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**Thermal Mark Patterns Applied to Salmon from Alaska, Washington,
Treaty Tribes and Other Northwest States for Brood Year 2002**

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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 2002 brood year. It includes release numbers where known and mark patterns applied in Alaska, Washington, Oregon 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 on-going 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 2002 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 65 different mark groups. To date, more than 921 million marked fish have been released. Strontium marking continued for the fourth 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 2002 salmon in Washington State (WDF&W and State treaty tribes), Oregon and other western states is presented in Table 2. More than 31 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 2002 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 2002.

SPECIES: CHINOOK

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK02-01	TM	2002	2004		CHINOOK	Alaska	Southeast	NSRAA	Medvejie Hatchery	Medvejie
AK02-02	TM	2002	2004		CHINOOK	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK02-03	TM	2002	2004		CHINOOK	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK02-04	TM	2002	2004		CHINOOK	Alaska	Southeast	NSRAA	Medvejie Hatchery	Medvejie
AK02-05	TM	2002	2003		CHINOOK	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Ressurrection Bay
AK02-06	TM	2002	2003		CHINOOK	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Crooked Creek
AK02-07	TM	2002	2003		CHINOOK	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Cook Inlet

ID#	MARK NAME	STAGE	WEIGHT	LENGTH	ESIMATED RELEASE	RBr CODE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	COMMENTS
AK02-01	MEDVEJIE02A				1,500,000	1:1.4,2.3	4,3H			
AK02-02	HIDDENFALLSU02CHIN				1,200,000	1:1.4,2.2	4,2H			
AK02-03	DIPAC02CHIN				600,000	1:1.4	4H			
AK02-04	MEDVEJIE02B				600,000	1:1.3,2.3	3,3H			
AK02-05	FORTRICHARDSON02CCHIN				200,000	1:1.2,2.5	2,5H			
AK02-06	FORTRICHARDSON02BCHIN				315,000	1:1.2,2.4	2,4H			
AK02-07	FORTRICHARDSON02ACHIN				300,000	1:1.2,2.3	2,3H			

SPECIES: COHO

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK02-27	TM	2002	2004		COHO	Alaska	Southeast	AKI	Port Armstrong Hatchery	Port Armstrong
AK02-28	TM	2002	2003		COHO	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Ship & Jim Creek
AK02-29	TM	2002	2004		COHO	Alaska	Southeast	NSRAA	Medvejie Hatchery	Medvejie
AK02-30	TM	2002	2004		COHO	Alaska	Southeast	DIPAC	Gastineau Hatchery	Macaulay
AK02-31	TM	2002	2003		COHO	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Bear Lake
AK02-32	TM	2002	2003		COHO	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK02-33	TM	2002	2003		COHO	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK02-34	TM	2002	2004		COHO	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
AK02-27	PORTARMSTRONG02COHO				200,000	1:1.5	5H			
AK02-28	FORTRICHARDSON02ACOH				640,000	1:1.5	5H			
AK02-29	MEDVEJIE02COHO				2,500,000	1:1.4,2.2	4,2H			
AK02-30	DIPAC02COHO				800,000	1:1.4	4H			
AK02-31	FORTRICHARDSON02BCOH				240,000	1:1.4	4H			
AK02-32	TRAILLAKES02LGCOHO				150,000	1:1.3,2.3+3.2	3,3H2			
AK02-33	TRAILLAKES02SMCOHO				450,000	1:1.3,2.3	3,3H			
AK02-34	WHN02COHO				300,000	1:1.3	3H			

Table 1 (continued). Summary of thermal mark codes applied to Alaska hatchery salmon in Brood Year 2002.

SPECIES: CHUM

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK02-08	TM	2002	2003		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK02-09	TM	2002	2003		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK02-10	TM	2002	2003		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK02-11	TM	2002	2003		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK02-12	TM	2002	2003		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK02-13	TM	2002	2003		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK02-14	TM	2002	2003		CHUM	Alaska	Southeast	NSRAA	Medvejie Hatchery	Medvejie
AK02-15	TM	2002	2003		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK02-16	TM	2002	2003		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK02-17	TM	2002	2003		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK02-18	TM	2002	2003		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK02-19	TM	2002	2003		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK02-20	TM	2002	2003		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK02-21	TM	2002	2003		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK02-22	TM	2002	2003		CHUM	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK02-23	TM	2002	2003		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Summer
AK02-24	TM	2002	2003		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK02-25	TM	2002	2003		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK02-26	TM	2002	2003		CHUM	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
AK02-08	AMALGA02B				8,000,000	1:1.6+2.6	6H6			
AK02-09	BOATHARBOR02				15,000,000	1:1.6+2.4	6H4			
AK02-10	LIMESTONE02				15,000,000	1:1.6+2.5	6H5			
AK02-11	GASTINEAU02B				7,000,000	1:1.6+2.3,3.3	6H3,3			
AK02-12	GASTINEAU02A				20,000,000	1:1.6+2.3	6H3			
AK02-13	AMALGA02B				40,000,000	1:1.4	4H			
AK02-14	DEEPINLET02B				20,000,000	1:1.5	5H			
AK02-15	NAKATINLET02FALL				8,000,000	1:1.4+2.5	4H5			
AK02-16	NEETS BAY02FALL				20,000,000	1:1.4, 2.2n	4,2nH			
AK02-17	KAKE02				questionable	1:1.4+2.3	4H3			
AK02-18	ANITABAY02				15,000,000	1:1.3,2.4n	3,4nH			
AK02-19	DEEPINLET02A				14,000,000	1:1.4	4H			
AK02-20	NEETS BAY02SUM				36,000,000	1:1.3+2.4	3H4			
AK02-21	TAKATZ02CHUM				42,000,000	1:1.3+2.2	3H2			
AK02-22	WHN02CHUM				75,000,000	1:1.3,2.4	3,4H			
AK02-23	NAKATINLET02SUM				16,000,000	1:1.3,2.4n+3.2	3,4nH2			
AK02-24	HIDDENFALLS02				38,000,000	1:1.3,2.3	3,3H			
AK02-25	KENDRICK02				10,000,000	1:1.3,2.2n	3,2nH			
AK02-26	PORTCHALMERS02				25,000,000	1:1.3	3H			

Table 1 (continued). Summary of thermal mark codes applied to Alaska hatchery salmon in Brood Year 2002.

SPECIES: SOCKEYE

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK02-46	TM	2002	2003		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Tahltan Lake
AK02-47	TM	2002	2003		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK02-48	TM	2002	2003		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK02-49	TM	2002	2004		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK02-50	TM	2002	2003		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Tatsamenie Lake
AK02-51	TM	2002	2003		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK02-52	TM	2002	2003		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Tatsamenie Lake
AK02-53	TM	2002	2003		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Big Lake
AK02-54	TM	2002	2004		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK02-55	TM	2002	2004		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK02-56	TM	2002	2003		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Hidden Lake
AK02-57	TM	2002	2003		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Tahltan Lake
AK02-58	TM	2002	2003		SOCKEYE	Alaska	Southeast	SSRAA	Burnett Inlet Hatchery	McDonald Lake
AK02-59	TM	2002	2004		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK02-60	TM	2002	2004		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK02-61	TM	2002	2003		SOCKEYE	Alaska	Southcentral	PWSAC	Main Bay Hatchery	Main Bay
AK02-62	TM	2002	2003		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Tutsumena Lake
AK02-63	TM	2002	2003		SOCKEYE	Alaska	Southeast	POWHA	Klawock River Hatchery	Klawock Lake
AK02-64	TM	2002	2003		SOCKEYE	Alaska	Southeast	SSRAA	Burnett Inlet Hatchery	Hugh Smith Lake
AK02-65	TM	2002	2003		SOCKEYE	Alaska	Southeast	SSRAA	Burnett Inlet Hatchery	Hugh Smith Lake

ID#	MARK NAME	STAGE	WEIGHT	LENGTH	ESIMATED RELEASE	RBr CODE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	COMMENTS
AK02-46	TAHLTAN02	Fed Fry	0.16		2,622,535	1:1.7	7H			
AK02-47	BEARLAKE02B				1,000,000	1:1.6	6H			
AK02-48	SWEETHEART02	Fed Fry	0.16		525,790	1:1.5,2.2	5,2H			
AK02-49	BEARLAKE02C				250,000	1:1.5,2.4	5,4H			
AK02-50	TATSAMENIE02FED	Fed Fry	0.18		442,035	1:1.4+2.3	4H3			
AK02-51	BEARLAKE02A				700,000	1:1.5,2.3	5,3H			
AK02-52	TATSAMENIE02UNFED	Emergent Fry	0.17		911,378	1:1.4	4H			
AK02-53	BIGLAKE02				1,500,000	1:1.5	5H			
AK02-54	SPEELARM02E/SM	ES			1,500,000	1:1.4,2.4n	4,4nH			
AK02-55	SPEELARM02L/SM	LS			1,500,000	1:1.4,2.3	4,3H			
AK02-56	HIDDENLAKE02				1,100,000	1:1.4,2.2	4,2H			
AK02-57	TUYA02				1,124,248	1:1.7+2.3	7H3			
AK02-58	NECKCREEK02				500,000	1:1.3,2.5	3,5H			
AK02-59	SPEELARM02L/LG	LL			1,500,000	1:1.3,2.4	3,4H			
AK02-60	SPEELARM02E/LG	EL			1,500,000	1:1.3,2.3n	3,3nH			
AK02-61	MAINBAY02				8,000,000	1:1.3,2.2	3,2H			
AK02-62	TUTSUMENA02				6,000,000	1:1.3	3H			
AK02-63	KLAWOCK02	Fed + Emergent Fry			364,587	1:1.2,2.3	2,3H			
AK02-64	HUGHSMITH02SM	E/S			225,000	1:1.2,2.2,3.3	2,2,3H			
AK02-65	HUGHSMITH02LG	L/L			225,000	1:1.2,2.2,3.2	2,2,2H			

Table 1 (continued). Summary of thermal mark codes applied to Alaska hatchery salmon in Brood Year 2002.

SPECIES: PINK

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK02-35	TM	2002	2003		PINK	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK02-36	TM	2002	2003		PINK	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK02-37	TM	2002	2003		PINK	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK02-38	TM	2002	2003		PINK	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK02-39	TM	2002	2003		PINK	Alaska	Southcentral	PWSAC	Armin F. Koernig Hatchery	Armin F. Koernig
AK02-40	TM	2002	2003		PINK	Alaska	Southcentral	PWSAC	Armin F. Koernig Hatchery	Armin F. Koernig
AK02-41	TM	2002	2003		PINK	Alaska	Southcentral	PWSAC	Armin F. Koernig Hatchery	Armin F. Koernig
AK02-42	TM	2002	2003		PINK	Alaska	Southeast	AKI	Port Armstrong Hatchery	Port Armstrong
AK02-43	TM	2002	2003		PINK	Alaska	Southeast	AKI	Port Armstrong Hatchery	Port Armstrong
AK02-44	TM	2002	2003		PINK	Alaska	Southcentral	PWSAC	Cannery Creek Hatchery	Cannery Creek
AK02-45	TM	2002	2003		PINK	Alaska	Southeast	AKI	Port Armstrong Hatchery	Port Armstrong

ID#	MARK NAME	STAGE	WEIGHT	LENGTH	ESIMATED RELEASE	RBr CODE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	COMMENTS
AK02-35	WHN0L2PINK				40,000,000	1:1.8+2.5	8H5			
AK02-36	WHN0L1PINK				40,000,000	1:1.8+2.3	8H3			
AK02-37	WHN02EPINK				40,000,000	1:1.8	8H			
AK02-38	DIPAC02PINK				1,500,000	1:1.5	5H			
AK02-39	AFK02L2				50,000,000	1:1.4+2.5	4H5			
AK02-40	AFK02L1				50,000,000	1:1.4+2.3	4H3			
AK02-41	AFK02E				50,000,000	1:1.4	4H			
AK02-42	PORTARMSTRONG02L				15,000,000	1:1.3+2.4	3H4			
AK02-43	PORTARMSTRONG02M				15,000,000	1:1.3+2.3	3H3			
AK02-44	CCH02				140,000,000	1:1.3,2.3	3,3H			
AK02-45	PORTARMSTRONG02E				15,000,000	01:01.3	3H			

Table 2. Summary of thermal mark codes applied to hatchery salmon in Washington and other states in brood year 2002.

SPECIES: CHINOOK

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
W02-41	TM	2002	2003		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W02-42	TM	2002	2003		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W02-43	TM	2002	2003		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W02-44	TM	2002	2003		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W02-45	TM	2002	2003		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W02-46	TM	2002	2003		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W02-47	TM	2002	2003		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W02-48	TM	2002	2003		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W02-49	TM	2002	2003		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W02-50	TM	2002	2003		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W02-51	TM	2002	2003		chinook	Washington	NW	WDFW	Kendall Creek Hatchery	Nooksack River spring
W02-52	TM	2002	2003		chinook	Washington	NW	Tulalip Tribes	Bernie Kai Kai Gobin Hatchery	Samish River fall
W02-53	TM	2002	2003		chinook	Washington	NW	Tulalip Tribes	Bernie Kai Kai Gobin Hatchery	Samish River fall
W02-54	TM	2002	2003		chinook	Washington	NW	Tulalip Tribes	Bernie Kai Kai Gobin Hatchery	Wallace River fall
W02-55	TM	2002	2003		chinook	Washington	NW	Tulalip Tribes	Bernie Kai Kai Gobin Hatchery	Wallace River fall
W02-56	TM	2002	2003		chinook	Washington	NW	Tulalip Tribes	Bernie Kai Kai Gobin Hatchery	Samish River summer
W02-59	TM	2002	2003		chinook	Washington	NW	WDFW	LLTK Lilliwaup Hatchery	George Adams fall
W02-61	TM	2002	2003		chinook	Washington	NW	WDFW	LLTK Lilliwaup Hatchery	George Adams fall
W02-63	TM	2002	2003		chinook	Washington	NW	WDFW	LLTK Lilliwaup Hatchery	Hamma Hamma River summer
W02-65	TM	2002	2003		chinook	Washington	NW	WDFW	LLTK Lilliwaup Hatchery	Hamma Hamma River summer
W02-75	TM	2002	2003		chinook	Washington	south central	USFWS	Spring Creek National Fish Hatchery	White Salmon River tule fall
W02-103	TM	2002	2003		chinook	Washington	central	Yakima Tribe	Cle Elum Hatchery	Yakima River spring

ID#	RELEASE SITE	STAGE	Total Released	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	Temp. Shift Direction	COMMENTS
W02-41	on-station April release	fed fry	56,000	1,4H4,2				chill
W02-42	Excelsior Creek	fed fry	210,000	5H4				chill
W02-43	Nooksack River midfork	fed fry	200,000	4H3,3				chill
W02-44	on-station early May release	fed fry	56,000	4H2,3				chill
W02-45	Excelsior Creek	fed fry	100,000	4H5				chill
W02-46	Excelsior Creek	fed fry	110,000	6H2,2,2				chill
W02-47	on-station late May release	fed fry	66,000	4H6				chill
W02-48	Nooksack River mainstem	fed fry	7,000	4H2,2,2,3				chill
W02-49	Nooksack River south fork	fed fry	3,000	4H6				chill
W02-50	rsi 1	unfed fry	42,000	5H4				chill
W02-51	rsi 2	unfed fry	42,000	5H4				chill
W02-52	Snohomish River	fed fry	1,200,000	3,3H			0	chill
W02-53	Snohomish River	fed fry		3,4H			0	chill
W02-54	Snohomish River	fed fry	500,000	2,2H4				chill
W02-55	Snohomish River	fed fry		2,2H			0	chill
W02-56	Snohomish River	fed fry	200,000	3,2H			0	chill
W02-59	Hamma Hamma River	fry	60,000	4H			0	chill
W02-61	Hamma Hamma River	fry		4H			0	chill
W02-63	Hamma Hamma River	fed fry	40,000	3,3H			0	chill
W02-65	Hamma Hamma River	fed fry		3,2H			0	chill
W02-75	Spring Creek	unfed fry		? 7,5H6,6				chill
W02-103	Yakima River	unfed fry	63,000	H2,2,2	0			chill

Table 2.(continued) Summary of thermal mark codes applied to hatchery salmon in Washington and other states in brood year 2002.

SPECIES: CHUM

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
W02-57	TM	2002	2003		chum	Washington	NW	WDFW	Hurd Creek Hatchery	Salmon Creek summer
W02-58	TM	2002	2003		chum	Washington	NW	WDFW	Hurd Creek Hatchery	Salmon Creek summer
W02-60	TM	2002	2003		chum	Washington	NW	WDFW	LLTK Lilliwaup Hatchery	George Adams fall
W02-62	TM	2002	2003		chum	Washington	NW	WDFW	LLTK Lilliwaup Hatchery	Hamma Hamma River summer
W02-64	TM	2002	2003		chum	Washington	NW	WDFW	LLTK Lilliwaup Hatchery	Hamma Hamma River summer
W02-66	TM	2002	2003		chum	Washington	NW	WDFW	LLTK Lilliwaup Hatchery	Lilliwaup River summer
W02-70	TM	2002	2003		chum	Washington	NW	WDFW	Big Beef Creek Facility	Big Beef Creek summer
W02-71	TM	2002	2003		chum	Washington	NW	WDFW	Big Beef Creek Facility	Big Beef Creek summer
W02-72	TM	2002	2003		chum	Washington	NW	WDFW	Big Beef Creek Facility	Big Beef Creek summer
W02-73	TM	2002	2003		chum	Washington	SW	WDFW	Grays River Hatchery	Grays River summer
W02-74		2002	2003		chum	Washington	NW	WDFW	Grays River Hatchery	Grays River summer
W02-76	TM	2002	2003		chum	Washington	NW	WDFW	Hurd Creek Hatchery	Chimacum Creek summer
W02-77	TM	2002	2003		chum	Washington	NW	WDFW	Hurd Creek Hatchery	Chimacum Creek summer
W02-78	TM	2002	2003		chum	Washington	NW	WDFW	Hurd Creek Hatchery	Chimacum Creek summer
W02-79	TM	2002	2003		chum	Washington	NW	WDFW	Hurd Creek Hatchery	Jimmycomelately Creek summer
W02-80	TM	2002	2003		chum	Washington	NW	WDFW	Hurd Creek Hatchery	Jimmycomelately Creek summer
W02-81	TM	2002	2003		chum	Washington	SW	WDFW	Chinook River Hatchery	Chinook River summer
W02-82	TM	2002	2003		chum	Washington	SW	WDFW	Chinook River Hatchery	Chinook River summer
W02-86	TM	2002	2003		chum	Washington	NW	WDFW	George Adams Hatchery	Union River summer
W02-87	TM	2002	2003		chum	Washington	NW	WDFW	George Adams Hatchery	Union River summer
W02-89	TM	2002	2003		chum	Washington	NW	WDFW	Bingham Creek Hatchery	Satsop Springs regular run
W02-90	TM	2002	2003		chum	Washington	SW	WDFW	Washougal Hatchery	Duncan Creek summer
W02-91	TM	2002	2003		chum	Washington	SW	WDFW	Washougal Hatchery	Duncan Creek summer
W02-92	TM	2002	2003		chum	Washington	SW	WDFW	Washougal Hatchery	Duncan Creek summer
W02-93	TM	2002	2003		chum	Washington	SW	WDFW	Washougal Hatchery	Duncan Creek summer

ID#	RELEASE SITE	STAGE	Total Released	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	Temp. Shift Direction	COMMENTS
W02-57	Salmon Creek fry release	fry	50,000	5H5				chill
W02-58	Salmon Creek rsi	unfed fry	50,000	5H			0	chill
W02-60	Hamma Hamma River	fry		3H			0	chill
W02-62	Hamma Hamma River	fed fry	40,000	3,3H3,3				chill
W02-64	Hamma Hamma River	fed fry		4H			0	chill
W02-66	Lilliwaup River	fed fry	80,000	3,3H5				chill
W02-70	Big Beef Creek 1	fed fry	31,000	2,2,2H4				chill
W02-71	Big Beef Creek 2	fed fry	31,000	2,2,2H2,2				chill
W02-72	Big Beef Creek 3	fed fry	31,000	2,2,2H4				chill
W02-73	Grays River	fed fry	400,000	4H4,2				chill
W02-74	Grays River	fed fry		3H4,2				chill
W02-76	Chimacum Creek fresh water	fry	40,000	1,2,2H			0	chill
W02-77	Chimacum Creek netpen/estuary	fry	20,000	3,2H			0	chill
W02-78	Chimacum Creek netpen/estuary	fry		3,3H			0	chill
W02-79	JCL Creek - woods site	fry	14,000	1,5H			0	chill
W02-80	JCL Creek - Valhalla site	fry	14,000	5H			0	chill
W02-81	Chinook River	fed fry	100,000	4H6				chill
W02-82	Chinook River	fed fry		3H6				chill
W02-86	Union River eyed egg release	eyed egg	45,000	5H			0	chill
W02-87	Union River fry release	fry	45,000	5H5				chill
W02-89	Satsop Springs	unfed fry	220,000	5H			0	chill
W02-90	Duncan Creek	unfed fry	250,000	1,2n,3H6				chill
W02-91	Duncan Creek	unfed fry		1,3H6				chill
W02-92	Duncan Creek	unfed fry		1,3H6				chill
W02-93	Duncan Creek	unfed fry		1,2H6				chill

Table 2. (continued) Summary of thermal mark codes applied to hatchery salmon in Washington and other states in brood year 2002.

SPECIES: SOCKEYE

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
W02-01	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-02	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-03	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-04	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-05	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-06	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-07	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-08	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-09	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-10	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-11	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-12	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-13	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-14	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-15	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-16	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-17	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-18	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-19	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-20	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-21	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-22	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River

ID#	RELEASE SITE	STAGE	Total Released	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	Temp. Shift Direction	COMMENTS
W02-01	Cedar River, airport site	unfed fry	290,000	7H		0		chill
W02-02	Cedar River, airport site	unfed fry	290,000	1,2,2,2H		0		chill
W02-03	Cedar River, airport site	unfed fry	290,000	H2,3,3	0			chill
W02-04	Cedar River, airport site	unfed fry	290,000	H3,2,2	0			chill
W02-05	Cedar River, airport site	fed fry	290,000	3,2H		0		chill
W02-06	Cedar River, airport site	fed fry	195,000	3,2H		0		chill
W02-07	Cedar River, airport site	fed fry	195,000	3H		0		chill
W02-08	Cedar River, airport site	fed fry	290,000	H2,1,4	0			chill
W02-09	Cedar River, airport site	fed fry	195,000	3,3H		0		chill
W02-10	Cedar River, Landsburg site	unfed fry	5,000,000	5H3				chill
W02-11	Cedar River, Landsburg site	unfed fry		5H3				chill
W02-12	Cedar River, Landsburg site	unfed fry		5H4				chill
W02-13	Cedar River, Landsburg site	unfed fry		5H4				chill
W02-14	Cedar River, Landsburg site	unfed fry		5H4				chill
W02-15	Cedar River, Landsburg site	unfed fry		H4,2,2,2	0			chill
W02-16	Cedar River, Landsburg site	unfed fry		H5,2,2	0			chill
W02-17	Cedar River, Landsburg site	unfed fry		H5,2,2	0			chill
W02-18	Cedar River, Landsburg site	unfed fry		H5,2,2	0			chill
W02-19	Cedar River, Landsburg site	unfed fry		H5,2	0			chill
W02-20	Cedar River, Landsburg site	unfed fry		H4,3	0			chill
W02-21	Cedar River, Landsburg site	unfed fry		H5,2,2	0			chill
W02-22	Cedar River, Landsburg site	unfed fry		H4,2,2	0			chill

Table 2. (continued) Summary of thermal mark codes applied to hatchery salmon in Washington and other states in brood year 2002.

SPECIES: SOCKEYE

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
W02-23	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-24	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-25	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-26	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-27	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-28	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-29	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-30	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-31	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-32	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-33	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-34	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-35	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-36	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-37	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-38	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-39	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-40	TM	2002	2003		sockeye	Washington	NW	WDFW	Landsburg Hatchery	Cedar River
W02-83	TM	2002	2003		sockeye	Washington	NW	Makah Tribes	Makah National Fish Hatchery	Lake Ozette
W02-84	TM	2002	2003		sockeye	Washington	NW	Makah Tribes	Makah National Fish Hatchery	Lake Ozette
W02-85	TM	2002	2003		sockeye	Washington	NW	Makah Tribes	Makah National Fish Hatchery	Lake Ozette

ID#	RELEASE SITE	STAGE	Total Released	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	Temp. Shift Direction	COMMENTS
W02-23	Cedar River, Landsburg site	unfed fry		H4,3,2	0			chill
W02-24	Cedar River, Riviera site	unfed fry	3,000,000	3,2H2				chill
W02-25	Cedar River, Riviera site	unfed fry		H4,2,2	0			chill
W02-26	Cedar River, Riviera site	unfed fry		4H4				chill
W02-27	Cedar River, Riviera site	unfed fry		4H3				chill
W02-28	Cedar River, Riviera site	unfed fry		4,2H3				chill
W02-29	Cedar River, Riviera site	unfed fry		4H2,2				chill
W02-30	Cedar River, Riviera site	unfed fry		4H3				chill
W02-31	Cedar River, Riviera site	unfed fry		H4,2,2	0			chill
W02-32	Cedar River, Riviera site	unfed fry		H4,2	0			chill
W02-33	Cedar River, trestle site	unfed fry	4,000,000	3,2H4				chill
W02-34	Cedar River, trestle site	unfed fry		3,2H4				chill
W02-35	Cedar River, trestle site	unfed fry		H3,2	0			chill
W02-36	Cedar River, trestle site	unfed fry		H5,4	0			chill
W02-37	Cedar River, trestle site	unfed fry		H5,4	0			chill
W02-38	Cedar River, trestle site	unfed fry		H3,4	0			chill
W02-39	Cedar River, trestle site	unfed fry		H4,4	0			chill
W02-40	Cedar River, trestle site	unfed fry		H5,3	0			chill
W02-83	Elk Lake	fingerling	120,000	4H			0	heat
W02-84	Stony Creek, group 1	fingerling	61,000	5H			0	heat
W02-85	Stony Creek, group 2	unfed fry	61,000	3H			0	heat

Table 2. (continued) Summary of thermal mark codes applied to hatchery salmon in Washington and other states in brood year 2002.

SPECIES: ATLANTIC, COHO, KOKANEE

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
W02-99	TM	2002	2003		Atlantic	Washington	SW	Cypress Island, Inc.	Cypress Island Fish Farm	Annual brood stock
W02-67	TM	2002	2003		coho	Washington	NW	WDFW	Hurd Creek Hatchery	Crocker Lake
W02-68	TM	2002	2003		coho	Washington	NW	WDFW	Hurd Creek Hatchery	Crocker Lake
W02-69	TM	2002	2003		coho	Washington	NW	WDFW	Hurd Creek Hatchery	Crocker Lake
W02-88	TM	2002	2003		coho	Washington	NW	WDFW	Bingham Creek Hatchery	North River late wild
W02-96	TM	2002	2003		coho	Washington	SW	WDFW	Washougal Hatchery	Lewis River late
W02-97	TM	2002	2003		coho	Washington	SW	WDFW	Washougal Hatchery	Lewis River late
W02-94	TM	2002	2003		kokanee	Washington	NW	WDFW	Lakewood Hatchery	Lake Whatcom
W02-95	TM	2002	2003		kokanee	Washington	NW	WDFW	Bellingham Hatchery	Lake Whatcom
W02-98	TM	2002	2003		kokanee	Washington	NW	WDFW	Lake Whatcom Hatchery	Lake Whatcom
W02-100	TM	2002	2003		kokanee	Washington	NW	WDFW	Lakewood Hatchery	Lake Whatcom
W02-101	TM	2002	2003		kokanee	Washington	NW	WDFW	Spokane Hatchery	Lake Whatcom
W02-102	TM	2002	2003		kokanee	Washington	NW	WDFW	Spokane Hatchery	Lake Whatcom
I02-01	TM	2002	2003		kokanee	Idaho	N	IDFG	Cabinet Gorge Hatchery	Lake Pend Oreille

ID#	RELEASE SITE	STAGE	Total Released	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	Temp. Shift Direction	COMMENTS
W02-99	Hood Canal	net pen	100,000	4H			0	chill
W02-67	Snow Creek	unfed fry	26,000	2,2,2H			0	chill
W02-68	Andrews Creek	unfed fry	26,000	3,2H			0	chill
W02-69	Crocker Lake	fry	20,000	2,4H			0	chill
W02-88	Forks Creek	eyed egg	300,000	4H			0	chill
W02-96	Lewis River	group 1	22,000	3,2H			0	chill
W02-97	Lewis River	group 2	50,000	5H			0	chill
W02-94	Alder Lake	fry	500,000	2,3H			0	chill
W02-95	Shannon Lake	fry	300,000	5H			0	dry/chill
W02-98	Lake Whatcom	unfed fry	5,500,000	6H			0	dry/chill
W02-100	American Lake	fry	240,000	5H			0	chill
W02-101	Banks Lake	spring fry	700,000	4H			0	chill
W02-102	Banks Lake	fall fingerling	1,050,000	2,2H			0	chill
I02-01	Lake Pend Oreille	fed fry	4,000,000	H5	0			chill