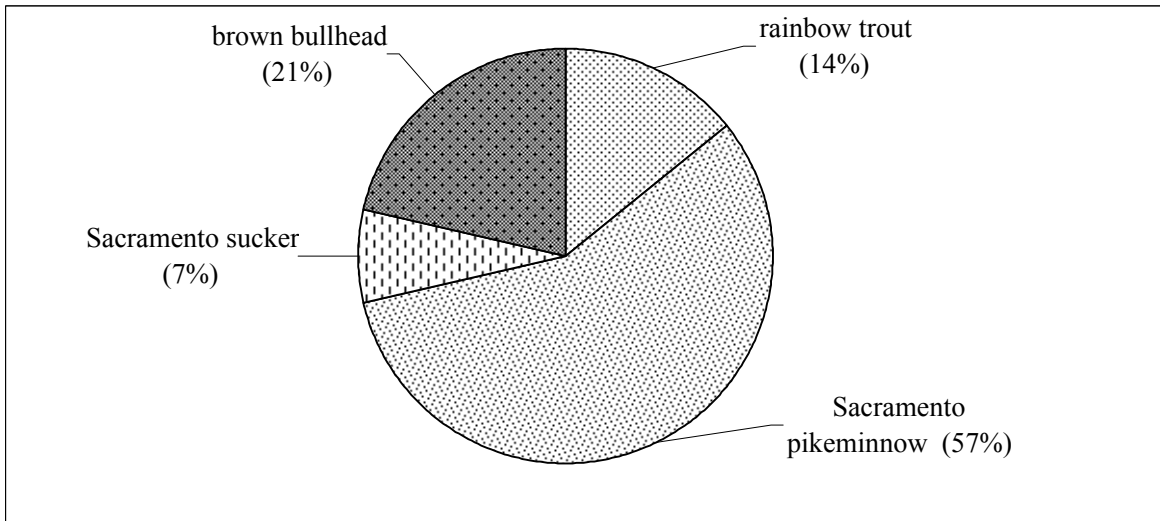


Figure E-1. Catch Composition at Bailey Creek Site, Lake Almanor Gill Netting, August 2000.

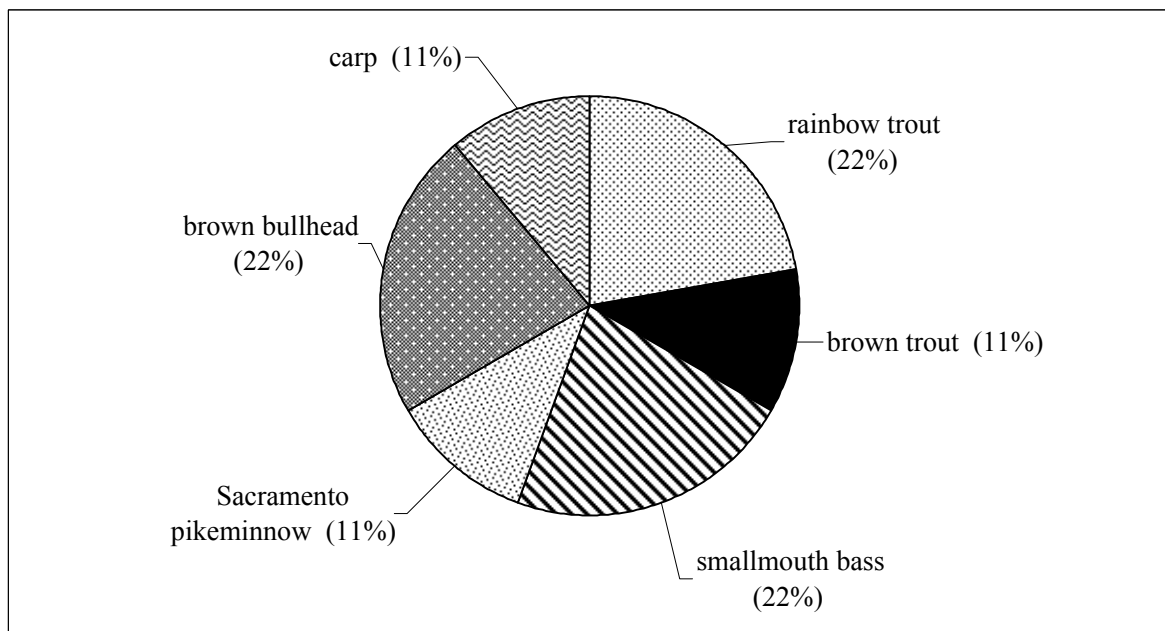


Figure E-2. Catch Composition at Goose Island Site, Lake Almanor Gill Netting, August 2000.

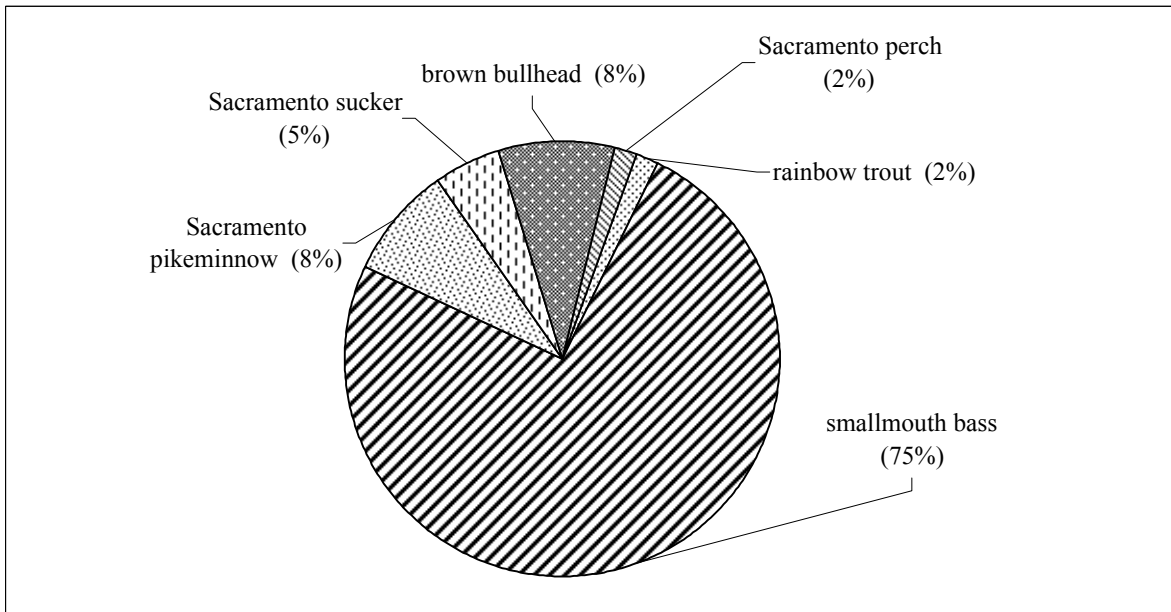


Figure E-3. Catch Composition at SE Shore Site, Lake Almanor Gill Netting, August 2000.

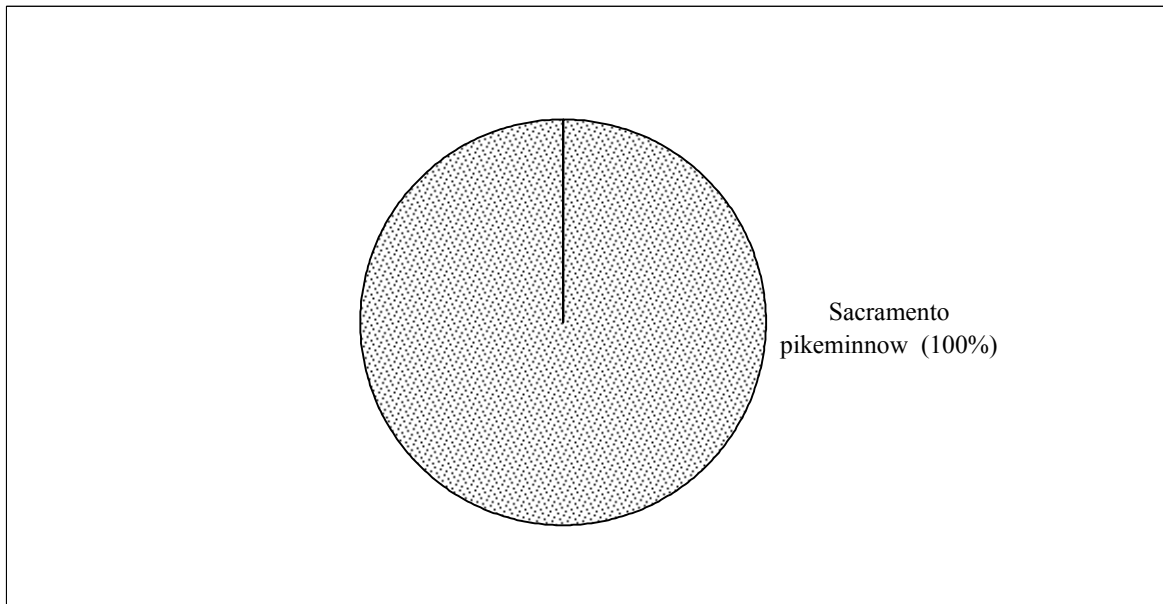


Figure E-4. Catch Composition at Canyon Dam Site, Lake Almanor Gill Netting, August 2000.

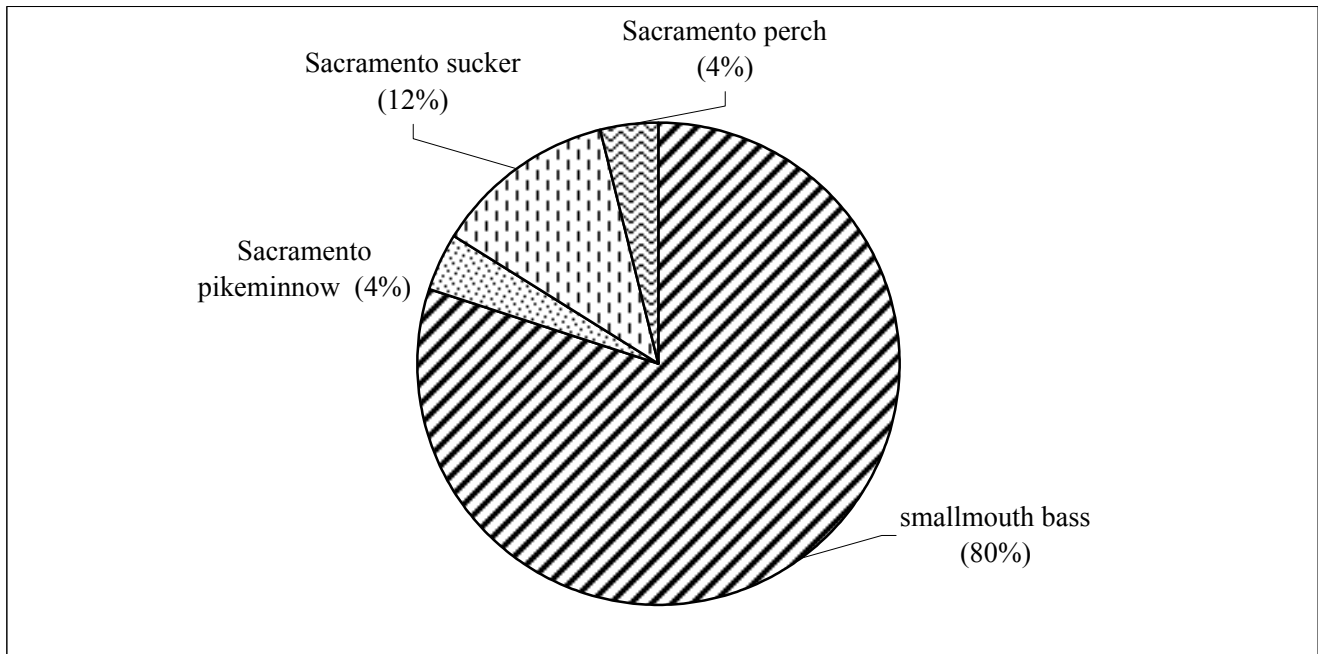


Figure E-5. Catch Composition at Hamilton Branch Site, Lake Almanor Gill Netting, August 2000.

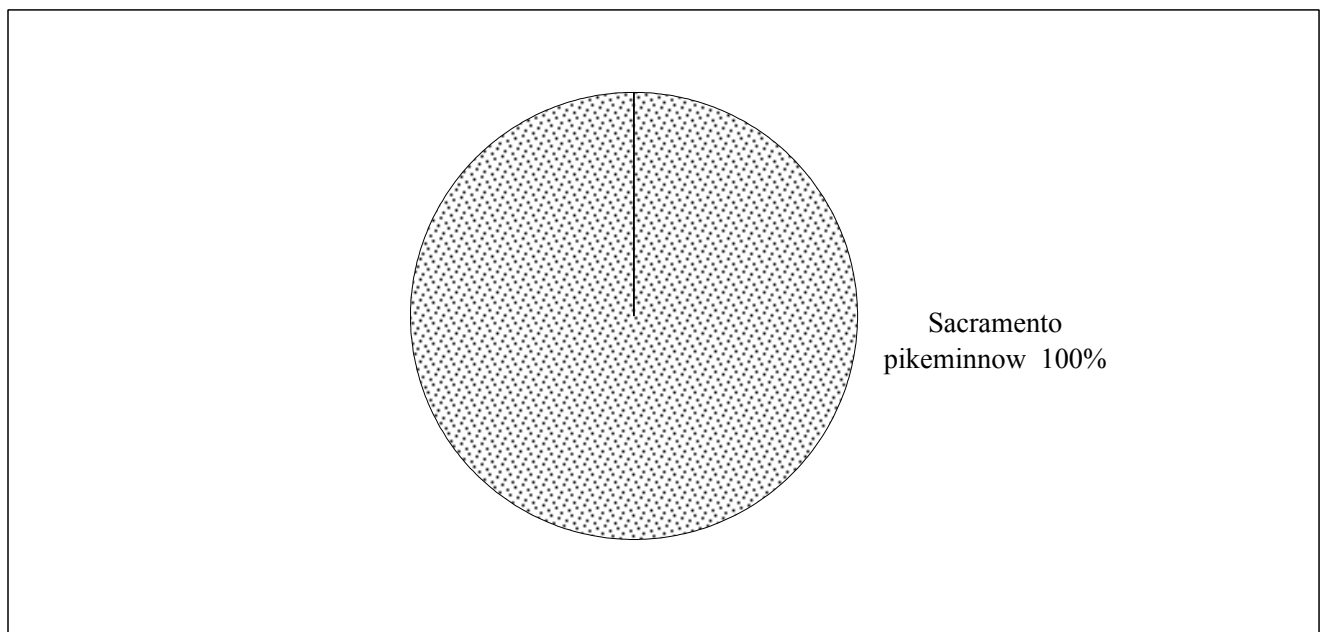


Figure E-6. Catch Composition at Prattville Intake Site, Lake Almanor, August 2000.

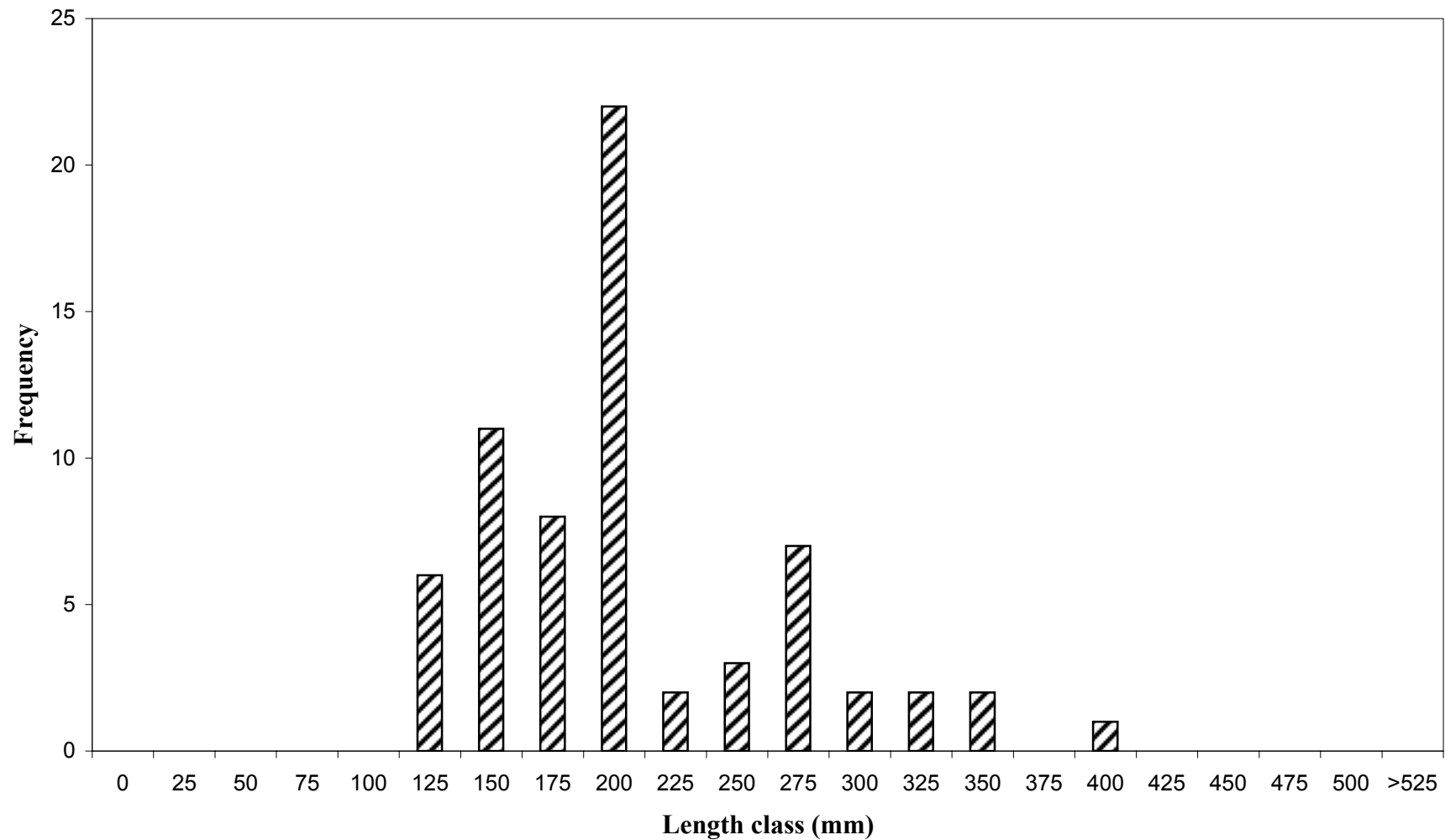


Figure E-7. Smallmouth Bass Length-Frequency,
All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

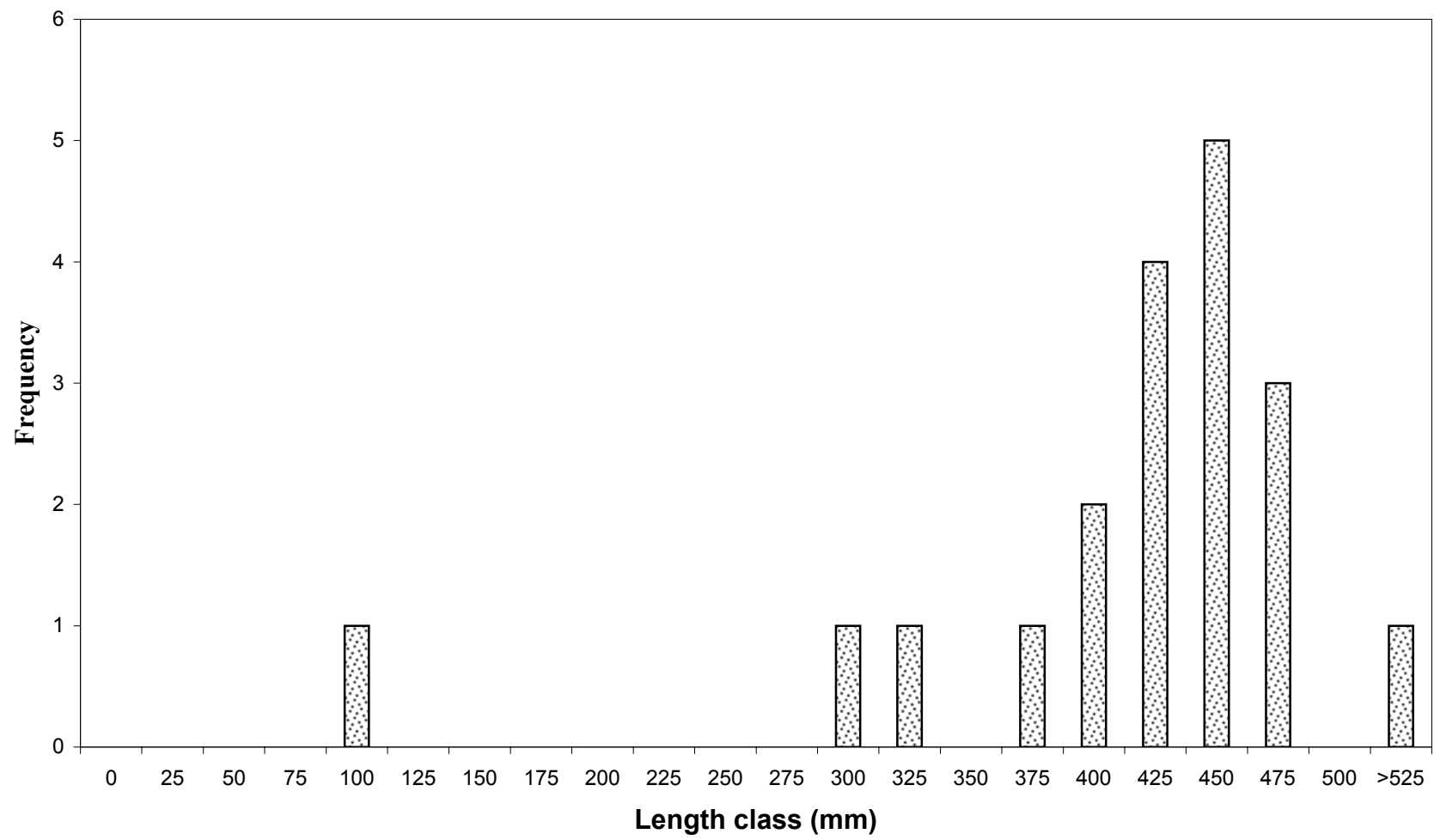


Figure E-8. Sacramento Pikeminnow Length-Frequency,
All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

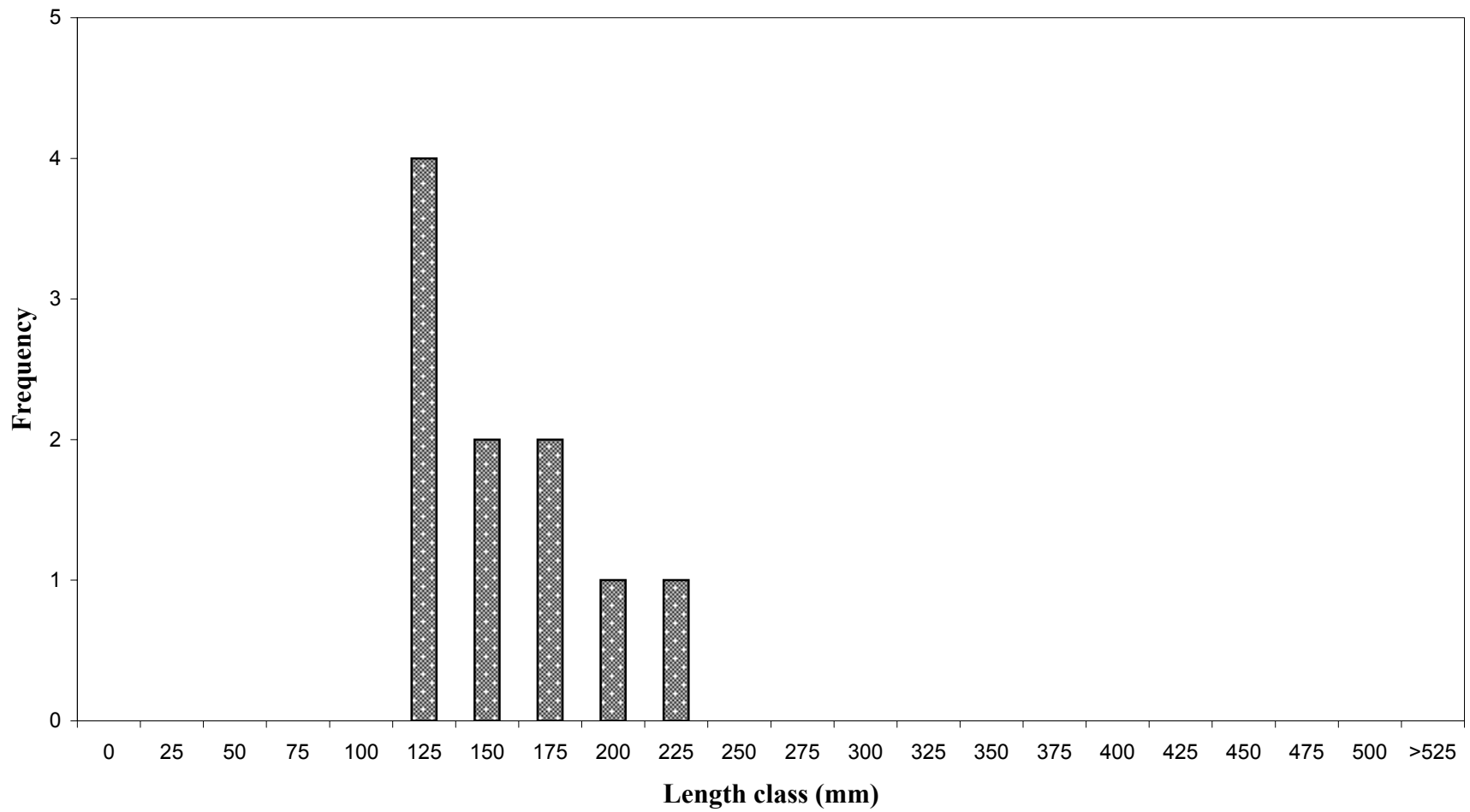


Figure E-9. Brown Bullhead Length-Frequency,
All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

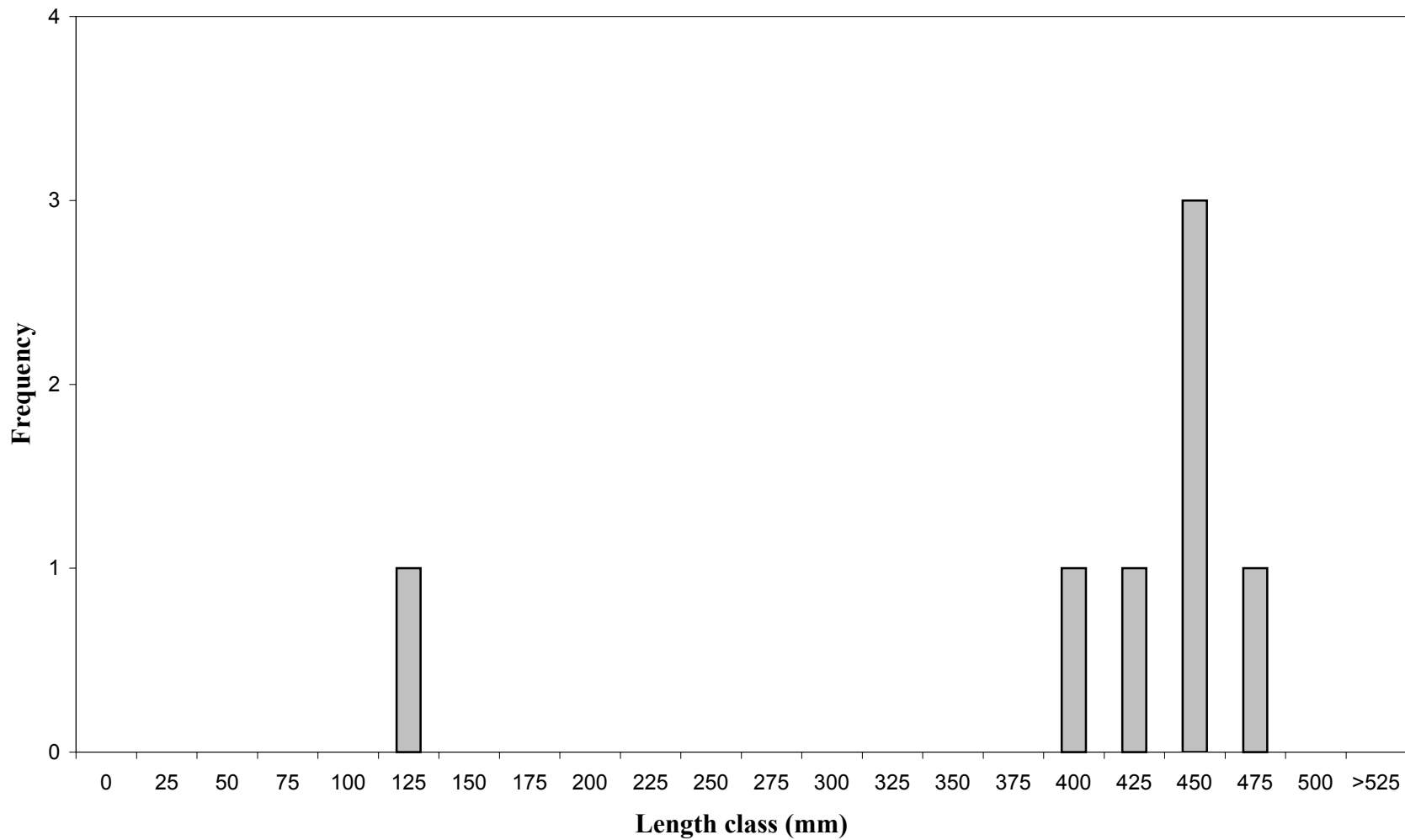


Figure E-10. Sacramento Sucker Length-Frequency,
All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

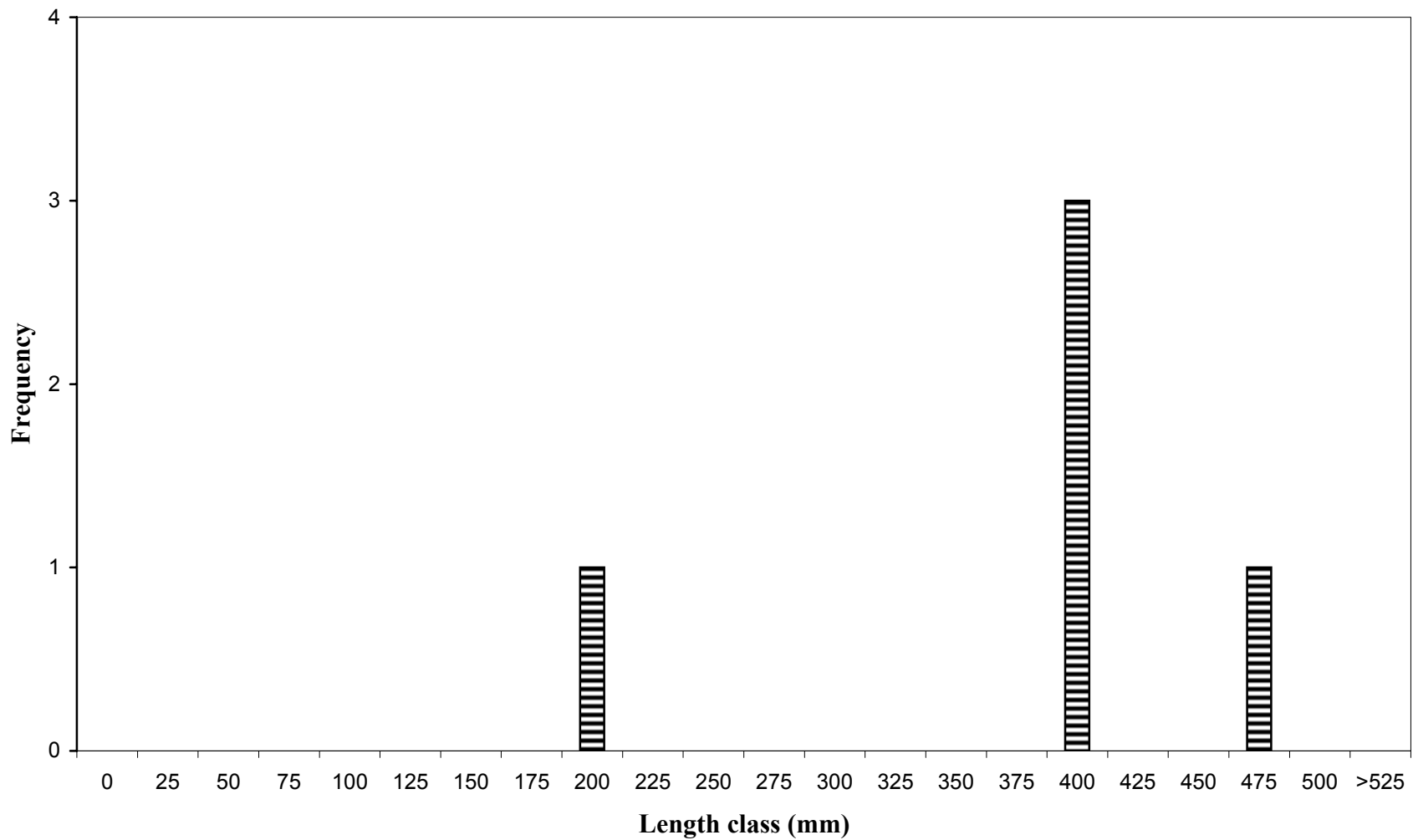


Figure E-11. Rainbow Trout Length-Frequency,
All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

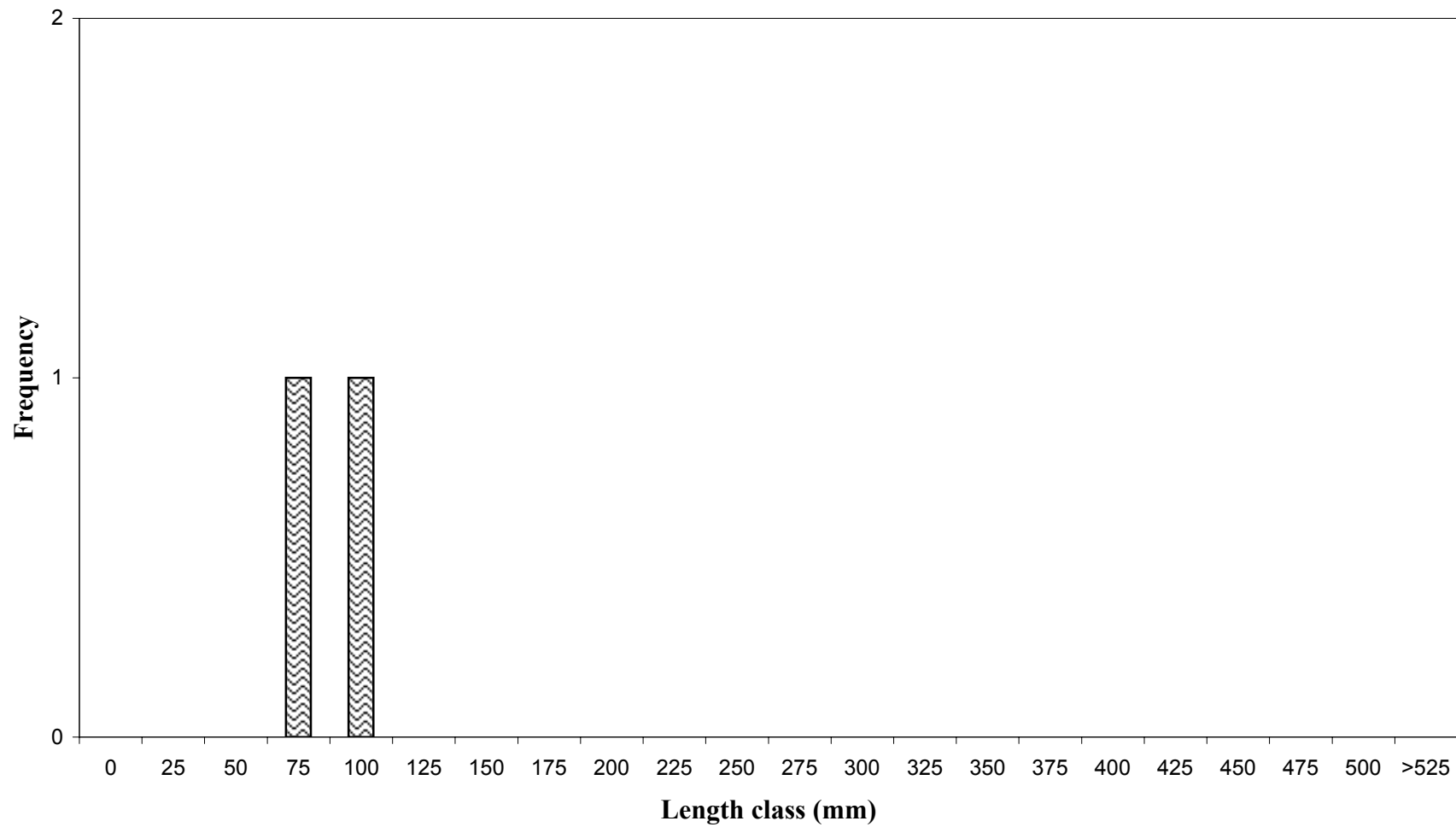


Figure E-12. Sacramento Perch Length-Frequency,
All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

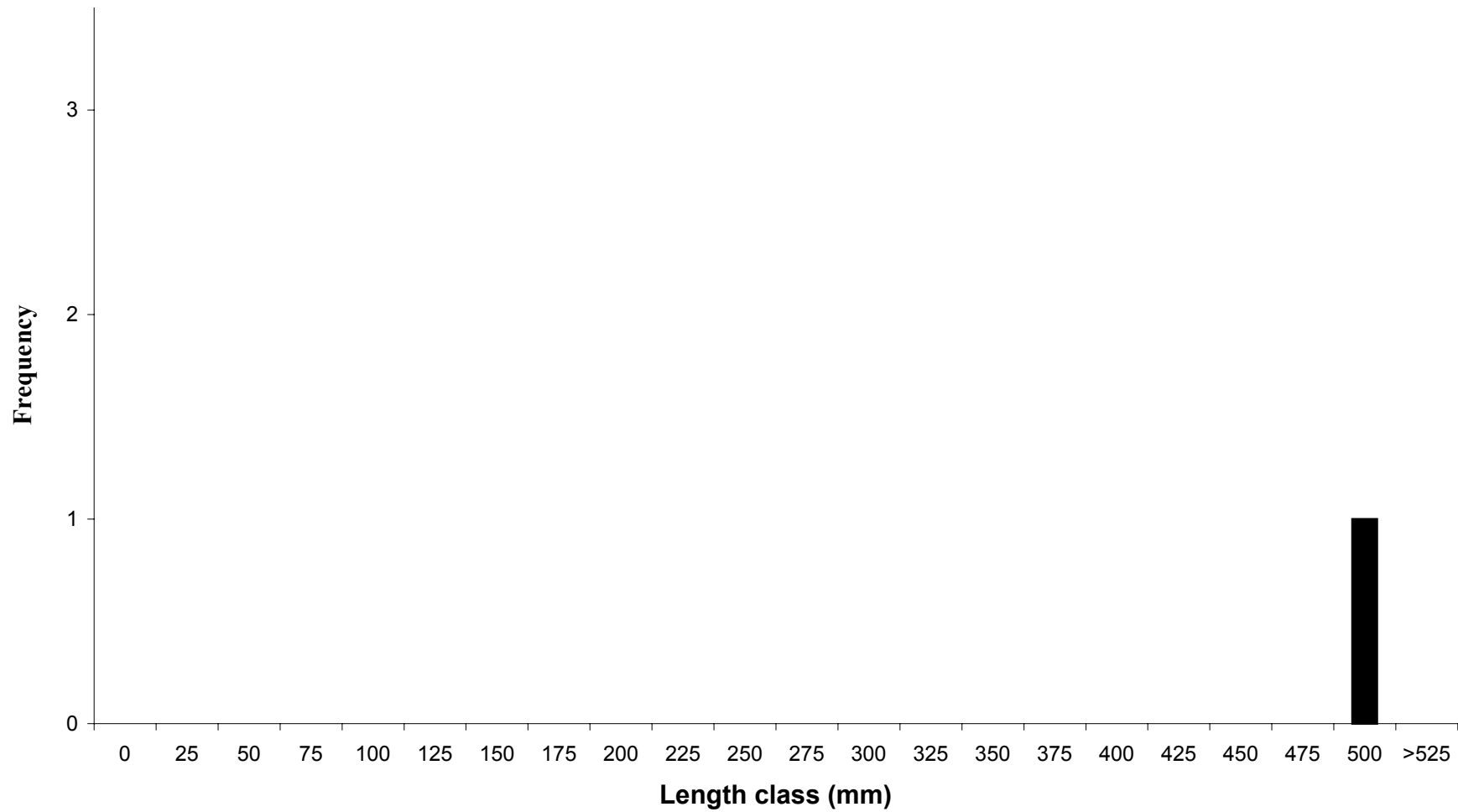


Figure E-13. Brown Trout Length-Frequency,
All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

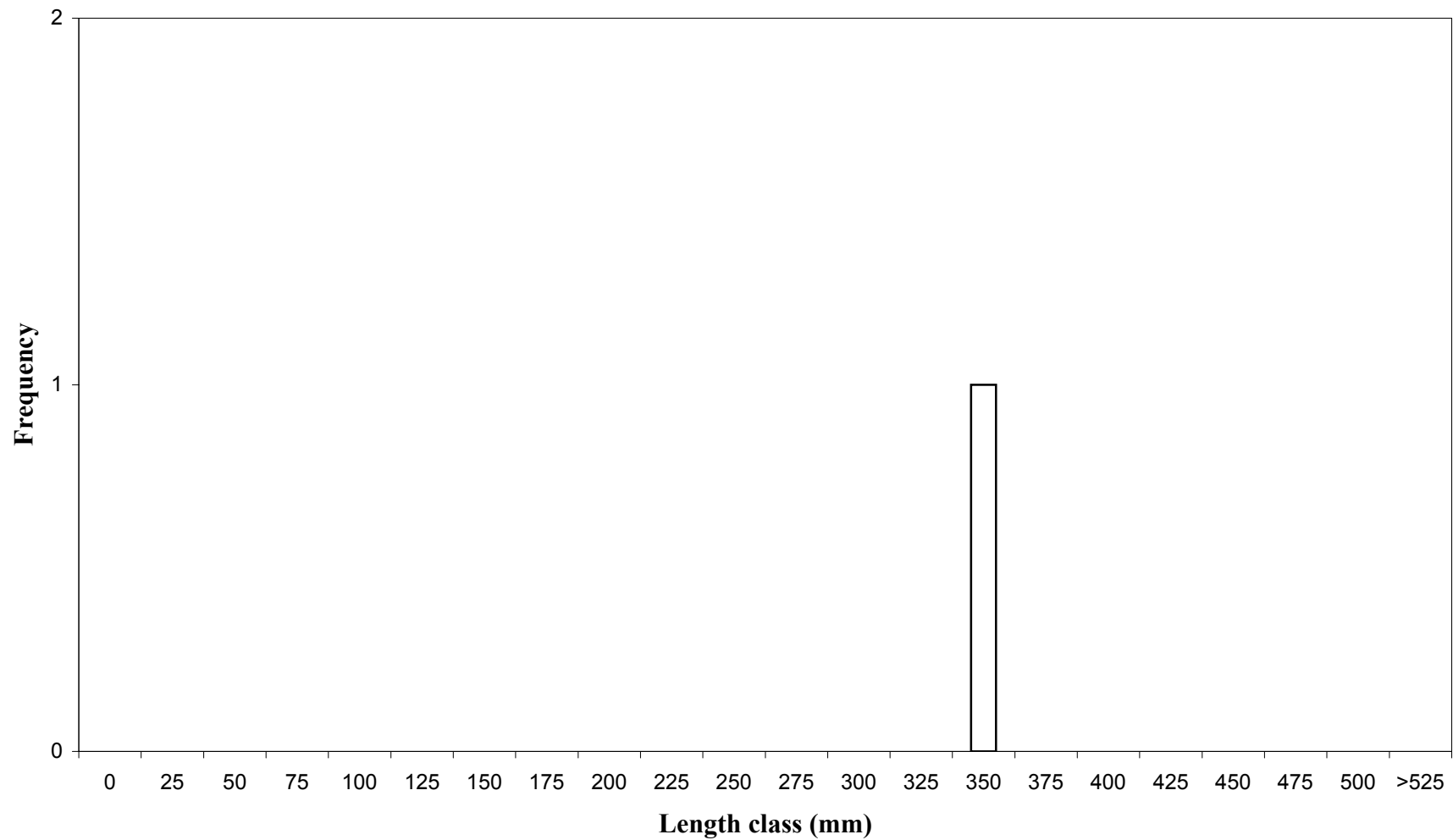


Figure E-14. Carp Length-Frequency,
All Sites Combined, Lake Almanor Gill Netting, August 8-11, 2000.

APPENDIX F – Historical Catch Data

Table F-1 – Seneca and Belden Reaches – Historical CDFG Station Locations.

Table F-2 – Seneca and Belden Reaches – Historical CDFG Fish Data.

Table F-3 – Fish Species Reported to Occur in the Upper North Fork Feather River
Project Area.

Table F-4 – Fish Species Reported to Occur in Lake Almanor.

Table F-5 – Fish Species Reported to Occur in the Butt Valley Reservoir.

Table F-1. Seneca and Belden Reaches - Historical CDFG Station Locations.

Seneca Reach	Year Sampled			
	1970	1975	1976	1980
Canyon Dam	n/a	From 200 ft below gage to dam, including pools: drift fishing with electroshocker.	n/a	n/a
Skinner Flat	475 ft section from foot of road, upstream: multiple passes with electrofisher.	Road end upstream of bridge past mine shack: drift fishing electrofisher.	n/a	From foot of road upstream 668 ft: One pass.
Salmon Falls	n/a	n/a	n/a	Above Salmon Falls: located about 400 to 1200 ft upstream of old mine, very rough; one pass.
Seneca above Old Crossing	n/a	1 1/2 miles upstream of bridge past mine shack: drift fishing with electroshofisher.	n/a	n/a
Seneca at Old Crossing	n/a	n/a	n/a	Located at Old crossing to (about 1/4 mile upstream of present bridge) upstream 678 ft.; mark and recapture.
Seneca at Gin Mill	n/a	n/a	n/a	From Gin Mill in Seneca upstream about 1215 ft (upper end below main bridge); mark and recapture.
Schoolhouse Hole/Point	550 ft section below Schoolhouse Hole; Mult. Pass with 3 electrofishers.	n/a	n/a	n/a
At Butt Creek	n/a	n/a	430 ft section below confluence with Butt Creek; incomplete.	n/a
2nd Footbridge	260 ft section above 2nd footbridge; mult. pass with 3 electrofishers.	n/a	n/a	n/a
First Footbridge	n/a	n/a	n/a	From first footbridge upstream 590 ft.; one pass
At Gage	n/a	From gage upstream 200 yards above 2nd bridge; drift fishing with electrofisher.	From gage upstream 530 ft.; block net with mult. Pass.	n/a
Belden Reach	Year Sampled			
	1970	1975	Nov-Dec, 1977	Nov. 1980*
Gage below Dam	n/a	n/a	n/a	Gage Below Dam
Queen Lily	n/a	n/a	n/a	Staircase section below campground
Addit Bridge	n/a	n/a	n/a	Station located immediately below addit bridge.
Siphon	n/a	n/a	n/a	Station located from downstream up to or slightly above Siphon.
Mainstem	n/a	n/a	One mile upstream of Belden Town; 300 ft section sampled.	n/a

* All sites were between 900 to 2000 feet in length, and were sampled by mark-recapture.
n/a - not available

Table F-2. Seneca and Belden Reaches - Historical CDFG Fish Data.

Seneca Reach	Year Sampled			
	1970	1975	1976	1980
Canyon Dam	n/a	Very few fish. Some trout to 12 inches and suckers to 19 inches. Sampled 200 ft.	n/a	n/a
Skinner Flat	Recovered 259 rainbow trout and 3 suckers per 475 ft.	Sucker/trout ratio 1:100. No trout over 10 inches.	n/a	Recovered 26 trout and 5 suckers per 668 ft. Estimate 427-711 trout per mile over 6 inches.
Salmon Falls	n/a	n/a	n/a	Recovered 10 trout and 5 suckers per 825 ft. Estimate 179-269 trout per mile over 6 inches.
Seneca above Old Crossing	n/a	Sucker/trout ratio 1:3 by number; 3:1 by weight. Not impressed with numbers of trout here.	n/a	n/a
Seneca at Old Crossing	n/a	n/a	n/a	Recovered 30 trout and 14 suckers per 678 ft. Estimate 234-312 trout per mile over 6 inches.
Seneca at Gin Mill	n/a	n/a	n/a	Recovered 43 trout, 22 suckers, and one smallmouth bass per 1215 ft. Estimate 253-337 trout per mile over 6 inches.
Schoolhouse Hole/Point	Recovered 117 trout and 105 suckers per 550 ft.	n/a	n/a	n/a
At Butt Creek	n/a	n/a	Recovered 23 trout and 78 suckers per 430 ft.	n/a
2nd Footbridge	Recovered 68 trout and 108 suckers per 260 ft.	n/a	n/a	n/a
First Footbridge	n/a	n/a	n/a	One pass. Recovered 9 trout and 33 suckers per 590 ft. Estimate 188-313 trout per mile over 6
At Gage	n/a	Sucker/trout ratio 30:1 down to 15:1 by number; 99% down to 97% by weight suckers. Estimated 1,000 lbs./acre suckers. Sampled 200 yrd stretch.	Recovered 29 rainbow trout and 211 suckers per 530 ft. Sucker/trout ratio 8:1 by number; 107:1 by weight.	n/a
Belden Reach	Year Sampled			
	1970	1975	Nov-Dec, 1977	Nov. 1980*
Gage below Dam	n/a	n/a	n/a	188 rainbow trout and 323 suckers per mile.
Queen Lily	n/a	n/a	n/a	594 rainbow trout and 1056 suckers per mile.
Addit Bridge	n/a	n/a	n/a	211 rainbow trout and 1056 suckers per mile.
Siphon	n/a	n/a	n/a	660 rainbow trout and 1584 suckers per mile.
Mainstem	n/a	n/a	n/a	n/a

*All sites were between 900 to 2000 feet in length, and were sampled by mark-recapture.

Results expressed as estimated number per mile

n/a - not available

Table F-3. Fish Species Reported to Occur in the Upper North Fork Feather River Project Area.

<u>Common Name</u>	<u>Scientific Name</u>	<u>Game/Non-Game</u>
<u>Native Species</u>		
Rainbow trout	<i>Oncorhynchus mykiss</i>	G
Sacramento Perch	<i>Archoplites interruptus</i>	G
Sacramento Sucker	<i>Catostomus occidentalis</i>	N-G
Tahoe sucker	<i>C. tahoeensis</i>	N-G
Sacramento pikeminnow ¹	<i>Ptychocheilus grandis</i>	N-G
Tui chub	<i>Gila bicolor</i>	N-G
Baird sculpin ²	<i>Cottus bairdii</i>	N-G
Riffle sculpin	<i>C. gulosus</i>	N-G
Hardhead	<i>Mylopharodon conocephalus</i>	N-G
Hitch	<i>Lavinia exilicauda</i>	N-G
<u>Introduced species</u>		
Brown trout	<i>Salmo trutta</i>	G
Brook trout ³	<i>Salvelinus fontinalis</i>	G
Chinook salmon	<i>O. tshawytscha</i>	G
Kokanee salmon	<i>O. nerka</i>	G
Silver salmon ³	<i>O. kisutch</i>	G
Chum salmon ³	<i>O. keta</i>	G
Smallmouth bass	<i>Micropterus dolomieu</i>	G
Largemouth bass	<i>M. salmoides</i>	G
Bluegill ²	<i>Lepomis macrochirus</i>	G
Green sunfish	<i>L. cyanellus</i>	G
Redear sunfish	<i>L. microlophus</i>	G
Brown bullhead	<i>Amerius nebulosus</i>	G
Channel catfish	<i>A. punctatus</i>	G
Wakasagi ⁴	<i>Hypomesus nipponensis</i>	N-G
Carp	<i>Cyprinus carpio</i>	N-G
Lahontan red-side ³	<i>Richardsonius egregius</i>	N-G

¹ Formerly referred to as Sacramento squawfish.

² Reported by CDFG (1962) to occur in Lake Almanor, but not actually collected by them.

³ Reported by CDFG (1962) to have been present in Lake Almanor, but probably no longer present.

⁴ Also referred to as Japanese pond smelt.

Table F-4. Fish Species Reported to Occur in Lake Almanor.

<u>Common Name</u>	<u>Scientific Name</u>	<u>Game/Non-Game</u>
<u>Native Species</u>		
Rainbow trout	<i>Oncorhynchus mykiss</i>	G
Sacramento Perch	<i>Archoplites interruptus</i>	G
Sacramento Sucker	<i>Catostomus occidentalis</i>	N-G
Tahoe sucker	<i>C. tahoeensis</i>	N-G
Sacramento pikeminnow ¹	<i>Ptychocheilus grandis</i>	N-G
Tui chub	<i>Gila bicolor</i>	N-G
Baird sculpin ²	<i>Cottus bairdii</i>	N-G
Riffle sculpin ³	<i>C. gulosus</i>	N-G
Hitch	<i>Lavinia exilicauda</i>	N-G
<u>Introduced Species</u>		
Brown trout	<i>Salmo trutta</i>	G
Brook trout ⁴	<i>Salvelinus fontinalis</i>	G
Chinook salmon	<i>O. tshawytscha</i>	G
Kokanee salmon ³	<i>O. nerka</i>	G
Silver salmon ³	<i>O. kisutch</i>	G
Chum salmon ³	<i>O. keta</i>	G
Smallmouth bass	<i>Micropterus dolomieu</i>	G
Largemouth bass	<i>M. salmoides</i>	G
Bluegill ³	<i>Lepomis macrochirus</i>	G
Green sunfish ⁴	<i>L. cyanellus</i>	G
Brown bullhead	<i>Amerius nebulosus</i>	G
Channel catfish ⁴	<i>A. punctatus</i>	G
Wakasagi ⁵	<i>Hypomesus nipponensis</i>	N-G
Carp	<i>Cyprinus carpio</i>	N-G
Lahontan redbside ³	<i>Richardsonius egregius</i>	N-G

¹ Formerly referred to as Sacramento squawfish.

² Reported by CDFG (1962) to occur in Lake Almanor, but not actually collected by them. This species is endemic to the Bonneville Basin, and was probably misidentified.

³ Reported by CDFG (1962) to have been present in Lake Almanor, but is no longer present (personal communication R. Decoto, CDFG).

⁴ Very rare (personal communication R. Decoto, CDFG)

⁵ Also referred to as Japanese pond smelt.

Table F-5. Fish Species Reported to Occur in the Butt Valley Reservoir.¹

<u>Common Name</u>	<u>Scientific Name</u>	<u>Game/Non-Game</u>
<u>Native Species</u>		
Rainbow trout	<i>Oncorhynchus mykiss</i>	G
Sacramento Perch	<i>Archoplites interruptus</i>	G
Sacramento Sucker	<i>Catostomus occidentalis</i>	N-G
Sacramento pikeminnow ²	<i>Ptychocheilus grandis</i>	N-G
Tui chub	<i>Gila bicolor</i>	N-G
Sculpin (?)	<i>Cottus sp.</i>	N-G
Hitch	<i>Lavinia exilicauda</i>	N-G
<u>Introduced Species</u>		
Brown trout	<i>Salmo trutta</i>	G
Chinook salmon	<i>O. tshawytscha</i>	G
Smallmouth bass	<i>Micropterus dolomieu</i>	G
Largemouth bass	<i>M. salmoides</i>	G
Green sunfish ³	<i>Lepomis Cyanellus</i>	G
Redear sunfish ³	<i>L. microlophus</i>	G
Brown bullhead	<i>Amerius nebulosus</i>	G
Wakasagi ⁴	<i>Hypomesus nipponensis</i>	N-G
Carp	<i>Cyprinus carpio</i>	N-G

¹ Species list is based on CDFG (1961) and studies conducted by Licensee between 1996-1998.

² Formerly referred to as squawfish.

³ Reported by CDFG (1961), but are probably either no longer present or only in small numbers (personal communication R. Decoto, CDFG).

⁴ Also referred to as Japanese pond smelt.