

**Thermal Mark Patterns Applied to Salmon from Alaska,
Washington, Treaty Tribes and Other Northwest States for
Brood Year 2003**

by

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Abstract

In Washington and Alaska, mass-marking of salmon using otolith thermal marking is an effective research and management tool for a variety of situations. The specific needs and applications for marking, however, are not same in each state. This document contains a report of thermal mark patterns applied to salmon stocks from the 2003 brood year. It includes release numbers where known and mark patterns applied in Alaska, Washington, Oregon, Idaho and by Treaty Tribes.

Summary of Alaska Thermal Marking Programs

In Alaska, thermal marking is primarily used to provide information about the contribution of hatchery fish, primarily pink, chum and sockeye salmon, to commercial and cost-recovery fisheries during the summer fishing season. In addition, several ongoing programs use this information to aid in the in-season management of mixed stock fisheries. Hatcheries use mark recovery data to evaluate the success of various release strategies. In research applications, thermal marks have been used to answer questions regarding lake survival and straying rates of returning adults. The presence of otolith thermal marks are also being used to determine the origin of juvenile and immature salmon collected during biotic surveys in the Gulf of Alaska. In many instances, thermal marks are being applied by hatcheries in the absence of a directed sampling program. This applies primarily to coho and Chinook salmon, but it includes some sockeye releases as well. The reasons for this vary, but it primarily occurs in situations where the marks cost little to apply and there is anticipation that a thermal mark recovery program will be implemented by the time the fish return.

Thermal mark patterns are assigned annually by the Alaska Department of Fish and Game with consideration based on the constraints of the hatchery, the management's need to identify specific stocks, and the existence of a funded program to recover and identify the thermal patterns. It has become increasingly difficult to create and apply unique patterns as the hatchery marking programs have expanded. Consequently, alternative marking strategies, such as the use of strontium chloride, are currently being explored.

A list of thermal marks applied to hatchery-reared salmon during brood year 2003 is provided in Table 1. Although final release estimates had not been reported by all the hatchery operations as of this date, there were a total of 71 different mark groups. To date, more than 1.2 billion marked fish have been released. Strontium marking continued for the fifth year at Gulkana Hatchery on sockeye, and a new program was initiated to thermal mark chum salmon in the Southeast region at Neets Bay.

The otolith pattern is presented both as the RBr notation (Munk and Geiger 1998) with slight modifications by Hagen (1999), as well as the equivalent Hatch Notation. The Hatch Notation is similar to the RBr code in that thermal rings are grouped into bands of rings that are evenly spaced. The primary difference is that the hatch event is denoted

with an ‘H,’ and the position of the ‘H’ in the code indicates what rings are formed pre- or post-hatch. Both notations are shown as well as a graphic representation of the mark.

Information regarding thermal marked patterns and numbers of released fish in Alaska is available from the Alaska Department of Fish and Game, Mark, Tag and Age Laboratory database and from the NPAFC Working Group on Salmon Marking’s Website (<http://npafc.taglab.org>).

Summary of Otolith Thermal Marking Projects by The Washington State Department of Fish and Wildlife, Northwest Treaty Tribes and other Western States.

In Washington State, mass-marking of hatchery salmon with thermally-induced otolith marks (Volk et al. 1999) is primarily used as an evaluation and research tool where identification of hatchery fish at various life history stages is important. Projects range widely in scope and magnitude, including evaluation of supplementation efforts for stock recovery, assessment of survival rates for different hatchery release strategies, determination of hatchery stray rates and evaluating impacts of hatchery programs on wild stocks. On a more limited scale, thermal marking is also used as an aid to pre-season and in-season management of near-terminal fisheries. WDF&W often acts as a consultant to other Western U.S. fisheries agencies using otolith thermal marking. Where information is available, these projects are included in this summary.

A summary of otolith thermal marks applied to BY 2003 salmon in Washington State (WDF&W and State treaty tribes), Oregon and other western states is presented in Table 2. More than 51 million juvenile salmon were mass-marked with thermally-induced patterns. Because the large majority of these projects are focused upon evaluation or research objectives, it is typical to have unique identifiers for many groups within a single stock. Similarly, because marks in these studies are typically recovered from juveniles or adults in or near their river of origin, duplicate marks between stocks are not a large problem and redundancy of marks between stocks occurs. Where possible, this duplication was avoided.

A growing use of otolith thermal marking in Washington is for evaluating the success of stock recovery efforts, particularly with chum and coho salmon. In many of these cases, eyed-eggs are placed in remote site incubators for volitional exit and thermal marking is the only way to place an identifier on these groups. Another growing application of thermal marking in Washington is to evaluate the impact of hatchery fish on wild fish in natural spawning areas. Nearly all thermal-marking efforts are conducted by chilling ambient incubation water and patterns are typically created using a modified bar code symbology (Volk et al. 1994). Pre-hatch marks are often used as brood year identifiers. The large diversity of marking site attributes among these efforts has demanded innovation and adaptation to achieve the required temperature differences to mark fish. In Table 2, the BY 2003 mark patterns are represented as a schematic of thermal events. For consistency, these patterns are also described according to the Hatch Code scheme.

We expect that thermal marking efforts will continue at a similar or slightly increased level next year. However, there is a possibility that in the near future, thermal marking may expand significantly in Washington State and Oregon as pressure mounts to unequivocally identify hatchery fish amidst concern over declining wild stocks.

References

Hagen, P. 1999. A modeling approach to address the underlying structure and constraints of thermal mark codes and code notation. (NPAFC Doc. 395). 12 p. Alaska Dept. Fish and Game, Juneau Alaska.

Munk, K.M. and Geiger, H.J. 1998. Thermal marking of otoliths: the “RBr” coding structure of thermal marks. (NPAFC Doc. 367). 19 p. Alaska Dept. of Fish and Game, Juneau Alaska.

Volk, E.C., S.L. Schroder, J.J. Grimm and H.S. Ackley. 1994. Use of a bar code symbology to produce multiple thermally induced marks. *Trans. Am. Fish. Soc.* 123:811-816.

Volk, E.C., Steven L. Schroder and Jeffery J. Grimm. 1999. Otolith Thermal Marking. *Fisheries Research.* 43/1-3, 207-221.

Table 1. Summary of thermal mark codes applied to Alaska hatchery salmon in brood year 2003.

SPECIES: CHINOOK

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK03-01	TM	2003	2005		CHINOOK	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Cook Inlet
AK03-02	TM	2003	2004		CHINOOK	Alaska	Southcentral	ADFG	Elmendorf Hatchery	Cook Inlet
AK03-03	TM	2003	2005		CHINOOK	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Crooked Creek
AK03-04	TM	2003	2004		CHINOOK	Alaska	Southcentral	ADFG	Elmendorf Hatchery	Crooked Creek
AK03-05	TM	2003	2005		CHINOOK	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Ressurrection Bay
AK03-06	TM	2003	2004		CHINOOK	Alaska	Southcentral	ADFG	Elmendorf Hatchery	Ressurrection Bay
AK03-07	TM	2003	2005		CHINOOK	Alaska	Southeast	NSRAA	Medvejie Hatchery	Medvejie
AK03-08	TM	2003	2005		CHINOOK	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK03-09	TM	2003	2005		CHINOOK	Alaska	Southeast	NSRAA	Medvejie Hatchery	Medvejie
AK03-10	TM	2003	2005		CHINOOK	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay

ID#	MARK NAME	STAGE	WEIGHT	LENGTH	ESIMATED RELEASE	RBr CODE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	COMMENTS
AK03-01	COOKINLET03CHIN				1,085,000	1:1.2,2.3	2,3H			Repeats each year
AK03-02	COOKINLET03CHINZ				315,000	1:1.2,2.3	2,3H			Repeats each year
AK03-03	PWSO3CHIN				315,000	1:1.2,2.4	2,4H			Repeats each year
AK03-04	PWSO3CHINZ				105,000	1:1.2,2.4	2,4H			Repeats each year
AK03-05	RESURRECTION03CHIN				210,000	1:1.2,2.5	2,5H			Repeats each year
AK03-06	RESURRECTION03CHINZ				105,000	1:1.2,2.5	2,5H			Repeats each year
AK03-07	GREENLAKE03CHIN				1,000,000	1:1.3,2.3	3,3H			Repeats each year
AK03-08	HIDDENFALLS03CHIN				1,500,000	1:1.4,2.2	4,2H			Repeats each year
AK03-09	MEDVEJIE03				1,300,000	1:1.4,2.3	4,3H			Repeats each year
AK03-10	DIPAC03CHIN				600,000	No Mark	No Mark			Alternates each year

SPECIES: COHO

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK03-32	TM	2003	2004		COHO	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Bear Lake
AK03-33	TM	2003	2005		COHO	Alaska	Southeast	AKI	Port Armstrong Hatchery	Port Armstrong
AK03-34	TM	2003	2004		COHO	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Ship & Jim Creek
AK03-35	TM	2003	2004		COHO	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK03-36	TM	2003	2004		COHO	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK03-37	TM	2003	2005		COHO	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK03-38	TM	2003	2005		COHO	Alaska	Southeast	NSRAA	Medvejie Hatchery	Medvejie
AK03-39	TM	2003	2005		COHO	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay

ID#	MARK NAME	STAGE	WEIGHT	LENGTH	ESIMATED RELEASE	RBr CODE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	COMMENTS
AK03-32	RESURRECTION03COHO				240,000	1:1.4	4H			Repeats each year
AK03-33	PORTARMSTRONG03COHO				1,600,000	1:1.5	5H			
AK03-34	COOKINLET03COHO				640,000	1:1.6	6H			Repeats each year
AK03-35	TRAILLAKES03SMCOHO				450,000	1:1.3,2.3	3,3H			Repeats each year
AK03-36	TRAILLAKES03LGCOHO				150,000	1:1.3,2.3+3.2	3,3H2			Repeats each year
AK03-37	WHN03COHO				300,000	1:1.3	3H			Repeats each year
AK03-38	MEDVEJIE03COHO				2,500,000	1:1.4,2.2	4,2H			Repeats each year
AK03-39	DIPAC03COHO				800,000	1:1.4	4H			Alternates each year

Table 1 (continued). Summary of thermal mark codes applied to Alaska hatchery salmon in brood year 2003.

SPECIES: CHUM

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK03-11	TM	2003	2004		CHUM	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK03-12	TM	2003	2004		CHUM	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK03-13	TM	2003	2004		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK03-14	TM	2003	2004		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK03-15	TM	2003	2004		CHUM	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK03-16	TM	2003	2004		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK03-17	TM	2003	2004		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK03-18	TM	2003	2004		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK03-19	TM	2003	2004		CHUM	Alaska	Southeast	NSRAA	Medvejie Hatchery	Medvejie
AK03-20	TM	2003	2004		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK03-21	TM	2003	2004		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK03-22	TM	2003	2004		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK03-23	TM	2003	2004		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK03-24	TM	2003	2004		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK03-25	TM	2003	2004		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK03-26	TM	2003	2004		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK03-27	TM	2003	2004		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK03-28	TM	2003	2004		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK03-29	TM	2003	2004		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK03-30	TM	2003	2004		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK03-31	TM	2003	2004		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK03-73	TM	2003	2004		CHUM	Alaska	Southeast	NSRAA	Medvejie Hatchery	Medvejie

ID#	MARK NAME	STAGE	WEIGHT	LENGTH	ESIMATED RELEASE	RBr CODE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	COMMENTS
AK03-11	WHN03A				75,000,000	1:1.5	5H			
AK03-12	WHN03B					1:1.3+2.3	3H3			
AK03-13	HIDDENFALLS03				29,881,079	1:1.3,2.3	3,3H			Repeats each year
AK03-14	HIDDENFALLS03L/LG	Late Large			13,662,435	1:1.4,2.3	4,3H			
AK03-15	PORTCHALMERS03				25,000,000	1:1.3	3H			Repeats each year
AK03-16	TAKATZ03				45,054,655	1:1.4	4H			
AK03-17	DEEPINLETHF03				17,994,400	1:1.4,2.2	4,2H			
AK03-18	DEEPINLETHF03L/LG	Late Large			5,343,150	1:1.4,2.4	4,4H			
AK03-19	DEEPINLETM03L/LG	Late Large			7,138,225	1:1.7	7H			
AK03-20	NAKATINLET03SUM	Summer			8,160,000	1:1.8n	8nH			
AK03-21	NAKATINLET03FALL	Fall			8,733,000	1:1.4n+2.3	4nH3			
AK03-22	NEETSBAY03SUM	Summer			47,000,000	1:1.5n+2.3	5nH3			
AK03-23	NEETSBAY03FALL	Fall			20,000,000	1:1.4+2.4	4H4			
AK03-24	AMALGA03A				24,035,968	1:1.5	5H			three year rotation
AK03-25	AMALGA03B				12,006,165	1:1.5+2.6	5H6			three year rotation
AK03-26	GASTINEAU03A				17,190,877	1:1.5+2.3	5H3			three year rotation
AK03-27	GASTINEAU03B				17,030,729	1:1.5+2.3,3.3	5H3,3			three year rotation
AK03-28	BOATHARBOR03				14,576,139	1:1.5+2.4	5H4			three year rotation
AK03-29	LIMESTONE03				14,798,685	1:1.5+2.5	5H5			three year rotation
AK03-30	ANITABAY03				13,895,916	1:1.5n+2.4	5nH4			
AK03-31	KENDRICK03				19,730,867	1:1.6n	6nH			
AK03-73					13,147,375	none	none			

Table 1 (continued). Summary of thermal mark codes applied to Alaska hatchery salmon in brood year 2003.

SPECIES: SOCKEYE

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK03-51	TM	2003	2004		SOCKEYE	Alaska	Southeast	SSRAA	Burnett Inlet Hatchery	McDonald Lake
AK03-52	TM	2003	2004		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK03-53	TM	2003	2004		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Hidden Lake
AK03-56	TM	2003	2004		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Tutsumena Lake
AK03-57	TM	2003	2004		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK03-58	TM	2003	2004		SOCKEYE	Alaska	Southeast	POWHA	Klawock River Hatchery	Klawock Lake
AK03-59	TM	2003	2004		SOCKEYE	Alaska	Southcentral	PWSAC	Main Bay Hatchery	Main Bay
AK03-60	TM	2003	2005		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK03-61	TM	2003	2005		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK03-62	TM	2003	2005		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK03-63	TM	2003	2005		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK03-64	TM	2003	2005		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK03-65	TM	2003	2004		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Tahltan Lake
AK03-66	TM	2003	2004		SOCKEYE	Alaska	Southeast	SSRAA	Burnett Inlet Hatchery	McDonald Lake
AK03-67	TM	2003	2004		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Tatsamenie Lake
AK03-68	TM	2003	2004		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Tatsamenie Lake
AK03-69	TM	2003	2004		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK03-70	TM	2003	2004		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Tahltan Lake
AK03-71	TM	2003	2004		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Big Lake
AK03-72	TM	2003	2004		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Tahltan Lake

ID#	MARK NAME	STAGE	WEIGHT	LENGTH	ESIMATED RELEASE	RBr CODE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	COMMENTS
AK03-51	NECKCREEK03				500,000	1:1.2,2.1,3.2	2,1,2H			
AK03-52	BEARLAKE03A				700,000	1:1.2,2.1	2,1H			
AK03-53	HIDDENLAKE03				1,100,000	1:1.2,2.2,3.2	2,2,2H			
AK03-56	TUTSUMENA03				6,000,000	1:1.2,2.3	2,3H			
AK03-57	BEARLAKE03B				1,000,000	1:1.2	2H			
AK03-58	KLAWOCK03				365,000	1:1.3,2.2	3,2H			
AK03-59	MAINBAY03				8,000,000	1:1.3,2.2+3.2	3,2H2			
AK03-60	SPEELARM03E/LG	EL			1,500,000	1:1.3,2.3	3,3H			
AK03-61	SPEELARM03L/LG	LL			1,500,000	1:1.3,2.4n	3,4nH			
AK03-62	BEARLAKE03C				250,000	1:1.3	3H			
AK03-63	SPEELARM03L/SM	LS			1,500,000	1:1.4,2.3n	4,3nH			
AK03-64	SPEELARM03E/SM	ES			1,500,000	1:1.4,2.4	4,4H			
AK03-65	TUYA03				2,250,000	1:1.4	4H			
AK03-66	BURNETTINLET03	Smolts			40,000	1:1.5,2.2	5,2H			
AK03-67	TATSAMENIE03				1,000,000	1:1.5	5H			
AK03-68						1:1.5+2.3	5H3			
AK03-69	SWEETHEART03				526,000	1:1.5n,2.3	5n3H			
AK03-70	TAHLTAN03				1,500,000	1:1.6	6H			
AK03-71	BIGLAKE03				1,500,000	2:1.4	H4			
AK03-72	TAHLTAN03				750,000	1:1.5+2.4	5H4			

Table 1 (continued). Summary of thermal mark codes applied to Alaska hatchery salmon in brood year 2003.

SPECIES: PINK

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK03-40	TM	2003	2004		PINK	Alaska	Southcentral	PWSAC	Cannery Creek Hatchery	Cannery Creek
AK03-41	TM	2003	2004		PINK	Alaska	Southeast	AKI	Port Armstrong Hatchery	Port Armstrong
AK03-42	TM	2003	2004		PINK	Alaska	Southeast	AKI	Port Armstrong Hatchery	Port Armstrong
AK03-43	TM	2003	2004		PINK	Alaska	Southeast	AKI	Port Armstrong Hatchery	Port Armstrong
AK03-44	TM	2003	2004		PINK	Alaska	Southcentral	PWSAC	Armin F. Koernig Hatchery	Armin F. Koernig
AK03-45	TM	2003	2004		PINK	Alaska	Southcentral	PWSAC	Armin F. Koernig Hatchery	Armin F. Koernig
AK03-46	TM	2003	2004		PINK	Alaska	Southcentral	PWSAC	Armin F. Koernig Hatchery	Armin F. Koernig
AK03-47	TM	2003	2004		PINK	Alaska	Southcentral	VFDA	Solomon Gulch Hatchery	Solomon Gulch
AK03-48	TM	2003	2004		PINK	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK03-49	TM	2003	2004		PINK	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK03-50	TM	2003	2004		PINK	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg

ID#	MARK NAME	STAGE	WEIGHT	LENGTH	ESIMATED RELEASE	RBr CODE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	COMMENTS
AK03-40	CCH03				140,000,000	1:1.3,2.3	3,3H			Repeats each year
AK03-41	PORTARMSTRONG03E	E			26,989,700	1:1.3	3H			Repeats each year
AK03-42	PORTARMSTRONG03M	M			46,052,100	1:1.3+2.3	3H3			Repeats each year
AK03-43	PORTARMSTRONG03L	L			10,793,250	1:1.3+2.4	3H4			Repeats each year
AK03-44	AFK03E				84,490,553	1:1.4	4H			Repeats each year
AK03-45	AFK03L1				48,070,195	1:1.4+2.3	4H3			Repeats each year
AK03-46	AFK03L2				37,899,397	1:1.4+2.5	4H5			Repeats each year
AK03-47	SGH03				222,457,568	1:1.6	6H			Repeats each year
AK03-48	WHN03EPINK				40,000,000	1:1.8	8H			Repeats each year
AK03-49	WHN03L1PINK				40,000,000	1:1.8+2.3	8H3			Repeats each year
AK03-50	WHN0L2PINK				40,000,000	1:1.8+2.5	8H5			Repeats each year

Table 2. Summary of thermal mark codes applied to hatchery salmon in Washington and other states in brood year 2003.

SPECIES: CHINOOK

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
W03-01	TM	2003	2004		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W03-02	TM	2003	2004		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W03-03	TM	2003	2004		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W03-04	TM	2003	2004		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W03-05	TM	2003	2004		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W03-06	TM	2003	2004		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W03-07	TM	2003	2004		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W03-08	TM	2003	2004		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W03-09	TM	2003	2004		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W03-10	TM	2003	2004		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W03-54	TM	2003	2004		chinook	Washington	NW	WDFW	George Adams Hatchery	Skokomish River
W03-55	TM	2003	2004		chinook	Washington	NW	WDFW	George Adams Hatchery	Skokomish River
W03-57	TM	2003	2004		chinook	Washington	NW	Tulalip Tribes	Bernie Kai Kai Gobin Hatchery	Snohomish River summers
W03-58	TM	2003	2004		chinook	Washington	NW	Tulalip Tribes	Bernie Kai Kai Gobin Hatchery	Snohomish River summers
W03-59	TM	2003	2004		chinook	Washington	NW	Tulalip Tribes	Bernie Kai Kai Gobin Hatchery	Snohomish River falls
O03-01	TM	2003	2004		chinook	Oregon	NW	ODF&W	Marion Forks Hatchery	Willamette River springs
O03-02	TM	2003	2004		chinook	Oregon	NW	ODF&W	Willamette Hatchery	Willamette River springs
O03-03	TM	2003	2004		chinook	Oregon	NW	ODF&W	Willamette Hatchery	Willamette River springs
O03-04	TM	2003	2004		chinook	Oregon	NW	ODF&W	Willamette Hatchery	Willamette River springs
O03-05	TM	2003	2004		chinook	Oregon	NW	ODF&W	Willamette Hatchery	Willamette River springs
O03-06	TM	2003	2004		chinook	Oregon	NW	ODF&W	McKenzie Hatchery	Willamette River springs

ID#	RELEASE SITE	STAGE	ESIMATED RELEASE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	Temp. Shift Direction	COMMENTS
W03-01	Kendall Creek Hatchery April release	fed fry	100,000	1,2,1H1,2,1,1			chill	
W03-02	Bridge Camp acclimation pond	fed fry	100,000	1,2,1H2,3			chill	
W03-03	Bridge Camp acclimation pond	fed fry	100,000	1,2,1H1,1,1,1			chill	
W03-04	Bridge Camp acclimation pond	fed fry	100,000	1,2,1H1,3,1			chill	
W03-05	Nooksack River midfork	fed fry	100,000	1,2,1H2,2,2			chill	
W03-06	Kendall Creek Hatchery early May release	fed fry	100,000	1,2,1H1,3,3			chill	
W03-07	Kendall Creek Hatchery late May release	fed fry	100,000	1,2,1H1,2,5			chill	
W03-08	Nooksack River - Lummi Tribes	fed fry	1,500	1,2,1H1,1,4			chill	
W03-09	Nooksack River - Nooksack Tribes	fed fry	8,000	1,2,1H1,1,2,2			chill	
W03-10	RSI	unfed fry	20,000	1,2,1H2,1,2			chill	
W03-54	Skokomish River falls	?	55,000	3,2H		0	chill	
W03-55	Tahuya River falls	?	55,000	1,4H		0	chill	
W03-57	Tulalip River	fed fry	1,000,000	1,1,2H		0	chill	
W03-58	Tulalip River	fed fry	700,000	1,1,1,2H		0	chill	
W03-59	Tulalip River	fed fry	250,000	4H		0	chill	
O03-01	North Santiam River	fed fry	820,000				heat	info not yet available
O03-02	Willamette River	fed fry	2,000,000				heat	info not yet available
O03-03	South Santiam River	fed fry	1,400,000				heat	info not yet available
O03-04	Clackamas River	fed fry	950,000				heat	info not yet available
O03-05	Sandy River	fed fry	350,000				heat	info not yet available
O03-06	McKenzie River	fed fry	1,500,000				chill	info not yet available

Table 2 (continued). Summary of thermal mark codes applied to hatchery salmon in Washington and other states in brood year 2003.

SPECIES: CHUM

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
W03-11	TM	2003	2004		chum	Washington	NW	WDFW	Hurd Creek Hatchery	Chimacum Creek summer
W03-12	TM	2003	2004		chum	Washington	NW	WDFW	Hurd Creek Hatchery	Chimacum Creek summer
W03-13	TM	2003	2004		chum	Washington	NW	WDFW	Lilliwaup Hatchery	Hamma Hamma River summer
W03-14	TM	2003	2004		chum	Washington	NW	WDFW	Lilliwaup Hatchery	Hamma Hamma River summer
W03-15	TM	2003	2004		chum	Washington	NW	WDFW	Hurd Creek Hatchery	Jimmycomelately Creek summer
W03-16	TM	2003	2004		chum	Washington	NW	WDFW	Hurd Creek Hatchery	Jimmycomelately Creek summer
W03-17	TM	2003	2004		chum	Washington	NW	WDFW	Lilliwaup Hatchery	Lilliwaup River summer
W03-18	TM	2003	2004		chum	Washington	NW	WDFW	Hurd Creek Hatchery	Salmon Creek summer
W03-19	TM	2003	2004		chum	Washington	NW	WDFW	Big Beef Creek Facility	Big Beef Creek summer
W03-20	TM	2003	2004		chum	Washington	NW	WDFW	Big Beef Creek Facility	Big Beef Creek summer
W03-21	TM	2003	2004		chum	Washington	NW	WDFW	Big Beef Creek Facility	Big Beef Creek summer
W03-43	TM	2003	2004		chum	Washington	SW	WDFW	Grays River Hatchery	Grays River
W03-44	TM	2003	2004		chum	Washington	SW	WDFW	Grays River Hatchery	Grays River and Chinook River
W03-64	TM	2003	2004		chum	Washington	NW	WDFW	George Adams Hatchery	Union River summers
W03-65	TM	2003	2004		chum	Washington	NW	WDFW	George Adams Hatchery	Union River summers
W03-66	TM	2003	2004		chum	Washington	NW	WDFW	George Adams Hatchery	Union River summers
W03-67	TM	2003	2004		chum	Washington	NW	WDFW	George Adams Hatchery	Union River summers
W03-68	TM	2003	2004		chum	Washington	NW	WDFW	George Adams Hatchery	Union River summers
W03-69	TM	2003	2004		chum	Washington	NW	WDFW	George Adams Hatchery	Union River summers
W03-70	TM	2003	2004		chum	Washington	SW	WDFW	Washougal Hatchery	Duncan Creek summers

ID#	RELEASE SITE	STAGE	ESIMATED RELEASE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	Temp. Shift Direction	COMMENTS
W03-11	Chimacum Creek fresh water	eyed egg	31,500	1,1,1,2H		0	chill	
W03-12	Chimacum Creek netpen/estuary	eyed egg	58,500	2,1,1,1H		0	chill	
W03-13	Hamma Hamma River	fed fry	35,000	4H4,1			chill	
W03-14	Hamma Hamma River	eyed egg	35,000	4H		0	chill	
W03-15	JCL Creek - Wood site	eyed egg	30,000	1,2,1H		0	chill	
W03-16	JCL Creek - Valhalla site	eyed egg	40,000	2,2H		0	chill	
W03-17	Lilliwaup River	fed fry	50,000	4H5			chill	
W03-18	Salmon Creek rsi	eyed egg	80,000	1,1,1,1H		0	chill	
W03-19	Big Beef Creek 1	fed fry	20,000	1,2,3H2,1,1			chill	
W03-20	Big Beef Creek 2	fed fry	38,000	1,2,3H1,1,2			chill	
W03-21	Big Beef Creek 3	fed fry	38,000	1,2,3H4			chill	
W03-43	Grays River	fed fry	400,000	4H3,3			chill	
W03-44	Chinook River	fed fry	100,000	4H1,1,1,3			chill	
W03-64	Union River	unfed fry	30,000	H1,1,1,1	0		chill	
W03-65	Union River	unfed fry	30,000	2,1,2H		0	chill	
W03-66	Tahuya River	unfed fry	30,000	H2,3	0		chill	
W03-67	Tahuya River	unfed fry	30,000	H3,1,1	0		chill	
W03-68	Tahuya River	unfed fry	30,000	2,1,2H3,1,1			chill	
W03-69	Tahuya River	unfed fry	30,000	2,4H		0	chill	
W03-70	Duncan Creek	unfed fry	100,000	4,1H2,2			chill	

Table 2 (continued). Summary of thermal mark codes applied to hatchery salmon in Washington and other states in brood year 2003.

SPECIES: SOCKEYE

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
W03-28	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-29	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-30	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-31	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-32	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-33	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-34	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-35	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-36	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-37	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-38	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-39	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-40	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-41	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-42	TM	2003	2004		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Lake Washington
W03-47	TM	2003	2004		sockeye	Washington	NW	Makah Tribes	Makah National Fish Hatchery	Lake Ozette
W03-48	TM	2003	2004		sockeye	Washington	NW	Makah Tribes	Makah National Fish Hatchery	Lake Ozette
W03-49	TM	2003	2004		sockeye	Washington	NW	Makah Tribes	Makah National Fish Hatchery	Lake Ozette
W03-50	TM	2003	2004		sockeye	Washington	NW	Makah Tribes	Makah National Fish Hatchery	Lake Ozette

ID#	RELEASE SITE	STAGE	ESIMATED RELEASE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	Temp. Shift Direction	COMMENTS
W03-28	Cedar River downriver	fed fry	198,000	2,2H2,2,2,2,1			chill	
W03-29	Cedar River upriver	unfed fry	1,100,000	2,2H2,2			chill	
W03-30	Cedar River downriver	unfed fry	1,200,000	2,4H2,2			chill	
W03-31	Cedar River downriver	fed fry	304,000	2,2,2H		0	chill	
W03-32	Cedar River downriver	fed fry	608,000	2,1,1,1H		0	chill	
W03-33	Cedar River downriver	fed fry	620,000	1,1,1,1H		0	chill	
W03-34	Cedar River downriver	fed fry	505,000	1,2,1,1H		0	chill	
W03-35	Cedar River upriver	unfed fry	548,000	2,2H4			chill	
W03-36	Cedar River downriver	fed fry	246,000	4H4			chill	
W03-37	Cedar River upriver	unfed fry	1,028,000	2,2H1,2,1			chill	
W03-38	Cedar River downriver	unfed fry	1,359,000	4H1,2,1			chill	
W03-39	Cedar River downriver	unfed fry	611,000	3,2,1H		0	chill	
W03-40	Cedar River downriver	unfed fry	608,000	4H		0	chill	
W03-41	Cedar River downriver	unfed fry	608,000	3,1,1H		0	chill	
W03-42	Cedar River downriver	unfed fry	608,000	1,1,4H		0	chill	
W03-47	Lake Ozette tributaries	unfed fry	60,000	1,4,1H		0	chill	
W03-48	Lake Ozette tributaries	unfed fry	50,000	2,1,4H		0	chill	
W03-49	Lake Ozette tributaries	unfed fry	10,000	2,1,5H		0	chill	
W03-50	Lake Ozette tributaries	unfed fry	60,000	3,1H		0	chill	

Table 2 (continued). Summary of thermal mark codes applied to hatchery salmon in Washington and other states in brood year 2003.

SPECIES: COHO

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
W03-46	TM	2003	2004		coho	Washington	NW	WDFW	Hurd Creek Hatchery	Dungeness River
W03-53	TM	2003	2004		coho	Washington	SW	WDFW	Washougal Hatchery	Lewis River
W03-56	TM	2003	2004		coho	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River springs
W03-60	TM	2003	2004		coho	Washington	NW	WDFW	Hurd Creek Hatchery	Snow Creek
W03-61	TM	2003	2004		coho	Washington	NW	WDFW	Hurd Creek Hatchery	Snow Creek
W03-62	TM	2003	2004		coho	Washington	NW	WDFW	Hurd Creek Hatchery	Snow Creek

ID#	RELEASE SITE	STAGE	ESIMATED RELEASE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	Temp. Shift Direction	COMMENTS
W03-46	Dungeness River	fed fry	50,000	1,3H		0	chill	
W03-53	Cedar Creek	unfed fry	400,000	4,1H		0	chill	
W03-56	Nooksack River	fed fry	65,000	1,3H		0	chill	
W03-60	Snow Creek	unfed fry	7,500	4,1,1H		0	chill	
W03-61	Andrews Creek	unfed fry	7,500	3,2,1H		0	chill	
W03-62	Crocker Lake	fed fry	18,000	1,2,2,1H		0	chill	

SPECIES: ATLANTIC, KOKANEE, and STEELHEAD

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
W03-45	TM	2003	2004		Atlantics	Washington	west central	WDFW	Cypress Island Fish Farm	broodstock
W03-22	TM	2003	2004		kokanee	Washington	west central	WDFW	Lakewood Hatchery	Alder Lake
W03-23	TM	2003	2004		kokanee	Washington	west central	WDFW	Lakewood Hatchery	Alder Lake
W03-24	TM	2003	2004		kokanee	Washington	west central	WDFW	Lakewood Hatchery	Alder Lake
W03-25	TM	2003	2004		kokanee	Washington	NE	WDFW	Spokane Hatchery	Banks Lake - Spokane Tribes
W03-26	TM	2003	2004		kokanee	Washington	NE	WDFW	Spokane Hatchery	Banks Lake - WDFW
W03-27	TM	2003	2004		kokanee	Washington	NE	WDFW	Spokane Hatchery	Banks Lake - WDFW
W03-51	TM	2003	2004		kokanee	Washington	NE	WDFW	Spokane Tribal Trout Hatchery	Lake Roosevelt
W03-52	TM	2003	2004		kokanee	Washington	NW	WDFW	Lake Whatcom Hatchery	Lake Whatcom
I03-02	TM	2003	2004		kokanee	Idaho	NW	Idaho Dept Fish and Game	Cabinet Gorge Hatchery	Lake Pend Oreille
W03-63	TM	2003	2004		steelhead	Washington	central	WDFW	Wells Hatchery	Columbia River

ID#	RELEASE SITE	STAGE	ESIMATED RELEASE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	Temp. Shift Direction	COMMENTS
W03-45	no release	adult	4,000,000	4H		0	chill	
W03-22	Alder Lake	unfed fry	253,000	1,2,1H		0	chill	
W03-23	American Lake	unfed fry	200,000	1,2,1H		0	chill	
W03-24	Summit Lake	unfed fry	155,000	1,2,1H		0	chill	
W03-25	Banks Lake	fed fry	300,000	1,2,1H		0	chill	
W03-26	Banks Lake	fed fry	550,000	1,2,1H		0	chill	
W03-27	Banks Lake	fingerling	900,000	1,1,2H		0	chill	
W03-51	Lake Roosevelt	fed fry	300,000	4H		0	chill	
W03-52	Lake Whatcom	fed fry	5,500,000	4H		0	chill	
I03-02	Lake Pend Oreille	fed fry	17,000,000	2,1H		0	chill	
W03-63	Columbia River	fed fry	75,000	5H		0	chill	