

NOTE

Only the cover page of this document is being provided/posted on the EPA Region 1's Merrimack Station NPDES Draft Permit Web page.

For further viewing, the full document is available at EPA Region 1.

The full document may contain a Table of Contents, Executive Summary, List of Figures, List of Tables, etc.



Admin #
180

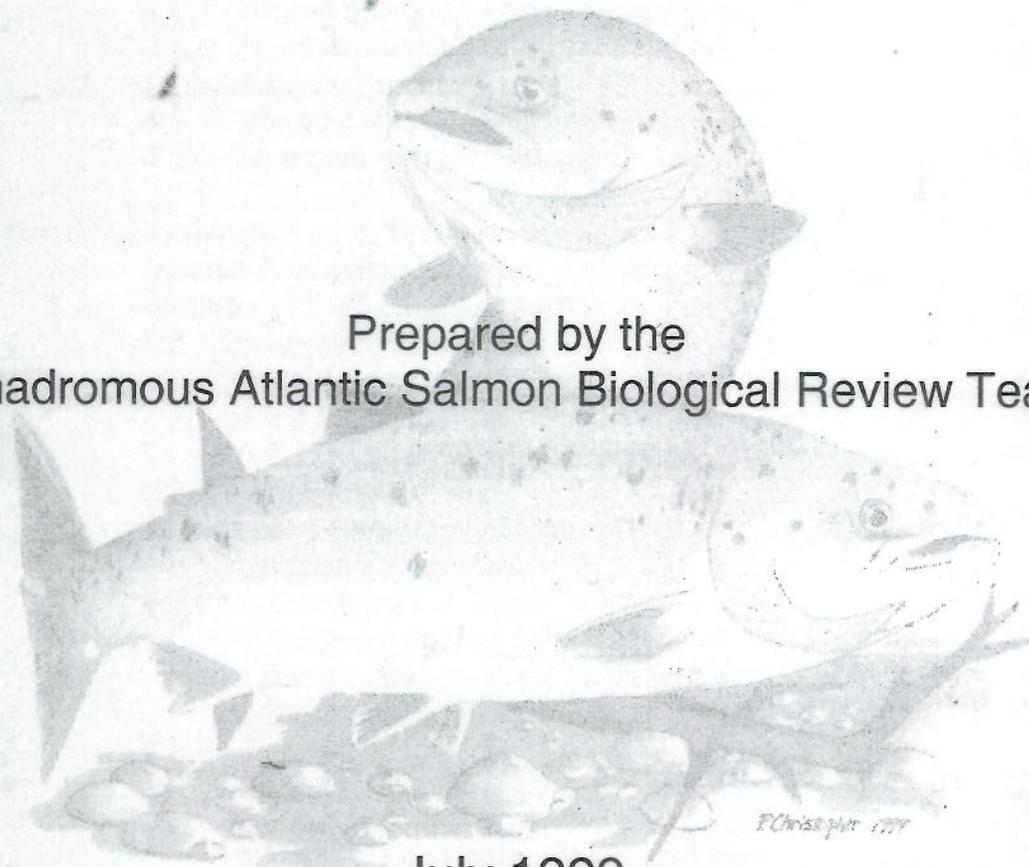
59

EVU NELSON



Review of the Status of Anadromous Atlantic Salmon (*Salmo salar*) under the U.S. Endangered Species Act

Prepared by the
Anadromous Atlantic Salmon Biological Review Team



July 1999



Table of Contents

Section 1: Executive Summary	1
Section 2: Introduction and Background	5
Section 3: Biological Information	
3.1 Life history	10
3.1.1 Riverine Habitat	10
3.1.2 Marine Habitat	15
Section 4: Historic Distribution, Abundance and Artificial Propagation	
4.1 Historic Distribution and Abundance	
4.1.1 Distribution	19
4.1.2 Abundance	22
4.2 Historic Artificial Stocking (1866-1970)	
4.2.1 Stocks Used for Artificial Propagation	23
4.2.2 Numbers and Life Stages Stocked	24
4.3 Contemporary Stocking (1970-1992)	
4.3.1 Stocks Used for Artificial Propagation	30
4.3.2 Numbers and Life Stages Stocked	30
Section 5: Consideration as a "Species" under the ESA	
5.1 Distinct Population Segment Analysis	34
5.2 Analysis of DPS Structure within the U.S.	36
5.2.1 Extirpated Populations	37
5.2.1.1 Long Island Sound	38
5.2.1.2 Central New England	39
5.2.1.3 Other Historic DPS Units	40
5.2.2 Extant Populations – Gulf of Maine DPS	42
5.3 Assessment of the Gulf of Maine DPS	
5.3.1 Species Status Elements of DPS Policy	46
5.3.2 Discreteness	46
5.3.2.1 Separateness from Other Populations	46
5.3.2.2 International Boundaries	52
5.3.2.3 Evaluation of Discreteness	52
5.3.3 Evolutionary and Ecological Significance	
5.3.3.1 Persistence and Habitat Characteristics	53
5.3.3.2 Phenotypic Traits	55
5.3.3.3 Life History Characteristics	56
5.3.3.4 Consideration of Hatchery Practices	57

Section 6: Distribution and Abundance – Status of Atlantic Salmon in the Gulf of
Maine DPS

6.1	Description of the Habitat	59
6.2	Surveys of Available Freshwater Production Habitat	62
6.3	Description of Population Abundance	71
	6.3.1 Adult Abundance	71
	6.3.2 Juvenile Abundance	80
	6.3.3 Smolt Production and Outmigration	82
6.4	Conservation Hatchery Program	84
6.5	Determination of Population Status	88

Section 7: Analysis of Listing Factors 90

7.1:	Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range	
	7.1.1 Water Quality	91
	7.1.2 Dams and obstructions to migration	94
	7.1.3 Agricultural practices	100
	7.1.4 Forestry	107
	7.1.5 Peat mining	111
	7.1.6 Habitat Protection within the DPS	112
	7.1.7 Other Habitat Issues	116
	7.1.8 Summary of Habitat Issues	117
7.2:	Overutilization for Commercial, Recreational, Scientific or Educational Purposes	
	7.2.1 Foreign Interceptory Fisheries	121
	7.2.1.1 The West Greenland Fishery	122
	7.2.1.2 The Canadian Fisheries	124
	7.2.1.3 Combined Harvest of U.S. Salmon	126
	7.2.1.4 Regulation of Commercial Fisheries	130
	7.2.2 Domestic Commercial and Recreational Fishery	
	7.2.2.1 Commercial Fishery	132
	7.2.2.2 Recreational Harvest	133
	7.2.2.2.1 Directed Catch and Release	136
	7.2.2.2.2 Illegal In-River Harvest	139
	7.2.2.2.3 Potential By-Catch	140
	7.2.3 Summary of Overutilization	142
7.3	Predation, Disease and Competition	
	7.3.1 Predation	143
	7.3.2 Disease	146
	7.3.3 Competition	152
	7.3.4 Summary	154

7.4	Inadequacy of Existing Regulatory Mechanisms	
7.4.1	International, National, and State Laws, Treaties and Agreements	157
7.4.2	Regulations and Permitting for Aquaculture	167
7.4.3	Summary	172
7.5	Other Natural or Manmade Factors Affecting Its Continued Existence	
7.5.1:	Aquaculture: Atlantic Salmon Farming	
7.5.1.1	Production and Location of Sites	174
7.5.1.2	Threats to Wild Salmon	176
7.5.2:	Natural Mortality in the Marine Environment	184
7.5.3	Artificial Propagation and Atlantic Salmon	188
7.5.4	Other	191
7.5.5	Summary	191
	Section 8: Conclusion	194
	References	199
	Appendix 1: Table of Salmon Collections, Stocking and Sampling Activities since 1990	231