

**TABLE OF CONTENTS**

<b>1.0</b>	<b>OBJECTIVES</b>	<b>1-1</b>
1.1	Relation to Other Biological Opinions	1-5
1.2	Section 10 Permits for the Juvenile Transportation Program	1-5
1.3	Application of ESA Section 7(a)(2) Standards—Jeopardy Analysis Framework	1-6
1.3.1	Section 7(a)(2) Jeopardy Analysis Framework Applied to FCRPS	1-10
1.3.1.1	Jeopardy Standard	1-10
1.3.1.2	Metrics Useful for Assessing Jeopardy Standards from the FCRPS	1-10
1.3.1.2.1	Metrics Indicative of Survival	1-11
1.3.1.2.2	Metrics Indicative of Recovery	1-11
1.3.1.2.3	Metric Indicative of Full Mitigation	1-12
<b>2.0</b>	<b>BACKGROUND</b>	<b>2-1</b>
2.1	Introduction	2-1
2.2	Previous Biological Opinions	2-1
2.3	Draft Environmental Impact Statement	2-3
2.4	Current Consultation	2-3
2.5	Federal Review Teams	2-3
2.5.1	The Biological Effects Team	2-3
2.5.2	Hydroregulation (Modeling) Team	2-4
2.5.3	Performance Standards Team	2-5
2.5.4	Water Quality Team	2-5
2.6	Meetings with State and Tribal Representatives	2-6
2.7	Related Regional Forums	2-7
2.7.1	Federal Caucus/All-H Paper	2-7
2.7.2	Plan for Analyzing and Testing Hypotheses (PATH)	2-9
2.7.3	Cumulative Risk Initiative (CRI)	2-9
2.7.4	NMFS White Papers	2-10
2.7.5	Quantitative Analysis (QAR)	2-10
2.7.6	Northwest Power Planning Council’s Multispecies Framework Project/Ecosystem Diagnosis and Treatment (EDT) Analysis	2-11
<b>3.0</b>	<b>PROPOSED ACTION</b>	<b>3-1</b>
3.1	Operation and Configuration of the FCRPS	3-1
3.2	Objectives for Salmon and Steelhead	3-1
3.2.1	Water Quality	3-2
3.2.2	Specific Project Operations	3-2
3.2.2.1	Libby	3-2
3.2.2.2	Hungry Horse	3-3

3.2.2.3 Grand Coulee . . . . .	3-3
3.2.2.4 Albeni Falls . . . . .	3-3
3.2.2.5 Dworshak . . . . .	3-4
3.2.2.6 Upper Snake/Brownlee . . . . .	3-4
3.2.2.7 Columbia River Treaty and Non-Treaty Storage . . . . .	3-5
3.2.3 Spill for Fish Passage . . . . .	3-6
3.2.4 Juvenile Fish Transportation . . . . .	3-6
3.2.5 Minimum Operating Pool (MOP) . . . . .	3-6
3.2.6 Peak Turbine Efficiency Operation . . . . .	3-7
3.2.7 Fish Passage Facilities . . . . .	3-7
3.2.7.1 Juvenile Fish Bypass . . . . .	3-7
3.2.7.2 Adult Fish Passage . . . . .	3-7
3.2.8 Other Activities . . . . .	3-7
3.2.9 Predator Control Program . . . . .	3-8
3.2.10 Adaptive Management Framework Through Adoption of Performance Measures . . . . .	3-9
3.3 Issuance of Section 10 Permit for Juvenile Fish Transportation Program by NMFS . . . . .	3-9
<b>4.0 BIOLOGICAL INFORMATION . . . . .</b>	<b>4-1</b>
4.1 Life Histories, Factors for Decline, and Current Range-Wide Status . . . . .	4-1
4.1.1 Snake River Spring/Summer Chinook Salmon . . . . .	4-1
4.1.1.1 Geographic Boundaries and Spatial Distribution . . . . .	4-1
4.1.1.2 Historical Information . . . . .	4-1
4.1.1.3 Life History . . . . .	4-2
4.1.1.4 Habitat and Hydrology . . . . .	4-2
4.1.1.5 Hatchery Influence . . . . .	4-2
4.1.1.6 Population Trends and Risks . . . . .	4-2
4.1.2 Snake River Fall Chinook Salmon . . . . .	4-3
4.1.2.1 Geographic Boundaries and Spatial Distribution . . . . .	4-3
4.1.2.2 Historical Information . . . . .	4-4
4.1.2.3 Life History . . . . .	4-4
4.1.2.4 Habitat and Hydrology . . . . .	4-4
4.1.2.5 Hatchery Influence . . . . .	4-4
4.1.2.6 Other . . . . .	4-5
4.1.2.7 Population Trends and Risks . . . . .	4-5
4.1.3 Upper Columbia River Spring-run Chinook Salmon . . . . .	4-5
4.1.3.1 Geographic Boundaries and Spatial Distribution . . . . .	4-5
4.1.3.2 Historical Information . . . . .	4-6
4.1.3.3 Life History (Including Ocean) . . . . .	4-6
4.1.3.4 Habitat and Hydrology . . . . .	4-6
4.1.3.5 Hatchery Influence . . . . .	4-6
4.1.3.6 Population Trends and Risks . . . . .	4-7

4.1.4	Upper Willamette River Chinook Salmon .....	4-8
4.1.4.1	Geographic Boundaries and Spatial Distribution .....	4-8
4.1.4.2	Historical Information .....	4-8
4.1.4.3	Life History .....	4-8
4.1.4.4	Habitat and Hydrology .....	4-9
4.1.4.5	Hatchery Influence .....	4-9
4.1.4.6	Other .....	4-9
4.1.4.7	Population Trends and Risks .....	4-9
4.1.5	Lower Columbia River Chinook Salmon .....	4-10
4.1.5.1	Geographic Boundaries and Spatial Distribution .....	4-10
4.1.5.2	Historical Information .....	4-10
4.1.5.3	Life History .....	4-10
4.1.5.4	Habitat and Hydrology .....	4-11
4.1.5.5	Hatchery Influence .....	4-11
4.1.5.6	Population Trends and Risks .....	4-11
4.1.6	Snake River Steelhead .....	4-12
4.1.6.1	Geographic Boundaries and Spatial Distribution .....	4-12
4.1.6.2	Historical Information .....	4-12
4.1.6.3	Life History (Including Ocean) .....	4-12
4.1.6.4	Habitat and Hydrology .....	4-12
4.1.6.5	Hatchery Influence .....	4-12
4.1.6.6	Population Trends and Risks .....	4-12
4.1.7	Upper Columbia River Steelhead .....	4-13
4.1.7.1	Geographic Boundaries and Spatial Distribution .....	4-13
4.1.7.2	Historical Information .....	4-13
4.1.7.3	Life History .....	4-13
4.1.7.4	Habitat and Hydrology .....	4-14
4.1.7.5	Hatchery Influence .....	4-14
4.1.7.6	Population Trends and Risks .....	4-14
4.1.8	Middle Columbia River Steelhead .....	4-15
4.1.8.1	Geographic Boundaries and Spatial Distribution .....	4-15
4.1.8.2	Historical Information .....	4-15
4.1.8.3	Life History .....	4-15
4.1.8.4	Habitat and Hydrology .....	4-16
4.1.8.5	Hatchery Influence .....	4-16
4.1.8.6	Population Trends and Risks .....	4-16
4.1.9	Upper Willamette River Steelhead .....	4-17
4.1.9.1	Geographic Boundaries and Spatial Distribution .....	4-17
4.1.9.2	Historical Information .....	4-17
4.1.9.3	Life History .....	4-17
4.1.9.4	Habitat and Hydrology .....	4-18
4.1.9.5	Hatchery Influence .....	4-18
4.1.9.6	Population Trends and Risks .....	4-18

4.1.10	Lower Columbia River Steelhead . . . . .	4-19
4.1.10.1	Geographic Boundaries and Spatial Distribution . . . . .	4-19
4.1.10.2	Historical Information . . . . .	4-19
4.1.10.3	Habitat and Hydrology . . . . .	4-19
4.1.10.4	Hatchery Influence . . . . .	4-20
4.1.10.5	Other . . . . .	4-20
4.1.10.6	Population Trends and Risks . . . . .	4-20
4.1.11	Columbia River Chum Salmon . . . . .	4-21
4.1.11.1	Geographic Boundaries and Spatial Distribution . . . . .	4-21
4.1.11.2	Historical Information . . . . .	4-21
4.1.11.3	Life History . . . . .	4-21
4.1.11.4	Other . . . . .	4-21
4.1.11.5	Population Trends and Risks . . . . .	4-21
4.1.12	Snake River Sockeye Salmon . . . . .	4-22
4.1.12.1	Geographic Boundaries and Spatial Distribution . . . . .	4-22
4.1.12.2	Historical Information . . . . .	4-22
4.1.12.3	Life History . . . . .	4-22
4.1.12.4	Habitat and Hydrology . . . . .	4-22
4.1.12.5	Population Trends and Risks . . . . .	4-22
4.2	Species-Level Biological Requirements . . . . .	4-22
4.3	Species Status With Respect to Species-Level Biological Requirements . . . . .	4-23
<b>5.0</b>	<b>ENVIRONMENTAL BASELINE . . . . .</b>	<b>5-1</b>
5.1	Description of the Action Area . . . . .	5-1
5.2	Biological Requirements Within the Action Area . . . . .	5-1
5.2.1	Essential Features of Critical Habitat Within the Action Area . . . . .	5-1
5.2.1.1	Juvenile Rearing Areas . . . . .	5-2
5.2.1.2	Juvenile Migration Corridor . . . . .	5-2
5.2.1.3	Areas for Growth and Development to Adulthood . . . . .	5-2
5.2.1.4	Adult Migration Corridors . . . . .	5-2
5.2.1.5	Spawning Areas . . . . .	5-2
5.2.2	Adequacy of Habitat Conditions in Critical Habitat . . . . .	5-2
5.3	Factors Affecting the Species' Environment Within the Action Area . . . . .	5-3
5.3.1	Hydrosystem Effects . . . . .	5-3
5.3.2	Habitat Effects . . . . .	5-4
5.3.3	Hatchery Effects . . . . .	5-7
5.3.4	Harvest Effects . . . . .	5-8
5.3.5	Natural Conditions . . . . .	5-10
<b>6.0</b>	<b>EFFECTS OF PROPOSED ACTION . . . . .</b>	<b>6-1</b>
6.1	Analytical Methods . . . . .	6-1
6.1.1	Methods for Evaluating Effects on Action-Area Biological Requirements . . . . .	6-1

6.1.1.1 Methods for Up-River ESUs .....	6-1
6.1.1.1.1 Adult Fish Survival .....	6-1
6.1.1.1.2 Juvenile Fish Survival .....	6-1
6.1.1.2 Application to All 12 ESUs .....	6-3
6.1.2 Methods for Evaluating Effects of Hydrosystem Actions on Species-Level Biological Requirements .....	6-3
6.1.2.1 General Method For Up-River ESUs .....	6-3
6.1.2.2 Detailed Methods and Assumptions .....	6-7
6.1.2.3 Application to All 12 ESUs .....	6-7
6.2 Effects of FCRPS Operations – Action Area Biological Requirements .....	6-8
6.2.1 Effects on Habitat in the Columbia River Mainstem, Estuary and Plume .....	6-9
6.2.2 Effects of Project Operations on Juvenile Salmonid Passage - General Considerations .....	6-11
6.2.2.1 Juvenile Salmonid Passage Through Turbines - General Considerations .....	6-11
6.2.2.2 Juvenile Salmonid Passage Through Bypass Systems - General Considerations .....	6-12
6.2.2.3 Juvenile Salmonid Passage Through Spill - General Considerations .....	6-12
6.2.2.4 Juvenile Inriver Reach Survival - General Considerations .....	6-12
6.2.3 Specific Effects of FCRPS Operations on Juvenile Salmonid Passage and Survival .....	6-13
6.2.3.1 Juvenile Salmonid Passage Through the Turbine Units at FCRPS Projects .....	6-13
6.2.3.2 Juvenile Salmonid Passage Through the Bypass Systems at FCRPS Projects .....	6-14
6.2.3.2.1 Juvenile Salmonid Passage Through the Spillways and Sluiceways at FCRPS Projects .....	6-15
6.2.3.3 Estimates of Post-Bonneville Juvenile Mortality Related to Passage Through the FCRPS Under the Proposed Action .....	6-17
6.2.3.3.1 Delayed Mortality of Transported Smolts .....	6-17
6.2.3.3.2 Delayed Mortality of Non-transported Smolts .....	6-18
6.2.4 Effects of Project Operation on Adult Salmonid Passage - General Considerations .....	6-20
6.2.4.1 Effect of FCRPS Project Operation on Adult Salmonid Passage .....	6-22
6.2.4.1.1 Downstream Migrating Adults (Kelts) .....	6-23
6.2.5 Effects of Water Regulation and Impoundments on Salmonid Migration and Survival - General Considerations .....	6-23
6.2.5.1 General Effects of FCRPS Hydrosystem Operations on Salmon and Steelhead .....	6-24
6.2.5.2 Streamflow Effects of FCRPS and Other BOR Project .....	

Operations .....	6-25
6.2.5.2.1 Electrical Generation .....	6-25
6.2.5.2.2 Flood Control .....	6-26
6.2.5.2.3 Flow Depletion Effects of BOR-Based Irrigation ..	6-27
6.2.5.2.4 Cumulative Hydrologic Effects. ....	6-31
6.2.5.2.5 Additional Effects of the Columbia Basin Irrigation Project .....	6-31
6.2.5.3 Effects of Water Regulation and Impoundments on Salmonid Migration and Survival .....	6-34
6.2.5.3.1 Water Regulation Affects Spawning and Rearing Areas .....	6-37
6.2.5.3.2 Food Resources and Physiological Status .....	6-40
6.2.6 Effects of Project Operations on Water Quality .....	6-41
6.2.6.1 Total Dissolved Gas Supersaturation .....	6-41
6.2.6.1.1 Risk Assessment of Allowing TDGS to 120% of Saturation .....	6-42
6.2.6.2 Water Temperature .....	6-44
6.2.6.2.1 Operation of Dworshak Reservoir to Control Snake River Water Temperatures .....	6-45
6.2.7 Effects of Predator Control Programs on Salmonid Migration and Survival - General Considerations .....	6-47
6.2.7.1 Effects of FCRPS Predator Control Measures on Salmonid Migration and Survival .....	6-47
6.2.8 Effects of the FCRPS Juvenile Fish Transportation Program on Salmonid Migration and Survival .....	6-48
6.2.9 Summary of the Effects of the Proposed Action in the Action Area ..	6-50
6.2.9.1 Snake River Spring/Summer Chinook Salmon .....	6-50
6.2.9.1.1 Juvenile Rearing Areas .....	6-50
6.2.9.1.2 Juvenile Migration Corridors .....	6-51
6.2.9.1.3 Areas for Growth and Development to Adulthood ..	6-52
6.2.9.1.4 Adult Migration Corridors .....	6-52
6.2.9.1.5 Spawning Habitat .....	6-55
6.2.9.2 Snake River Fall Chinook Salmon .....	6-55
6.2.9.2.1 Juvenile Rearing Areas and Migration Corridors ..	6-55
6.2.9.2.2 Areas for Growth and Development to Adulthood ..	6-56
6.2.9.2.3 Adult Migration Corridors .....	6-56
6.2.9.2.4 Spawning Habitat .....	6-56
6.2.9.3 Upper Columbia River Spring Chinook Salmon .....	6-57
6.2.9.3.1 Juvenile Rearing Areas .....	6-57
6.2.9.3.2 Juvenile Migration Corridors .....	6-57
6.2.9.3.3 Areas for Growth and Development to Adulthood ..	6-57
6.2.9.3.4 Adult Migration Corridors .....	6-58
6.2.9.3.5 Spawning Habitat .....	6-58

6.2.9.4 Upper Willamette River Chinook Salmon .....	6-58
6.2.9.4.1 Juvenile Rearing Areas .....	6-58
6.2.9.4.2 Juvenile Migration Corridors .....	6-58
6.2.9.4.3 Areas for Growth and Development to Adulthood ..	6-59
6.2.9.4.4 Adult Migration Corridors .....	6-59
6.2.9.4.5 Spawning Habitat .....	6-59
6.2.9.5 Lower Columbia River Chinook Salmon .....	6-60
6.2.9.5.1 Juvenile Rearing Areas .....	6-60
6.2.9.5.2 Juvenile Migration Corridors .....	6-60
6.2.9.5.3 Areas for Growth and Development to Adulthood ..	6-61
6.2.9.5.4 Adult Migration Corridors .....	6-61
6.2.9.5.5 Spawning Habitat .....	6-62
6.2.9.6 Snake River Steelhead .....	6-62
6.2.9.6.1 Juvenile Rearing Areas .....	6-62
6.2.9.6.3 Areas for Growth and Development to Adulthood ..	6-63
6.2.9.6.4 Adult Migration Corridors .....	6-63
6.2.9.6.5 Spawning Habitat .....	6-63
6.2.9.7 Upper Columbia River Steelhead .....	6-63
6.2.9.7.1 Juvenile Rearing Areas .....	6-63
6.2.9.7.2 Juvenile Migration Corridors .....	6-63
6.2.9.7.3 Areas for Growth and Development to Adulthood ..	6-64
6.2.9.7.4 Adult Migration Corridors .....	6-64
6.2.9.7.5 Spawning Habitat .....	6-65
6.2.9.8 Middle Columbia River Steelhead .....	6-65
6.2.9.8.1 Juvenile Rearing Areas .....	6-65
6.2.9.8.2 Juvenile Migration Corridors .....	6-65
6.2.9.8.3 Areas for Growth and Development to Adulthood ..	6-66
6.2.9.8.4 Adult Migration Corridors .....	6-66
6.2.9.8.5 Spawning Habitat .....	6-66
6.2.9.9 Upper Willamette Steelhead .....	6-66
6.2.9.9.1 Juvenile Rearing Areas .....	6-66
6.2.9.9.2 Juvenile Migration Corridors .....	6-67
6.2.9.9.3 Areas for Growth and Development to Adulthood ..	6-67
6.2.9.9.4 Adult Migration Corridors .....	6-67
6.2.9.9.5 Spawning Habitat .....	6-68
6.2.9.10 Lower Columbia River Steelhead .....	6-68
6.2.9.10.1 Juvenile Rearing Areas .....	6-68
6.2.9.10.2 Juvenile Migration Corridors .....	6-68
6.2.9.10.3 Areas for Growth and Development to Adulthood ..	6-68
6.2.9.10.4 Adult Migration Corridors .....	6-69
6.2.9.10.5 Spawning Habitat .....	6-69
6.2.9.11 Columbia River Chum Salmon .....	6-69
6.2.9.11.1 Juvenile Rearing Areas .....	6-69

6.2.9.11.2 Juvenile Migration Corridors . . . . .	6-69
6.2.9.11.3 Areas for Growth and Development to Adulthood . . . . .	6-70
6.2.9.11.4 Adult Migration Corridors . . . . .	6-70
6.2.9.11.5 Spawning Habitat . . . . .	6-71
6.1.9.12 Snake River Sockeye Salmon . . . . .	6-71
6.2.9.12.1 Juvenile Rearing Areas . . . . .	6-71
6.2.9.12.2 Juvenile Migration Corridors . . . . .	6-71
6.2.9.12.3 Areas for Growth and Development to Adulthood . . . . .	6-72
6.2.9.12.4 Adult Migration Corridors . . . . .	6-72
6.2.9.12.5 Spawning Habitat . . . . .	6-72
6.3 Analysis of the Effects of Proposed Action on Biological Requirements Over the Full Life Cycle . . . . .	6-73
6.3.1 Snake River Spring/Summer Chinook Salmon . . . . .	6-73
6.3.1.1 Survival and Recovery Components of the Jeopardy Standard . . . . .	6-73
6.3.1.2 Full Mitigation Component of the Jeopardy Standard . . . . .	6-78
6.3.1.3 Consideration of All Components of the Jeopardy Standard . . . . .	6-80
6.3.2 Upper Columbia River Spring Chinook Salmon . . . . .	6-80
6.3.2.1 Survival and Recovery Components of the Jeopardy Standard . . . . .	6-80
6.3.2.2 Full Mitigation Component of the Jeopardy Standard . . . . .	6-84
6.3.2.3 Consideration of All Components of the Jeopardy Standard . . . . .	6-85
6.3.3 Snake River Fall Chinook Salmon . . . . .	6-85
6.3.3.1 Survival and Recovery Components of the Jeopardy Standard . . . . .	6-86
6.3.3.2 Full Mitigation Component of the Jeopardy Standard . . . . .	6-88
6.3.3.3 Consideration of All Components of the Jeopardy Standard . . . . .	6-89
6.3.4 Snake River Steelhead . . . . .	6-89
6.3.4.1 Survival and Recovery Components of the Jeopardy Standard . . . . .	6-90
6.3.4.2 Full Mitigation Component of the Jeopardy Standard . . . . .	6-91
6.3.4.3 Consideration of All Components of the Jeopardy Standard . . . . .	6-93
6.3.5 Upper Columbia River Steelhead (Methow River Population) . . . . .	6-93
6.3.5.1 Survival and Recovery Components of the Jeopardy Standard . . . . .	6-94
6.3.5.2 Full Mitigation Component of the Jeopardy Standard . . . . .	6-96
6.3.5.3 Consideration of All Components of the Jeopardy Standard . . . . .	6-98
6.3.6 Upper Willamette River Chinook Salmon . . . . .	6-98
6.3.7 Lower Columbia River Chinook Salmon . . . . .	6-99
6.3.8 Middle Columbia River Steelhead . . . . .	6-99
6.3.9 Upper Willamette River Steelhead . . . . .	6-100
6.3.10 Lower Columbia River Steelhead . . . . .	6-100

6.3.11	Columbia River Chum Salmon .....	6-101
6.3.12	Snake River Sockeye Salmon .....	6-102
6.3.13	Summary – Effects of the Proposed Action on Biological Requirements Over the Full Life Cycle .....	6-102
6.3.13.1	Summary of Findings for All 12 ESUs .....	6-103
6.3.13.2	Summary of Quantitative Findings for Five ESUs .....	6-104
<b>7.0</b>	<b>CUMULATIVE EFFECTS .....</b>	<b>7-1</b>
<b>8.0</b>	<b>CONCLUSIONS .....</b>	<b>8-1</b>
8.1	Snake River Spring/Summer Chinook Salmon .....	8-2
8.1.1	Proposed BPA, Corps, and BOR Action .....	8-2
8.1.2	NMFS' Issuance of a Section 10 Transportation Permit .....	8-3
8.2	Snake River Fall Chinook Salmon .....	8-4
8.2.1	Proposed BPA, Corps, and BOR Action .....	8-4
8.2.2	NMFS' Issuance of a Section 10 Transportation Permit .....	8-5
8.3	Upper Columbia River Spring Chinook Salmon .....	8-6
8.3.1	Proposed BPA, Corps, and BOR Action .....	8-6
8.3.2	NMFS' Issuance of a Section 10 Transportation Permit .....	8-7
8.4	Upper Willamette River Chinook Salmon .....	8-8
8.4.1	Proposed BPA, Corps, and BOR Action .....	8-8
8.4.2	NMFS' Issuance of a Section 10 Transportation Permit .....	8-8
8.5	Lower Columbia River Chinook Salmon .....	8-9
8.5.1	Proposed BPA, Corps, and BOR Action .....	8-9
8.5.2	NMFS' Issuance of a Section 10 Transportation Permit .....	8-9
8.6	Snake River Steelhead .....	8-10
8.6.1	Proposed BPA, Corps, and BOR Action .....	8-10
8.6.2	NMFS' Issuance of a Section 10 Transportation Permit .....	8-11
8.7	Upper Columbia River Steelhead .....	8-12
8.7.1	Proposed BPA, Corps, and BOR Action .....	8-12
8.7.2	NMFS' Issuance of a Section 10 Transportation Permit .....	8-13
8.8	Middle Columbia River Steelhead .....	8-14
8.8.1	Proposed BPA, Corps, and BOR Action .....	8-14
8.8.2	NMFS' Issuance of a Section 10 Transportation Permit .....	8-15
8.9	Upper Willamette River Steelhead .....	8-16
8.9.1	Proposed BPA, Corps, and BOR Action .....	8-16
8.9.2	NMFS' Issuance of a Section 10 Transportation Permit .....	8-16
8.10	Lower Columbia River Steelhead .....	8-17
8.10.1	Proposed BPA, Corps, and BOR Action .....	8-17
8.10.2	NMFS' Issuance of a Section 10 Transportation Permit .....	8-17
8.11	Columbia River Chum Salmon .....	8-18
8.11.1	Proposed BPA, Corps, and BOR Action .....	8-18
8.11.2	NMFS' Issuance of a Section 10 Transportation Permit .....	8-18

8.12	Snake River Sockeye Salmon .....	8-19
8.12.1	Proposed BPA, Corps, and BOR Action .....	8-19
8.12.2	NMFS' Issuance of a Section 10 Transportation Permit .....	8-20
<b>9.0</b>	<b>REASONABLE AND PRUDENT ALTERNATIVE .....</b>	<b>9-1</b>
9.1	Overview of the Alternative .....	9-1
9.1.1	Performance Standards .....	9-1
9.1.2	Hydro Actions .....	9-2
9.1.3	Offsite Mitigation Actions .....	9-2
9.1.4	One- and 5- Year Plans .....	9-3
9.1.5	Comprehensive 5- and 8-Year Check-ins .....	9-3
9.1.6	Monitoring, Evaluation, and Progress Reporting .....	9-3
9.1.7	Advance Planning for Breach or Other Additional Actions .....	9-5
9.1.8	Breach Triggers .....	9-5
9.1.9	Independent Peer Review .....	9-5
9.1.10	Immediate Actions and Benefits .....	9-5
9.2	Performance Standards .....	9-7
9.2.1	Programmatic Performance Standards .....	9-7
9.2.2	Biological Performance Standards .....	9-7
9.2.2.1	Standards Related to Status of the ESUs .....	9-8
9.2.2.2	Standards Related to Effectiveness of Actions .....	9-9
9.2.2.2.1	FCRPS Hydro Performance Standards .....	9-9
9.2.2.2.2	FCRPS Offsite Mitigation Performance Standards ..	9-11
9.2.3	Physical Performance Standards .....	9-14
9.3	Summary of Offsite Mitigation Program .....	9-16
9.4	Description of Mid-Point Evaluation Process .....	9-17
9.4.1	Performance Standards with Monitoring and Evaluation .....	9-17
9.4.1.1	Progress Reports .....	9-17
9.4.1.2	NMFS Midpoint Evaluations in 2005 and 2008 .....	9-18
9.4.1.3	Assessment of Standards Related to Status of ESUs .....	9-22
9.4.1.4	Assessment of Standards Related to Implementation and Effectiveness of the RPA .....	9-23
9.4.1.5	Guidelines for Alternative Actions in the Event of a Failure Report .....	9-23
9.4.1.6	Action Agency Response to NMFS Notification of Failure to Avoid Jeopardy .....	9-24
9.5	Development and Implementation of 1- and 5-year Plans .....	9-25
9.5.1	Expectations for the Development and Implementation of the 1- and 5-year Plans .....	9-26
9.5.2	Process for Developing and Implementing Key Elements of the 1- and 5-Year Plans .....	9-27
9.5.2.1	Hydrosystem .....	9-28

9.5.2.2 Operations .....	9-29
9.5.2.3 Configuration .....	9-30
9.5.2.4 Water Quality .....	9-30
9.5.2.5 Tribal Coordination on Hydro Actions .....	9-30
9.5.2.6 Offsite Mitigation - Habitat .....	9-31
9.5.2.7 Offsite Mitigation - Hatcheries and Harvest .....	9-31
9.5.2.8 Unanticipated Actions .....	9-32
9.5.2.9 Approval of Plans .....	9-32
9.5.2.10 Annual Progress Reports .....	9-33
9.6 Measures to Avoid Jeopardy .....	9-34
9.6.1 Hydro Measures .....	9-34
9.6.1.1 Overview .....	9-34
9.6.1.1.1 Improving Water Management .....	9-35
9.6.1.1.2 Improving Juvenile Project Passage Survival .....	9-36
9.6.1.1.3 Improving Juvenile Reservoir Survival .....	9-37
9.6.1.1.4 Improving Adult Survival .....	9-37
9.6.1.1.5 Improving Water Quality .....	9-37
9.6.1.1.6 Resolving Critical Uncertainties .....	9-38
9.6.1.1.7 Enhanced Operation and Maintenance of Fish Passage Facilities .....	9-39
9.6.1.2 Water Management .....	9-39
9.6.1.2.1 Flow Management Objectives in Mainstem Columbia and Lower Snake Rivers .....	9-39
9.6.1.2.2 Planning and Management of Available Water to Support Mainstem Flow Objectives .....	9-43
9.6.1.2.3 FCRPS Reservoir Operations to Support Mainstem Objectives .....	9-44
9.6.1.2.4 BOR Non-FCRPS Project Operations to Support Mainstem Flow Objectives .....	9-49
9.6.1.2.5 Non-Federal Project Operations Coordinated with FCRPS and BOR Projects to Support Mainstem Flow Objectives .....	9-50
9.6.1.2.6 Measures to Evaluate and Adjust the Amount of Water Available to Support Flow .....	9-50
9.6.1.2.7 Actions to Address Columbia Basin Project Effects Other than Flow Depletions and Storage Operations. .	9-57
9.6.1.3 Juvenile Fish Transportation .....	9-58
9.6.1.3.1 Strategy .....	9-58
9.6.1.3.2 Current and Near-Term Actions .....	9-58
9.6.1.3.3 Studies (Including Research, Monitoring, and Evaluations) .....	9-60
9.6.1.3.4 Future Actions .....	9-62
9.6.1.4 Juvenile Fish Passage .....	9-63

9.6.1.4.1 Juvenile Fish Passage Strategy .....	9-64
9.6.1.4.2 Overview of RPA Actions Project-by-Project .....	9-65
9.6.1.4.3 Current and Near-Term Actions .....	9-70
9.6.1.4.4 Project-by-Project Spill Requirements .....	9-71
9.6.1.4.5 Studies (Including Research, Monitoring, and Evaluations) .....	9-76
9.6.1.4.6 System or General Studies (including Research, Monitoring, and Evaluations) .....	9-82
9.6.1.4.7 Configuration Alternatives and Decision Dates .....	9-86
9.6.1.5 Reservoir Passage .....	9-86
9.6.1.5.1 Predator Control Strategy .....	9-87
9.6.1.5.2 Current and Near-Term Actions .....	9-87
9.6.1.5.3 Studies (Including Research, Monitoring, and Evaluation) .....	9-88
9.6.1.6 Adult Passage and Research .....	9-90
9.6.1.6.1 Adult Fish Passage Strategy .....	9-90
9.6.1.6.2 Studies (including Research, Monitoring, and Evaluations) .....	9-91
9.6.1.6.3 Adult Fishway Operating Criteria .....	9-95
9.6.1.6.4 Reliability Enhancement .....	9-96
9.6.1.6.5 Fishway System Assessments .....	9-97
9.6.1.7 Water Quality .....	9-98
9.6.1.7.1 Water Quality Strategy .....	9-98
9.6.1.7.2 Water Quality Plan Implementation and Water Quality Improvement Team .....	9-102
9.6.1.7.3 Current and Near-Term Actions and Studies .....	9-103
9.6.1.8 Strategy to Improve Fish Facility Operations and Maintenance .....	9-107
9.6.1.8.1 Fish Passage Plan Development and Implementation .....	9-107
9.6.1.8.2 Actions to Improve Operation and Maintenance of Passage Facilities .....	9-107
9.6.1.8.3 Actions to Improve Operation and Maintenance Planning and Budgeting .....	9-109
9.6.1.9 Advance Planning for Possible Additional Actions .....	9-109
9.6.2 Habitat Actions .....	9-110
9.6.3 Overview of Harvest Measures .....	9-115
9.6.3.1 Overview .....	9-115
9.6.3.2 Measures to Assist in the Further Reform of Harvest .....	9-116
9.6.3.2.1 Measures to Address Effects of Selective Fishing on Fishery Management Systems (e.g., Fishery Management and Stock Assessment Models) .....	9-116
9.6.3.2.2 Measures to Develop or Expand the Use of Selective	

	Fishing Methods and Gear .....	9-117
9.6.3.3	Measures to Provide Alternative Fishing Locations .....	9-118
9.6.3.4	Developing Plans and Strategies for Reducing Impacts on Listed Fish while Retaining or Enhancing Fishery Values or Mitigating Impacts on Fisheries .....	9-118
9.6.3.5	Developing Plans and Strategies for Crediting Reductions in Impacts on Listed Fish .....	9-119
9.6.3.6	Developing Implementation Plans for Harvest Reforms, Alternative Fishing Locations, and Other Harvest Measures	9-119
9.6.4	Offsite Mitigation - Hatcheries .....	9-120
9.6.4.1	Actions to Reform Existing FCRPS Mitigation Hatcheries	9-121
9.6.4.2	Actions to Create an Artificial Propagation Safety-Net Program .....	9-123
9.6.4.3	Actions to Implement Recommendations in the NWPPC's Artificial Production Review .....	9-124
9.6.5	Research, Monitoring, and Evaluation Plan .....	9-125
9.6.5.1	Overall Assessment Goals .....	9-127
9.6.5.2	Population Identification and Establishment of Recovery Goals .....	9-128
9.6.5.3	Mainstem and Tributary Habitat .....	9-130
9.6.5.4	Hatcheries .....	9-131
9.6.5.5	Estuarine and Early Ocean Habitat .....	9-133
9.6.5.6	Hydroelectric Project and Reservoir Passage .....	9-137
9.6.5.6.1	Juvenile Monitoring and Evaluation .....	9-137
9.6.5.6.2	Adult Monitoring and Evaluation .....	9-139
9.6.5.7	Data Management .....	9-140
9.7	Analysis of Effects .....	9-142
9.7.1	Effects of RPA Measures on Action-Area Biological Requirements	9-142
9.7.1.1	Juvenile Salmonid Passage .....	9-142
9.7.1.1.1	Turbine Units .....	9-142
9.7.1.1.2	Bypass Systems .....	9-143
9.7.1.1.3	Spillway and Sluiceway Systems .....	9-144
9.7.1.2	Adult Salmonid Passage .....	9-148
9.7.1.3	Water Regulation and Impoundments .....	9-150
9.7.1.3.1	Probability of Achieving NMFS Flow Objectives	9-150
9.7.1.3.2	FCRPS Reservoir Effects .....	9-152
9.7.1.4	Water Quality .....	9-154
9.7.1.5	Effects of Predator Control .....	9-154
9.7.1.6	Juvenile Transportation Program .....	9-155
9.7.1.6.1	Percentage of Each Species Transported .....	9-155
9.7.1.6.2	Survival Benefits to Each Species .....	9-155
9.7.1.6.3	Effects of Extended Barging Season .....	9-156
9.7.1.6.4	Potential Release of Trucked Fish from the New	

Bonneville Juvenile Fish Bypass Outfall . . . . .	9-156
9.7.1.6.5 Transportation from McNary Dam . . . . .	9-156
9.7.1.6.6 Improvements to the Transportation Program . . . . .	9-157
9.7.1.6.7 NMFS' Issuance of Section 10 Permits for the Juvenile Transportation Program and the Smolt Monitoring Program . . . . .	9-157
9.7.1.7 Summary: Effects of the RPA on Juvenile and Adult Survival . . . . .	9-157
9.7.2 Analysis of the Effects of the RPA on Biological Requirements Over the Full Life Cycle . . . . .	9-159
9.7.2.1 Snake River Spring/Summer Chinook Salmon . . . . .	9-159
9.7.2.1.1 Survival and Recovery Components of the Jeopardy Standard . . . . .	9-159
9.7.2.1.2 Full Mitigation Component of the Jeopardy Standard . . . . .	9-164
9.7.2.1.3 Consideration of All Components of the Jeopardy Standard . . . . .	9-164
9.7.2.2 Upper Columbia River Spring Chinook Salmon . . . . .	9-164
9.7.2.2.1 Survival of Recovery Components of the Jeopardy Standard . . . . .	9-165
9.7.2.2.2 Full Mitigation Component of the Jeopardy Standard . . . . .	9-167
9.7.2.2.3 Consideration of All Components of the Jeopardy Standard . . . . .	9-168
9.7.2.3 Snake River Fall Chinook Salmon . . . . .	9-168
9.7.2.3.1 Survival and Recovery Components of the Jeopardy Standard . . . . .	9-168
9.7.2.3.2 Full Mitigation Component of the Jeopardy Standard . . . . .	9-171
9.7.2.3.3 Consideration of All Components of the Jeopardy Standard . . . . .	9-172
9.7.2.4 Snake River Steelhead . . . . .	9-172
9.7.2.4.1 Survival and Recovery Components of the Jeopardy Standard . . . . .	9-172
9.7.2.4.2 Full Mitigation Component of the Jeopardy Standard . . . . .	9-175
9.7.2.4.3 Consideration of All Components of the Jeopardy Standard . . . . .	9-176
9.7.2.5 Upper Columbia River Steelhead . . . . .	9-176
9.7.2.5.1 Survival and Recovery Components of the Jeopardy Standard . . . . .	9-176
9.7.2.5.2 Full Mitigation Component of the Jeopardy Standard . . . . .	9-179

9.7.2.5.3	Consideration of All Components of the Jeopardy Standard .....	9-180
9.7.2.6	Summary of Findings for Middle and Lower River ESUs and Sockeye Salmon .....	9-180
9.7.2.7	Summary of Quantitative Findings for Five ESUs .....	9-188
9.7.3	Evaluation of Snake River Four-Dam Breach in Comparison to the RPA .....	9-191
9.7.3.1	Effects of Snake River Four-Dam Breach on Action Area Biological Requirements .....	9-191
9.7.3.1.1	Dam Passage Survival During Removal and Transition Periods .....	9-192
9.7.3.1.2	Effects of Breaching on Sedimentation and Fluvial Geomorphology .....	9-194
9.7.3.1.3	Estimated Juvenile Survival Following Transition Period .....	9-197
9.7.3.1.4	Estimated Adult Survival Following Transition Period .....	9-200
9.7.3.2	Analysis of the Effects of Snake River Four-Dam Breach on Biological Requirements Over the Full Life Cycle .....	9-201
9.7.3.2.1	Snake River Spring/Summer Chinook Salmon .....	9-202
9.7.3.2.2	Snake River Fall Chinook Salmon .....	9-207
9.7.3.2.3	Snake River Steelhead .....	9-210
9.7.3.2.4	Snake River Sockeye .....	9-214
9.7.3.2.5	Eight Other ESUs .....	9-214
9.7.3.2.6	Summary - Effects of Snake River Four-Dam Breach on Biological Requirements Over the Full Life Cycle .....	9-214
9.7.4	RPA Conclusions .....	9-218
9.7.4.1	General Conclusions For All ESUs .....	9-218
9.7.4.2	Snake River Spring/Summer Chinook Salmon .....	9-219
9.7.4.3	Snake River Fall Chinook Salmon .....	9-220
9.7.4.4	Upper Columbia River Spring Chinook Salmon .....	9-220
9.7.4.5	Upper Willamette River Chinook Salmon .....	9-221
9.7.4.6	Lower Columbia River Chinook Salmon .....	9-221
9.7.4.7	Snake River Steelhead .....	9-221
9.7.4.8	Upper Columbia River Steelhead .....	9-222
9.7.4.9	Middle Columbia River Steelhead .....	9-222
9.7.4.10	Upper Willamette River Steelhead .....	9-222
9.7.4.11	Lower Columbia River Steelhead .....	9-223
9.7.4.12	Columbia River Chum Salmon .....	9-223
9.7.4.13	Snake River Sockeye Salmon .....	9-224
<b>10.0</b>	<b>INCIDENTAL TAKE STATEMENT .....</b>	<b>10-1</b>

10.1	Introduction .....	10-1
10.2	Amount or Extent of Take Anticipated .....	10-2
	10.2.1 Incidental Take Associated with Operation of the FCRPS .....	10-2
	10.2.2 Incidental Take Associated with Offsite Mitigation .....	10-2
10.3	Effect of the Take .....	10-4
10.4	Reasonable and Prudent Measures .....	10-4
	10.4.1 Monitor Incidental Take .....	10-4
	10.4.2 Reduce Incidental Take by Improving Juvenile and Adult Passage Survival .....	10-4
10.5	Terms and Conditions .....	10-5
	10.5.1 Terms and Conditions Related to Monitoring Take .....	10-5
	10.5.1.1 Evaluate Reach Survivals .....	10-5
	10.5.1.2 Monitor Smolt-to-Adult Returns .....	10-5
	10.5.1.3 Monitor Post-Transport and Post-Bypass Delayed Mortality .....	10-6
	10.5.1.4 Monitor Juvenile Fish Passage at Dams .....	10-6
	10.5.1.5 Monitor Effects of Dissolved Gas Supersaturation .....	10-7
	10.5.1.6 Install Adult PIT-tag Detectors to Facilitate Monitoring .....	10-7
	10.5.1.7 Monitor Adult Survival .....	10-7
	10.5.1.8 Monitor Turbine Efficiency .....	10-8
	10.5.1.9 Report Project Operations in a Timely Manner .....	10-9
	10.5.1.10 Report on Progress Implementing the Fish Passage Plan in a Timely Manner .....	10-9
	10.5.2 Terms and Conditions Related to Improving Juvenile and Adult Passage Survival .....	10-9
	10.5.2.1 Store Additional Water at Libby .....	10-9
	10.5.2.2 Develop a Dissolved Gas Model to Inform Spill and Dissolved Gas Management Decisions .....	10-9
	10.5.2.3 Model Water Temperature to Inform Operational Decisions .....	10-10
	10.5.2.4 Develop Temperature Data Collection System to Inform Operational Decisions .....	10-10
	10.5.2.5 Assess Use of Safer PIT-tag Detection Methods .....	10-10
	10.5.2.6 Improve Panel Design of Extended Submerged Intake Screens .....	10-11
	10.5.2.7 Implement Studies to Reduce Bird Predation at FCRPS Projects .....	10-11
	10.5.2.8 Reduce Incidental Take Associated with Annual Fish Passage Plans .....	10-11
	10.5.2.9 Reduce Mortality Associated with Special Facility Operations .....	10-11
	10.5.2.10 Develop Action Plan for Reducing Steelhead Holding in John Day Fish Ladders .....	10-12
	10.5.2.11 Evaluate Kelt Passage and Potential Improvements .....	10-12



<b>11.0 CONSERVATION RECOMMENDATIONS .....</b>	<b>11-1</b>
11.1 Create Spawning Habitat for LCR Chinook Salmon in the Ives Island Area Below Bonneville Dam .....	11-1
11.2 Evaluate Effects of FCRPS Operations on Infectious Disease Transmission ..	11-1
11.3 Develop an Anesthetic That Will Meet FDA Requirements .....	11-2
11.4 Evaluate Effects of Shad .....	11-3
11.5 Evaluate Moving the Lower Columbia River Flow Measurement Location ..	11-3
<b>12.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT .....</b>	<b>12-1</b>
12.1 Essential Fish Habitat in the Columbia River Basin .....	12-2
12.2 Summary of Proposed Action .....	12-5
12.2.1 Operation and Configuration of the FCRPS .....	12-5
12.2.2 Flow Objectives for Salmon and Steelhead .....	12-5
12.2.2.1 Water Quality .....	12-5
12.2.2.2 Specific Project Operations .....	12-5
12.2.2.3 Spill for Fish Passage .....	12-5
12.2.2.4 Juvenile Fish Transportation .....	12-6
12.2.2.5 Minimum Operating Pool (MOP) .....	12-6
12.2.2.6 Peak Turbine Efficiency Operation .....	12-6
12.2.2.7 Fish Passage Facilities .....	12-6
12.2.2.8 Predator Control Program .....	12-6
12.2.2.9 Adaptive Management Framework Through Adoption of Performance Measures .....	12-6
12.2.2.10 Issuance of Section 10 Permit for Juvenile Fish Transportation Program by NMFS .....	12-7
12.3 Effects of the Proposed Action .....	12-8
12.3.1 General Considerations .....	12-8
12.3.2 Estuary and Nearshore Essential Fish Habitat .....	12-8
12.3.2.1 Groundfish EFH .....	12-8
12.3.2.2 Coastal Pelagics EFH .....	12-9
12.3.2.3 Salmon EFH .....	12-9
12.3.2.4 Mainstem Essential Fish Habitat .....	12-11
12.4 Conclusion .....	12-12
12.5 EFH Conservation Recommendations .....	12-12
12.6 Statutory Requirements .....	12-15
12.7 Consultation Renewal .....	12-15
<b>13.0 REINITIATION OF CONSULTATION .....</b>	<b>13-1</b>
<b>14.0 REFERENCES .....</b>	<b>14-1</b>

- APPENDIX A      BIOLOGICAL REQUIREMENTS, CURRENT STATUS, AND  
TRENDS: TWELVE COLUMBIA RIVER BASIN  
EVOLUTIONARILY SIGNIFICANT UNITS**
- APPENDIX B      BIOLOGICAL EFFECTS ANALYSIS AND SIMPAS MODEL  
DOCUMENTATION**
- APPENDIX C      ANALYSIS OF EFFECTS OF PROPOSED ACTION AND  
REASONABLE AND PRUDENT ALTERNATIVE ON SPECIES-  
LEVEL BIOLOGICAL REQUIREMENTS OF LISTED SPECIES**
- APPENDIX D      DEVELOPMENT OF A WATER QUALITY PLAN FOR THE  
COLUMBIA RIVER MAINSTEM: A FEDERAL AGENCY  
PROPOSAL**
- APPENDIX E      SPILL AND 1995 RISK MANAGEMENT UPDATE**