Exhibit 1

Exhibit 1

Water Rights Applications 1990-2004
Humboldt County

Application ID	Applicant	Date Filed	Date Issued
A029681	Cole	3/7/1990	8/21/1997
A029981	Garberville Water Company	7/22/1991	5/15/1995
A029994	Young	8/26/1991	12/22/1992
A030424	Ruth	1/11/1995	3/4/1998
A030611	Brown	4/14/1997	11/30/1999
A030941	Sun Tan Glen Subdivision	9/17/1999	5/28/2002
A030970	Morais	10/14/1999	
A031073	California Department of Transportation	6/20/2000	
A031164	City of Rio Dell California Municipal Water Corporation	3/20/2001	
A031222	Shannon	8/23/2001	
A031439	Mierau	9/2/2003	

Water Rights Applications 1990-2004
Marin County

Application ID	Applicant	Date Filed	Date Issued
A029905	Evergreen Alliance Golf Ltd	2/14/1991	2/6/1997
A029993	Marin-Bolinas Botanical Garden	8/21/1991	5/2/1994
A030121	Nan Tucker McEvoy	4/30/1992	11/9/1995
A030658	Murphy	10/24/1997	
A031014	Lucas Film Ltd	1/21/2000	
A031036	Minne A Corda	3/21/2000	
A031076	McEvoy	6/20/2000	
A031077	McEvoy	6/20/2000	

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Mendocino County

Application ID	Applicant	Date Filed	Date Issued
A029645	Helluva Vineyards LLC	1/18/90	9/28/90
A029646	Helluva Vineyards LLC	1/18/90	9/28/90
A029672	Henneberg	3/6/90	7/1/91
A029723	Ford	4/23/90	10/30/91
A030052	Romer	12/26/91	8/27/92
A029719	Foster	4/11/90	9/23/92
A029995	Wilson	8/26/91	10/8/92
A029984	HH LLC	8/7/91	2/28/94
A029795	Ciancutti	8/13/90	3/30/94
A029933	Martin	4/2/91	2/20/96
A029679	Redwood Grove Vineyards	3/7/90	1/17/97
A030373	Bewley-Motluk Family	6/20/94	5/12/97
A029907	Scommegna Family Vineyards	2/14/91	2/29/00
A030560	Moerman	8/22/96	5/23/00
A030564	Moerman	8/28/96	5/23/00
A030036	Johnson Orchards	11/12/91	7/26/00
A029711	Bennett	4/4/90	4/19/01
A029744	Schwindt	5/14/90	
A029753	Nick Alexander Imports	5/25/90	
A029760	Brutocao Vineyards	6/11/90	
A029763	Nelson and Sons	6/22/90	
A029764	Nelson and Sons	6/15/90	
A029765	Nelson and Sons	6/15/90	
A029783	Middleridge Vineyards	7/31/90	
A029810	Day Ranch	8/29/90	
A029910	Savoy	3/4/91	
A029911	Savoy	3/4/91	
A030015	M-R Vineyard	10/10/91	
A030024	Cahn	10/24/91	
A030161	Thomas	7/16/92	
A030162	Thomas	7/16/92	
A030162A	Thomas	7/16/92	
A030162B	Thomas	7/16/92	
A030163	Thomas	7/16/92	
A030170	Gannon	8/4/92	
A030290	White	10/12/93	
A030349	Light	4/13/94	
A030363	Todd	5/10/94	
A030448	Jackson	6/6/95	
A030449	Jackson	6/6/95	
A030451	Elk County Water District	6/8/95	
A030474	Cahn	8/15/95	
A030479	Jones	9/12/95	
A030492	Wallo	10/24/95	
A030533	Schoeneman	4/23/96	
A030553	Milovina Brothers	7/1/96	
A030554	Milovina Brothers	7/1/96	
A030615	Bartolomei	4/24/97	

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A030638	Redwood Valley County Water District	8/20/97	
A030656	Brutocao Vineyards	10/21/97	
A030683	Frey Vineyards	2/27/98	
A030717	Jenks	6/19/98	
A030718	Elke	6/19/98	
A030721	Boltz	6/30/98	
A030722	Donnelly Creek Vineyards	7/1/98	
A030735	Meyer	7/28/98	
A030761	Marks	9/14/98	
A030779	Feliz Creek	10/2/98	
A030780	Feliz Creek	10/2/98	
A030789	Wentzel	10/9/98	
A030792	Day Ranch	10/9/98	
A030794	Demuth	10/13/98	
A030804	Moreno and Company	11/2/98	
A030808	Green	11/9/98	
A030828	Battinich	12/15/98	
A030859	Gaines	4/9/99	
A030860	Baker	4/9/99	
A030861	Redwood Grove Vineyards	4/9/99	
A030869	Navarro Fairhills Ranch	4/14/99	
A030870	Navarro Fairhills Ranch	4/14/99	
A030872	Klindt	4/19/99	
A030873	Mathias	4/19/99	
A030877	Fetzer	4/27/99	
A030878	Fetzer	4/27/99	
A030892	Point Arena Water Works	5/13/99	
A030912	Lalanne Vineyards	7/1/99	
A030926	Donovan	7/29/99	
A030930	Rose Family Vineyards	8/18/99	
A030934	White	9/17/99	
A030966	Holland	10/14/99	
A030967	Cold Creek Compost Inc.	10/14/99	
A030982	Rosetti	11/22/99	
A030986	Haiku Vineyard	11/22/99	
A030987	Fetzer Vineyards	11/22/99	
A030988	Fetzer Vineyards	11/22/99	
A030994	Savoy	1/21/00	
A031003	Elke	1/21/00	
A031004	Wiley	1/21/00	
A031040	Henwood	4/13/00	
A031057	McGhee	5/12/00	
A031059	Linholme Properties	6/5/00	
A031060	Linholme Properties	6/5/00	
A031080	Schoeneman	6/20/00	
A031085	Patiana Organic Vineyards	7/27/00	
A031086	Masut Du Ho Vineyards	7/31/00	
A031087	Masut Du Ho Vineyards	7/31/00	
A031091	Fetzer	8/21/00	

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A031092	Fetzer Vineyards	8/22/00	
A031093	Fetzer	8/22/00	
A031094	Fetzer Vineyards	8/22/00	
A031096	William Charles and Nancy Charles Trust	8/29/00	
A031097	Wasson	8/30/00	
A031105	Fetzer	9/15/00	
A031133	Cakebread Vineyards	1/30/01	
A031135	Bergner	1/30/01	
A031138	Robert Mondavi Properties	1/30/01	
A031139	Robert Mondavi Properties	1/30/01	
A031140	Robert Mondavi Properties	1/30/01	
A031141	Robert Mondavi Properties	1/30/01	
A031159	Fetzer	3/14/01	
A031171	Tri Marguerite Vineyards	3/26/01	
A031178	Hayward	4/27/01	
A031179	East Sanel Irrigation Co.	5/1/01	
A031181	Shadowbrook Farms	5/3/01	
A031183	Rustic Retirement	5/10/01	
A031184	Lakeview Vineyards	5/15/01	
A031194	Alaska Water Exports	6/6/01	
A031195	Alaska Water Exports	6/6/01	
A031250	Kuimelis	11/19/01	
A031253	Golden	12/10/01	
A031255	Gerhart	12/11/01	
A031258	Rhodes	12/17/01	
A031259	Mid Mountain Vineyards	12/18/01	
A031260	Rhodes	12/18/01	
A031261	East Sanel Irrigation Co.	12/19/01	
A031282	Golden	1/23/02	
A031296	M-R Vineyard	2/19/02	
A031305	Surprise Valley Ranch, Inc.	3/14/02	
A031311	Rosetti	3/26/02	
A031315	Milovina	4/8/02	
A031336	Bloom	6/20/02	
A031337	Redwood Valley County Water District	6/20/02	
A031339	Golden Vineyards	6/27/02	
A031344	Geomar Corporation	7/9/02	
A031348	Christensen	8/8/02	
A031360	Carley	9/23/02	
A031383	Dolan & Son	1/15/03	
A031386	Fetzer Vineyards	1/22/03	
A031387	Beckstoffer Ranches	1/22/03	
A031399	Milovina	2/25/2003	
A031401	Mendocino County Russian River Flood Control	3/10/03	

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A031418	Cox	4/24/03	
A031425	Stonecraft Homes	5/15/03	
A031426	Welch	5/15/03	
A031434	Donnelly Creek Vineyards	7/28/03	
A031435	Richardson	7/28/03	
A031437	Buich Family Trust	7/30/03	
A031445	Walker Lake Association	9/11/03	
A031446	Middleridge Vineyards	9/11/03	
A031447	Omnium Estates	9/16/03	
A031461	Salans	11/10/03	
A031463	Chase	11/13/03	
A031464	Flight Rail Corporation	11/25/03	
A031467	Sullivan	11/25/03	

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Application ID	Applicant	Date Filed	Date Issued
A029773	Stonebridge Cellars Inc	7/6/1990	9/17/1991
A029689	Moore	3/14/1990	6/3/1992
A029845	Vivette & Company	10/25/1990	9/15/1992
A029775	Huneeus	7/6/1990	5/5/1993
A029871	Clifton	12/3/1990	8/19/1993
A029747	Heide	5/21/1990	9/21/1993
A030193	Sinskey	11/17/1992	11/16/1993
A029640	Ahmann	1/12/1990	4/18/1994
A030098	Peck	4/8/1992	5/9/1994
A029699	Hubert Paul & Colleen Lauffs Trustees	3/26/1990	5/11/1994
A029700	Hubert Paul & Colleen Lauffs Trustees	3/26/1990	5/11/1994
A029701	Hubert Paul & Colleen Lauffs Trustees	3/26/1990	5/11/1994
A029702	Hubert Paul & Colleen Lauffs Trustees	3/26/1990	5/11/1994
A030247	Kirkland Vineyards	4/28/1993	12/6/1994
A030206	The Hess Collection Winery	12/23/1992	12/20/1994
A029882	Usibelli Coal Mines Inc.	12/17/1990	2/15/1995
A030004	V Sattui Winery	9/13/1991	3/8/1995
A030005	V Sattui Winery	9/13/1991	3/8/1995
A030006	V Sattui Winery	9/13/1991	3/8/1995
A029903	De Simoni	2/6/1991	6/13/1995
A029742	Komes	5/14/1990	6/22/1995
A030125	York Creek Vineyards	5/5/1992	11/1/1995
A030303	Napa Valley Country Club	11/15/1993	11/6/1995
A030236	Beringer Blass Wine Estates	3/17/1993	11/28/1995
A030118	William Hardin Trust	4/28/1992	1/26/1996
A030119	Jeanne Hardin Trust	4/28/1992	1/26/1996
A029972	Young	7/1/1991	2/6/1996
A030245	Pride	4/19/1993	2/28/1996
A030356	Clos du Val Wine Company	4/18/1994	3/18/1996
A030242	Shafer	4/12/1993	4/2/1996
A030102	Robert Mondavi Vineyards	4/13/1992	6/10/1996
A030103	Robert Mondavi Vineyards	4/13/1992	6/10/1996
A030104	Robert Mondavi Vineyards	4/28/1992	6/10/1996
A030023	Kenefick	10/22/1991	6/14/1996
A030122	Ferrari-Carano Vineyards & Winery	4/30/1992	6/15/1996
A030073	Clarke	3/5/1992	7/3/1996
A029820	Taylor	9/11/1990	7/15/1996
A029825A	Taylor	9/18/1990	7/15/1996
A029825B	Martin	9/18/1990	7/15/1996
A030244	Congdon	4/16/1993	8/28/1996
A030421	Nerlove	12/27/1994	10/18/1996
A030293	Heublein, Inc.	10/19/1993	2/10/1997
A030392	Domaine Carneros	8/15/1994	5/7/1997
A030229	Acacia Winery	3/1/1993	5/12/1997
A030512	Kerson	2/29/1996	10/8/1997
A030471	Jamieson Vineyards	8/9/1995	10/16/1997
A030119A	Alana Hardin Trust	4/28/1992	12/10/1997
A030119B	Lam	4/28/1992	12/10/1997
A030441	Olney	5/4/1995	1/12/1998
A030032	Mahoney	11/6/1991	2/3/1998
A030396	Hudson	9/7/1994	7/10/1998

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A030753	Borge	8/25/1998	11/29/1999
A030386	Franciscan Estates Selections	7/21/1994	12/13/1999
A030610	Sinskey	4/11/1997	2/23/2000
A030825	Murray	12/11/1998	2/25/2000
A030630	Dean	7/8/1997	3/3/2000
A029909	The Hess Collection Winery	2/28/1991	3/29/2000
A030678	Konrad	2/19/1998	3/29/2000
A030483	Nichelini	9/29/1995	5/15/2000
A030484	Nichelini	9/29/1995	5/15/2000
A029740	Scully	5/7/1990	5/24/2000
A030485	California Wine Company - Gilson	9/29/1995	6/23/2000
A030486	California Wine Company - Gilson	9/29/1995	6/23/2000
A030513	California Wine Company - Hopman	2/29/1996	6/26/2000
A030514	California Wine Company - Hopman	2/29/1996	6/26/2000
A030515	California Wine Company - Gilson	2/29/1996	6/26/2000
A030516	California Wine Company - Gilson	2/29/1996	6/26/2000
A030490	Heitz Wine Cellars	10/11/1995	7/3/2000
A030491	Heitz Wine Cellars	10/11/1995	7/3/2000
A030096	Lewelling Family Trust	4/7/1992	9/19/2000
A030675	Franciscan Vineyards	1/26/1998	1/17/2001
A030504	Truchard	1/19/1996	4/5/2001
A030505	Truchard	1/19/1996	4/5/2001
A030561	Truchard	8/23/1996	4/5/2001
A030664	Wilson	12/5/1997	6/19/2001
A030584	The Hess Collection Winery	12/18/1996	4/4/2002
A030627	R Stanley Dollar 1996 Trust	7/8/1997	3/13/2003
A029475	Atwater	3/7/1990	
A029676	Atwater	3/7/1990	
A029677	Atwater	3/7/1990	
A029686	David	3/13/1990	
A029687	David	3/13/1990	
A029736	Berglund Family Vineyards	5/2/1990	
A029748	Ciudaj	5/23/1990	
A029767	Vista del Lago Vineyards	6/26/1990	
A029800	Leonard	8/17/1990	
A029801	Leonard	8/17/1990	
A029852	Beckstoffer Vineyard	11/6/1990	
A029853	Howell Mountain Mutual Water Co.	11/6/1990	
A029865	Pine Lake Ranch	11/26/1990	
A029892	Vintage Grapevine Inc.	1/22/1991	
A029929	Chateau Potelle, Inc.	3/22/1991	
A029951	Moskowite	5/9/1991	
A029973	Cadden	7/1/1991	
A030012	Hudson	10/4/1991	
A030144	Temple	6/15/1992	
A030252	Beckstoffer Vineyard	5/6/1993	
A030253	Beckstoffer Vineyard	5/6/1993	
A030322	Russ Trust	12/17/1993	
A030323	Russ Trust	12/17/1993	
A030384	Nichelini	7/21/1994	
A030408	US Bureau of Land Management	10/14/1994	
A030473	WHL Corporation	8/15/1996	

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A030476	Pine Ridge Winery	8/28/1995	
A030477	Pine Ridge Winery	8/28/1995	
A030539	Gomez	5/15/1996	
A030542	Dellagana	5/23/1996	
A030545	Pope Valley Partners	6/3/1996	
A030546	Pope Valley Partners	6/3/1996	
A030594	Grgich Hills Cellar	2/27/1997	
A030597	Komes	3/4/1997	
A030605	Domaine Carneros	4/7/1997	
A030655	Nemerever	10/21/1997	
A030674	Brodman	1/26/1998	
A030679	Cain Vineyard	2/23/1998	
A030690	Newton Vineyard	4/1/1998	
A030697	Stagecoach Vineyard	4/21/1998	
A030698	Sydney Apartments	4/21/1998	
A030725	G3 Properties	7/8/1998	
A030726	City of St. Helena	7/9/1998	
A030737	O'Shaughnessy	7/30/1998	
A030738	Ladera Vineyards	7/30/1998	
A030739	Renteria Family Trust	7/30/1998	
A030740	Sutter Home Winery	7/30/1998	
A030756	G3 Properties	8/31/1998	
A030803	Levitin	10/26/1998	
A030824	Hudson	12/10/1998	
A030827	Ghisletta	12/15/1998	
A030856	Cutler	4/7/1999	
A030857	Talcott	4/7/1999	
A030858	Vintner	4/7/1999	
A030913	Newton Vineyard	7/1/1999	
A030914	Keebler	7/1/1999	
A030929	Kirlin	8/18/1999	
A030935	McFeely	9/17/1999	
A030950	Dina	9/17/1999	
A030959	Acacia Winery	10/14/1999	
A030965	Turnbull Wine Cellars	10/14/1999	
A031020	Roy	2/29/2000	
A031034	Gordon Family Ranch	3/21/2000	
A031262	Ash Creek Vineyards	12/19/2001	
A031279	Joseph Emil Usibelli Trust	1/22/2002	
A031280	Markham Vineyards	1/22/2002	
A031312	Work	3/27/2002	
A031345	Carpenter Family Revocable Trust	7/16/2002	
A031361	UCC Vineyard Fund	9/25/2002	

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Application ID	Applicant	Date Filed	Date Issued
A029662	Collard	2/20/1990	8/8/1991
A029789	Spight Properites	8/3/1990	8/19/1991
A029678	Kulleberg	3/7/1990	10/4/1991
A029671	Bacigalupi	3/5/1990	11/15/1991
A029682	Gallo Vineyards	3/7/1990	1/24/1992
A029836	Siles	10/11/1990	2/6/1992
A029755	Gallo Vineyards	5/30/1990	5/5/1992
A029847	Morelli	10/30/1990	8/26/1992
A029698	Sleepy Hollow Properties	3/23/1990	9/9/1992
A029912	Farrow	3/7/1991	1/7/1993
A029637	Paradise Vineyards	1/8/1990	5/18/1993
A030132	Page	5/21/1992	1/12/1994
A029986	Vera H. Kreck Trust	8/7/1991	2/17/1994
A030173	Ridge Vineyards	8/27/1992	3/22/1994
A030114	Friese	4/24/1992	6/3/1994
A030109	Thornton	4/22/1992	11/16/1994
A029666	Domaine Chandon	2/26/1990	12/15/1994
A030382	Timber Cove County Water District	7/18/1994	3/13/1995
A030438	Sea Ranch Water Company	3/22/1995	7/13/1995
A030124	York Creek Vineyards	5/5/1992	11/1/1995
A030125	York Creek Vineyards	5/5/1992	11/1/1995
A030196	Domaine Chandon	12/8/1992	6/19/1996
A030298	Stuller	10/28/1993	6/13/1997
A029893	Pacheco	1/25/1991	10/30/1997
A030609	McDowell	4/10/1997	11/24/1998
A029901	Russian River County Water District	2/6/1991	1/6/1999
A030703	Griffin	5/14/1998	4/14/1999
A030199	Riverview II Homeowners Association	12/10/1992	8/5/1999
A030412	Fieldstone Winery & Vineyard	11/10/1994	10/25/1999
A030673	DeMartin	1/26/1998	1/25/2000
A030391	Sweetwater Springs Road Mutual Water Company	8/15/1994	3/9/2000
A030397	Helmholz	9/7/1994	3/23/2000
A030282	Ferrari-Carano Vineyards & Winery	9/22/1993	9/13/2000
A029802	Splan	8/17/1990	1/18/2001
A030797	Brecht	10/15/1998	3/8/2001
A029848	Furth	11/1/1990	3/30/2001
A029849	Furth	11/1/1990	3/30/2001
A029850	Furth	11/1/1990	3/30/2001
A029998	Carr	8/26/1991	10/18/2001
A030437	Maniar	3/20/1995	11/12/2002
A030051	Cloverleaf Ranch	12/23/1991	6/26/2003
A029652	Gilardi	1/31/1990	
A029703	Jackson Family Investments	3/27/1990	
A029704	Jackson Family Investments	3/27/1990	
A029705	Jackson Family Investments	3/27/1990	

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A029706	Jackson Family Investments	3/27/1990	
A029707	Jackson Family Investments	3/27/1990	
A029708	Jackson Family Investments	3/27/1990	
A029715	Ferrari-Carano Vineyards & Winery	4/9/1990	
A029737	Town of Windsor Water District	5/2/1990	
A029754	Foothill Property Owners' Association	5/29/1990	
A029772	Sass	7/5/1990	
A029784	Burton	7/31/1990	
A029811	Jackson Family Investments	8/31/1990	
A029858	Grigg	11/13/1990	
A029983	Ogg	8/2/1991	
A030077	Cazadero Water Company	3/17/1992	
A030126	Marcheschi	5/11/1992	
A030181	Ritchie	10/5/1992	
A030182	E & J Gallo Winery	10/5/1992	
A030186	Austin Acres Mutual Water Company	10/19/1992	
A030187	Williams	10/26/1992	
A030223	Sonoma Cutrer Vineyards	2/10/1993	
A030259	Galef	6/10/1993	
A030336	Degrange	3/22/1994	
A030364	Rickards	5/18/1994	
A030365	Rickards	5/18/1994	
A030368	Arthur Kunde & Sons	6/7/1994	
A030369	Wildwood Vineyards	6/7/1994	
A030405	Wildwood Vineyards	9/30/1994	
A030429	E R Stern Trust	2/10/1995	
A030518	Calpine Geyers Company	3/8/1996	
A030534	Maniar	4/26/1996	
A030536	Alta Vista Ranch	4/26/1996	
A030558	Cardoza	8/21/1996	
A030579	Roche	10/16/1996	
A030583	Jackson Family Investments	12/10/1996	
A030592	Kullberg	12/18/1997	
A030635	Ricci	8/1/1997	
A030663	City of Healdsburg	12/5/1997	
A030687	Klein Foods	3/23/1998	
A030688	Klein Foods	3/23/1998	
A030695	Hanna	4/10/1998	
A030711	Financial Portfolio Ltd.	6/8/1998	
A030730	Neerhout	7/20/1998	
A030744	Bendich	8/7/1998	
A030745	Michael	8/7/1998	
A030746	McMicking	8/7/1998	
A030747	McMicking	8/7/1998	
A030748	McMicking	8/7/1998	
A030781	Five Bar S Ranch & Vineyards	10/2/1998	
A030782	JVW Corporation	10/2/1998	

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A030787	Bodega Water Company	10/9/1998	
A030788	Williams & Selyem	10/9/1998	
A030796	Sonoma Cutrer Vineyards	10/15/1998	
A030798	Ridge Vineyards	10/15/1998	
A030799	McMicking	10/15/1998	
A030800	Klein Foods	10/15/1998	
A030801	Wetzel	10/15/1998	
A030802	Bavarian Lion Company	10/15/1998	

Water Rights Applications 1990-2004

County	Total Issued	Total Pending	Total Applications	Total Domestic	Total Small Use	Total
Humboldt	6	5	11	33	46	**90**
Marin	3	5	8	2	10	**20**
Mendocino	17	138	155	100	133	**388**
Napa	77	69	146	43	67	**256**
Sonoma	41	59	100	63	99	**262**
Total	**144**	**276**	**420**	**241**	**355**	**1,016**

Exhibit 2

Exhibit #2

DECLARATION OF STAN GRIFFIN

I, Stan Griffin, declare as follows.

1. I am the Northern California President of Trout Unlimited of California. I have served in that capacity for two years. I have personal knowledge of the facts state herein except for matters stated upon information and belief, which I believe to be true; if asked, I could competently testify thereto.

2. Prior to my present capacity at Trout Unlimited (TU), I have held the following positions as a member of TU: Regional Vice-President for Hawaii, California, Nevada (1994-2001); and, Member of National Board of Trustees (1994-2001). I have been a member of TU, the nation's largest and leading coldwater fisheries conservation organization, since 1982.

3. During this time, I have either served or am presently serving on the following committees, councils, or groups: Federal Pacific Fishery Management Council (1993-1999); California Advisory Committee for Salmon and Steelhead Trout (1989-present); California Steelhead Subcommittee (1991-present); California Department of Fish and Game Fisheries Restoration Grant Program (1988-present); Technical Advisory Committee to Marin Municipal Water District's Lagunitas Creek Restoration Project (1996-present); Tomales Bay Advisory Committee (1983-present); and, Official Alternate on California Coho Recovery Planning Team (2003).

4. During this time, I have received the following awards or special recognitions of my work on behalf of salmon, steelhead, and trout in California: California Legislature Assembly Resolution, Joint Committee on Fisheries and Aquaculture (Mar. 13, 2002) (special commendation for restoration work); Trout Unlimited 2001 Mortenson Award (annual award for outstanding member leadership); National Oceanic Atmospheric Administration (National

Marine Fisheries Service) 2000 Environmental Hero Award; Trout Unlimited 1996 Distinguished Service Award; and, United Anglers of California 1992 Iron Man Award.

5. In general, my volunteer work for TU has focused on (a) salmon and steelhead recovery in California, particularly coho salmon, (b) the water rights practices, policies, and processes of the California State Water Resources Control Board (Water Board), and (c) the intersection between (a) and (b).

6. In approximately 1982, I began my volunteer work on behalf of TU and started to focus on salmon and steelhead issues in Marin County. Specifically, my work at this time involved Lagunitas and Corte Madera Creeks. This early work resulted in landmark successes with the Water Board and Marin Municipal Water District to restore coho salmon in Lagunitas Creek, in Marin.

7. At that time, I began to expand the scope of my work to include policy and legislative advocacy in addition to grassroots restoration work. Also, at that time, I participated in many watershed and community meetings in Marin County and gradually began participating and monitoring salmon and steelhead issues in Sonoma County, specifically the Russian River.

8. In approximately 1985 or 1986, I began to focus more on Russian River issues in Sonoma County, and in particular on regulation of in-river gravel mining operations in the mainstem Russian to protect and restore coho salmon. This focus ultimately resulted in me working on guidelines for Sonoma County gravel issues (the "Aggregate Resource Management Plan").

9. By approximately 1990, I was regularly monitoring and working on Russian River issues relevant to salmon and steelhead recovery, including securing anadromous fish passage at Healdsburg Dam. I developed this focus because it furthered TU's mission to protect, conserve,

and restore native salmon and steelhead and their habitats in California. The Russian River used to be one of California's healthiest and most abundant coho salmon and steelhead rivers. It also had a legendary past as a recreational fishery, and with its close proximity to the San Francisco Bay Area could become one again once the fish are recovered.

I.
History of Water Rights Issues in Russian River Watershed

10. It was during this time in the first part of the 1990s that I began to become aware through attending meetings and workshops in the Russian watershed that the Water Board was faced with a flood of applications for new water rights permits under the California Water Code to appropriate water, and that if granted these new permits for appropriation could adversely impact water availability in tributaries to the Russian mainstem for coho and steelhead recovery.

11. Consequently, I began to investigate the issue by attending more meetings, gathering information about the Water Board water rights process, and ultimately discovering how to participate in that process as a public citizen on behalf of TU and on behalf of the public trust resources coho salmon and steelhead.

12. This process of investigation and self-education uncovered what I thought was a really significant fish restoration problem. I concluded that state and federal agencies, including the Water Board, California Department of Fish and Game (CDFG), and National Marine Fisheries Service (which I believe is now called NOAA Fisheries), and the general population were paying little attention to the problem.

13. I exercised my citizen and public interest opportunity under the Water Code in 1991 and filed my first formal protest, dated March 14, 1991 (A.29715), to an application for a new water rights permit to appropriate water from a tributary to the Russian, on public interest,

environmental, and public trust grounds, and specifically the cumulative impacts and water availability issues related to salmon and steelhead protection and restoration. Since that first protest, I have continued to protest additional applications for appropriations and today have approximately a total of 82 protests against applications for approximately 112 new water rights permits and diversions in the Russian River watershed.[1]

14. By the middle 1990s, the Water Board must have accepted it had a large issue on its hands because it noticed and conducted workshops on January 4, 1995 and November 7, 1996 to address information relating to water rights issues on the Russian River. I participated in these workshops and made presentations of TU's position regarding the impact to coho salmon and steelhead from permitting new water rights to appropriate water from the tributaries to the Russian. These workshops were well attended and caused a lot of attention on the issue. However, the Water Board, to the best of my knowledge, did not provide or announce any official policy or practice changes at this time.

15. The next thing that really happened was in August 1997 when the Water Board published something called "*SWRCB Staff Report, Russian River Watershed, Proposed Actions to be taken by the Division of Water Rights on Pending Water Right Applications within the Russian River Watershed*" (Aug. 15, 1997) (1997 Staff Report). During this time, I kept receiving official notices of more and more applications for new permits being filed with the Water Board. Many of these applications were related to expansion and vineyard growth in Sonoma and Mendocino counties. The 1997 Staff Report basically proposed actions and a process for dealing with pending applications.

16. Although the Water Board acknowledged in 1997 that a general consensus existed

[1] There is a numerical discrepancy between protests and applications because many official notices consolidate multiple applications or proposed diversions.

for a comprehensive watershed management plan to address long-term fisheries protection and restoration (*see* 1997 Staff Report at 4-5), it did not provide or announce any official policy or practice changes consistent with this admission at that time. I continued to file protests against new applications during this period, because no new policy or practice was created to adequately ensure salmon and steelhead protection.

17. On October 23, 1997, the Water Board conducted another workshop where it indicated that "[u]nless directed otherwise, Division staff will proceed with processing applications as outlined . . ." in the 1997 Staff Report. *See* SWRCB Workshop Meeting Agenda, Oct. 23, 1997.

18. Because of the combination of experiencing the complicated Water Board process and my opinion that the 1997 Staff Report was incomplete and seriously flawed in its approach to water availability issues and cumulative effects on salmonids, around this time, I contacted Dr. William Trush, of McBain and Trush, a highly respected North Coast consulting firm, to assist TU in attempting to correct the shortcomings of the 1997 Staff Report and develop a sound scientific approach to flow and biological conditions for salmonids in these mid-coastal streams as to water rights permits issued by the Water Board. For TU, Dr. Trush has submitted into this ongoing effort the following documents:

a. McBain and Trush, Trout Unlimited, A Commentary on the SWRCB Staff Report: *Russian River Watershed, Proposed Actions To Be Taken By The Division Of Water Rights On Pending Water Rights Applications Within The Russian River Watershed, August 15, 1997*, dated March 12, 1998;

b. McBain and Trush, Trout Unlimited, *Commentary on the SWRCB Staff Protocol For Water Allocations In The Russian River And Other North Coastal Rivers*, dated May 4, 1999; and,

c. McBain and Trush, Trout Unlimited, *Allocating Streamflows to Protect and Recover Threatened Salmon and Steelhead Populations in the Russian River and other North Coast Rivers of California*, dated July 10, 2000 (Draft).

19. The Water Board must have also felt that the 1997 Staff Report was lacking because they noticed and conducted another workshop on the issue and assembled a peer review panel to address information submitted at the workshop. The Water Board-Division of Water Rights established the peer review to respond to meetings with TU, NOAA Fisheries, and CDFG regarding fishery concerns. I believe this technical workshop took place on January 31, 2000. Subsequently, Drs. Peter Moyle, UC-Davis, and Mathais Kondolf, UC-Berkeley, published a peer review, "*Fish Bypass Flows for Coastal Watersheds: A Review of Proposed Approaches for the State Water Resources Control Board,*" on June 12, 2000, which found several Water Board practices flawed and presented recommendations for improving the process based on review of competing proposals and comments. This workshop was also heavily attended.

20. Yet again, on November 27, 2000, the Water Board conducted another noticed workshop on the issue to ostensibly discuss improving the water rights process and procedures. On July 18, 2001, staff released an analysis of this meeting responding in chart format to comments received. For the sixth and final time, the Water Board conducted a noticed workshop on September 5, 2001 to discuss improving the water rights process and procedures. TU provided written comments and attended each noticed workshop that occurred over this six year-workshop span.

21.. During this entire time period I continued to file formal protests to new applications; however, again, I am not aware of the Water Board announcing any new policy or practice changes, including adopting or modifying and adopting the 1997 Staff Report. I last filed a formal protest on August 2, 2004, because as of that date, to the best of my knowledge, no new Water Board policy or practice had been created to adequately ensure salmon and steelhead protection and recovery, despite this issue being squarely on the radar since at least 1991.

II.
Water Rights Permit Application Process

22. In my experience, the water rights application process in the Russian River watershed typically follows certain steps. First, the Water Board sends a notice in the mail stating that an application is now on file for a new appropriation of water. This notice contains a brief description of the proposed project. Second, within the time allowed to me, I review the notice and determine whether it is for additional appropriation from a tributary to the Russian River; if so, I formally file a written protest on public interest, environmental and public trust grounds. Remarkably, given the size of the tributary watersheds for which an application typically proposes to appropriate water, the scale of the proposed project often includes dams in excess of 100 feet in height. (*See* A. 29715.) Third, the Water Board, Division of Water Rights staff (Division Staff) acknowledges in written form that my protest is acceptable.

23. Division Staff has never rejected a TU protest against an application for a *new* water rights permit. However, in some cases, the notice relates to a petition or request to modify an *existing* water right permit to change the amount, purpose, or place of diversion. I also review these notices and periodically protest them as well. Division Staff has accepted some of these protests and rejected others. Division Staff, in these cases, has never provided any basis for rejection as compared to acceptance, nor has staff indicated that there is any policy or guidelines in use to prevent inconsistencies in decisions on protests in these cases. I have not been able to discover the rhyme or reason to why some are summarily accepted and others summarily rejected in these limited instances.

24. To return to the application process, it usually takes about two to three months from me receiving a noticed application for a new permit and Division Staff acceptance of my

protest. Fourth, Division Staff generally directs the applicant to contact TU as the protestant and request withdrawal of the protest. I have withdrawn only one protest during my work on this issue. In that specific case, the Applicant approached TU and adequately described certain factual, material misstatements in the Division Staff original notice of the application, *and* made a persuasive showing that the application, if approved, would not impact salmon and steelhead. Although TU has a strong preference for collaborative solutions, in my experience, all most all applicants request withdrawal without proposing permit conditions or other fish protection requirements at this stage.

25. The next and fifth step is generally nothing. Nothing happens for most of my TU protests as far as public involvement is allowed. TU has filed approximately 82 protests against approximately 112 applications since our first protest in 1991. Of those applications, only 12 have advanced to the next step that I am aware of in the process for public input and involvement, which is a Division Staff noticed field visit and site inspection to the view the Applicant's project. I have received notice of and attended only 12 field visits despite almost a decade of involvement as a public interest voice in the water rights application process. I have never seen or been provided with any schedule regarding the administrative timeline for an individual application.

26. On the field visit and inspection aspect of the water rights application process, the Division Staff notice of a field visit sets a time and date and typically informs me that the purpose of meeting is to view the proposed project and resolve my protest. I attend all noticed field visits for which I have protested an application. Sometimes staff from NOAA Fisheries and CDFG attends, in addition to Division Staff, the applicant, and occasionally the applicant's

consultant, if they have one, and other interested members of the public.[2] During these visits, Division Staff attempt to mediate or facilitate my withdrawal of the relevant protest. The focus is almost exclusively on whether I will withdraw the protest and very little discussion or effort, in my experience, takes place on whether sufficient or new evidence exists to show the proposed project will not contribute to the harm of listed species.

27. At each field visit that I have attended, Division Staff inform the Applicant that the next step, because I will not withdraw TU's protest, is for staff to issue a "Division Decision." My first noticed filed trip was September 28, 2000 (A.29772 and A.30126). My last noticed filed trips were in the summer of 2003. I have not received one Division Decision for any of the 12 applications for which I have attended field visits. Therefore, it is unclear to me exactly what a Division Decision is. I can find no policy or practice guideline describing Division Decisions.

28. As mentioned previously, I have withdrawn only one protest. Division Staff action and final Water Board action on applications for new water rights permits are subject to the California Environmental Quality Act (CEQA). Of all my protests regarding approximately 112 applications, in the past twelve years only one application has progressed through the CEQA process to the point of publication of draft environmental documentation, specifically a Draft Initial Study and Proposed Negative Declaration (A.30933). To my knowledge, *none* of the other applications that I have protested have progressed to this stage in CEQA, even those applications which I protested in the early 90s. I have never seen or been provided with an

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2 I know that the agencies, and in particular NOAA Fisheries, are hard-pressed to meet the grind of the permitting review process because I have received letters stating that: "With the limited NMFS staff assigned to assist the Board in reviewing applications, it is extremely difficult to attend the numerous and mandatory public workshops and field inspections without getting our protests dropped from consideration by the Board." Letter from Mr. James Bybee, Habitat Manager, Northern California, NOAA Fisheries to Mr. Harry Schueller, Chief, Division of Water Rights, SWRCB p.1 (Nov. 9, 2000).

administrative schedule or timeline for the CEQA process on an individual application. The same is true for Division production of the "water availability analysis", which serves as the basis for CEQA determinations and Water Code compliance.

III.
Unauthorized Diversions

29. This one particular application for which Division Staff released a Proposed Negative Declaration pursuant to CEQA raises a larger problem with the Water Board's application process for water rights permits; and, frankly the Water Board's failure to monitor and enforce on a consistent, system-wide basis. On April 8, 2002, I received the environmental documentation for the subject application. Then about one year later, on March 28, 2003, Division Staff conducted a formal site visit and inspection to view the proposed project. Two summers earlier, however, on August 31, 2000, I had actually accepted an informal invitation from the applicant to inspect the proposed project *site*. (This application was filed September 17, 1999.) That day, in *2000*, I spent the morning touring the proposed site with the applicant and a representative of NOAA Fisheries. At that time, there was absolutely no physical construction of any manmade barrier in the streambed. However, in the summer of *2003*, when I arrived for the Water Board-noticed field visit, I discovered a *constructed diversion dam* in the exact location that one year earlier had been merely a *proposed site* for construction. This dam had been built in the middle of the waterway, blocked the entire streambed, and appeared to be positioned to capture all rainfall from the smaller sub-watershed on the property. The reservoir that the dam formed was full of water and I did not see any flow bypass mechanism. All of this new evidence post dates the publication of the CEQA documentation and therefore was not analyzed in the Draft Initial Study or Proposed Negative Declaration. However, I was informed during the field

visit that a "Division Decision" was forthcoming on this particular application despite an apparently stale CEQA documents. To date, I have received no such decision.

30. This site visit is an example of a much larger problem with the process. Based on my experience, it is my opinion that this dam (and obvious on-stream reservoir) was built without Water Board permission. Moreover, based on my experience, it is my opinion that this dam was also likely built without the permission of CDFG pursuant to Fish and Game Code section 1600 et seq., which requires approval to manipulate a streambed. Without permission such dams and reservoirs and the diversion of water with them is illegal. When asked whether I would withdraw my protest during the field visit for this application, I remarked that in the summer of 2000 I had not seen a dam constructed instream and that therefore I could not withdraw. Division Staff at that time informed the applicant not to be concerned with my objection about construction of a diversion dam in advance of completion of the application process for a new water rights permit, because so long as an application was on file construction and diversion would be overlooked. I understand that this "grandfathering" policy exists even though the Water Board appears to not have approved any new permits in the last decade.

31. This particular application is emblematic of the same problem with a majority of applications that I have protested. As discussed, the Water Board notices all applications for new permits to appropriate water. A description of the proposed project is included in the notice. A careful reading of the notice can determine whether the proposed project is actually to construct a diversion dam or storage reservoir *or* whether the proposed project seeks a permit for an *already constructed* dam or reservoir. In the case of the later, the notice language may actually state "existing instream dam." Proof of this problem from the notices may also be inferred; notices for not yet constructed facilities clearly state that the project is "to be

constructed."[3]

32. ***I have reviewed all the notices for applications that I have protested and of approximately 112 applications 64 seek a permit for an already constructed dam or reservoir (several in fact involve multiple existing on-stream dams on the same waterway). In other words, 57% of these applications request retroactive permission.*** I make the reasonable assumption that for applications for which I have not protested a similar pattern or percentage exists. It is my understanding that approximately 200 applications are pending before the Water Board just in the Russian River watershed alone and another 40 in the Navarro.

33. Based on my experience, the Water Board and Division Staff informally but publicly condone a policy that does not penalize such applications. I am not aware of any case where an application that seeks a permit for already constructed dams or reservoirs has suffered administratively in the application process; nor am I aware of Division Staff or the Water Board requiring mitigation for any adverse environmental harm associated with these applications. In addition to actual construction in advance of permitting, I believe based on my experience that appropriation of water is occurring in advance of permitting at these dams and reservoirs. In some cases, for example with my earliest protested applications in 1991, this would mean un-permitted appropriation of water may have been occurring for twelve years, *while the relevant application to appropriate is pending*. Finally, it is important to note that in my experience the

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3 In some cases, the proof is even clearer. For example, I received a copy of a reply letter from Division Staff to an applicant, dated October 22, 2002, responding to the applicant's complaint that Division Staff accepted TU's protest. Division Staff stated:

> "In your letter you ask why protests have been accepted against your project when these reservoirs *have been in existence since the 1960s* and no objections were received during construction. It is my understanding that *these reservoirs have been storing water without a valid basis for right for over 40 years* and that this application was filed in order to legalize the use of water as described in your application." (emphasis added)

Letter from Division Staff to Ash Creek Vineyards (A.31262) (Oct. 22, 2002).

application and the subsequent paperwork never states whether the applicant has obtained a 1603 permit from CDFG, a county grading ordinance, or any other affirmative showing of compliance with applicable laws or regulations, even in the case of applications were construction or appropriation has already happened.

IV.
Enforcement, Compliance, and Monitoring

34. I conclude that Division Staff and Water Board enforcement of water rights permits, and particularly those conditions within permits designed to protect and restore salmon and steelhead, is inadequate to prevent continuing harm to listed species. I also conclude that monitoring of compliance with permit conditions is insufficient. In the nine years that I have focused on water rights issues in Sonoma and Mendocino counties I have personally worked with staff from NOAA Fisheries, CDFG, and the Water Board. During this time, at any given moment, to the best of my knowledge, NOAA Fisheries has never had more than 2-3 field staff dedicated to water rights monitoring and enforcement and the application process, CDFG has never had more than 2-3 staff, and the Water Board never more than 6-7 Division Staff for a geographic area in Trout Unlimited and Audubon's petition that is approximately the size of Vermont state. I am not aware of any of these staff regularly monitoring any presently permitted diversion or appropriation.

35. During field visits for review of proposed projects, I consistently raise the issue of permit compliance and monitoring. I have never heard or seen discussed orally or in written form during any individual application process the prospect of real-time flow monitoring equipment becoming a permit condition. In fact, in one instance when I requested the opportunity to be involved in the development of monitoring conditions regarding a particular

application, Division Staff informed me that I had no grounds to participate in such a discussion, despite having timely obtained standing as a protestant to the application. Finally, I am not aware of any instance where the Water Board and/or Division Staff have formally adopted the Joint Guidelines, and specifically the recommendations on monitoring and compliance.

36. I declare under penalty of perjury of the laws of the State of California and the United States of America that the foregoing is true and correct and that this declaration was executed October 27, 2004 at Albany, California.

Respectfully submitted,

Dated: October 27, 2004

Stan Griffin

Exhibit

Exhibit # 3

STATE OF CALIFORNIA - THE RESOURCES AGENCY

DEPARTMENT OF FISH AND GAME
POST OFFICE BOX 47
YOUNTVILLE, CALIFORNIA 94599
(707) 944-5500

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

777 Sonoma Avenue, Room 325
Santa Rosa, California 95404

June 17, 2002

Mr. Ed Anton, Chief
State Water Resources Control Board
P.O. Box 2000
Sacramento, California 95812

Dear Mr. Anton:

In May 2000, DFG and NMFS distributed draft guidelines for maintaining instream flows to protect fisheries resources downstream of water diversions in mid-California coastal streams. These guidelines provided bypass flow recommendations and measures for protecting natural hydrographs that were reviewed and supported by peer review (Moyle et al. 2000). Previously permitted on-stream reservoirs have limited the ability of the SWRCB to use the guideline component concerned with avoiding cumulative impacts. Subsequent analysis and discussions by SWRCB, DFG, and NMFS staff have resulted in an alternative approach for conserving natural hydrographs and assessing cumulative impacts of multiple water projects. This method, which has been adopted by SWRCB staff, involves computation of a Cumulative Flow Impairment Index (CFII).

Although DFG, NMFS, and SWRCB environmental staff are in agreement on the application of this new method, there has been no clear written description of this procedure. Furthermore, the relationship of this procedure to DFG/NMFS guidelines for water diversions has been unstated. For that reason, we have updated DFG/NMFS May 22, 2000 guidelines to include use of the CFII method for conserving natural stream hydrographs and addressing the issue of cumulative impacts. Enclosed are six copies of these updated draft guidelines.

We greatly appreciate the efforts of SWRCB staff in helping to develop components of these guidelines. We look forward to continued opportunities for the State Water Resources Control Board and our agencies to cooperate in the conservation of listed species. If you have any questions or comments concerning the guidelines, contact Dr. William Hearn (NMFS) at (707) 575-6062 or Ms. Linda Hanson (DFG) at (707) 944-5562.

Sincerely,

Mr. James Bybee
NMFS Habitat Manager
Northern California

Mr. Robert W. Floerke, Regional Manager
Department of Fish & Game
Central Coast Region

TABLE OF CONTENTS

ERRATA

These guidelines were initially distributed to the California State Water Resources Control Board on June 17, 2002. Copies were then widely distributed to interested parties. A minor error and inconsistency in the guidelines was subsequently detected. For clarification the following error and intended correction is noted:

On page 7, in paragraph 2 under Section II-B-Item 5 (Protection of the Natural Hydrograph and Avoidance of Cumulative Impacts), Line 16 and Line 18 incorrectly provide a season of October 1 to March 31 for computations of unimpaired runoff. Consistent with Appendix A, the correct season for computation of unimpaired runoff is December 15 to March 31.

DRAFT

Guidelines for Maintaining Instream Flows to Protect Fisheries Resources Downstream of Water Diversions in Mid-California Coastal Streams

1. INTRODUCTION

The California Department of Fish and Game (DFG) and the National Marine Fisheries Service (NMFS) jointly developed draft guidelines for diverting water from central-coastal watersheds in California. Those guidelines, which were dated May 22, 2000, were developed in response to concern that current practices for issuing water rights were not adequate to protect and recover anadromous salmonids in coastal watersheds. These watersheds are often highly regulated, extensively developed and subject to significant levels of impairment. Depletion and storage of stream flows have significantly altered natural hydrological cycles and adversely affected aquatic habitats and resources. Reduced flows also interrupt invertebrate drift, disrupt channel dynamics, increase deposition of fine sediments, inhibit recruitment of spawning gravels, and promote encroachment of riparian and non-endemic vegetation into spawning and rearing areas.

The May 22, 2000 guidelines were developed pursuant to respective agency mandates and missions to protect and restore anadromous salmonids and their habitats. These guidelines provide standard recommended protective terms and conditions to be followed in the absence of site-specific, biological, and hydrologic assessments. The guidelines call for limiting new water right permits to diversions during the winter period (December 15-March 31) when stream flows are generally high. Minimum bypass flows and cumulative maximum rates of diversion are recommended to ensure that streams are adequately protected from new winter diversions. The guidelines also recommend that, except for limited circumstances, storage ponds should be constructed off-stream, rather than on-stream. Water diversions should also be screened using NMFS or DFG screening criteria, and fish passage facilities should be provided where appropriate.

The May 22, 2000 guidelines recommended that conservation of the natural hydrograph and avoidance of significant cumulative impacts could be accomplished by limiting the cumulative maximum rate of diversion from a watershed. The recommended cumulative maximum rate of diversion is equivalent to 15% of the "winter 20% exceedence flow" at the point of diversion. Following its distribution, the State Water Resources Control Board (SWRCB) staff stated that the DFG/NMFS guideline element for protecting the natural hydrograph and limiting cumulative impacts to salmonids was impractical, because many existing, legal storage ponds store 100% of a stream's runoff while they are filling. Therefore, on-stream ponds inherently exceed any maximum rate of diversion, at least temporarily. Rather than adopt a quantitative procedure to address this problem, SWRCB proposed an alternative approach for protecting the natural hydrograph and limiting cumulative impacts of numerous diversions. That alternative approach, described in SWRCB (2001), limits cumulative impacts and conserves the natural hydrograph by limiting the maximum cumulative volume of water that can be diverted in a watershed. Similar to the maximum rate of diversion, this maximum cumulative volume guideline is recommended for projects for which there has been insufficient site-specific, biological assessment of instream flow needs to protect fisheries. DFG and NMFS accept the reasonableness of this alternative "cumulative volume" approach to limiting cumulative impacts. Therefore, this update of the May 22, 2000 guidelines provides a technical description of the calculations required for this alternative method (see Appendix A). This update also reflects a minor change to the May 22, 2000 guidelines by noting that protecting spawning habitat for salmonids is largely achieved through conservation of the natural hydrograph. Except for these two changes, this update of the DFG/NMFS guidelines for maintaining instream flows in Mid-California coastal streams is unchanged from the May 22, 2000 draft guidelines.

These guidelines are recommended for use by permitting agencies, planning agencies and water resource development interests when taking proposed actions that would divert or act to reduce stream flows in California's mid-coastal watersheds containing anadromous salmonids. These guidelines do not constitute a final agency action for purposes of the National Environmental Policy Act or the California Environmental Quality Act. Nor do these guidelines define, or authorize take for purposes of State or Federal Endangered Species Acts. Rather, the guidelines are intended to preserve a level of flow that ensures that anadromous salmonids will not be adversely impacted by diversions. Altering stream flows outside these guidelines may impact salmonids by: blocking and/or delaying migration; reducing usable habitat; impacting habitat quality; stranding fish; entraining fish into poorly screened or unscreened diversions; and increased juvenile mortality resulting from increased water temperatures.

These joint guidelines are organized in two parts. The first, (*Terms and Conditions to be Incorporated into Water Rights Permits for Small Diversions)* consists of specific terms and conditions to be incorporated into water rights permits, issued by the State Water Resources Control Board (SWRCB) for small diversions where adequate site-specific biological data are not available. The guidelines were developed based on the biology and ecology of anadromous salmonids and their habitat requirements. The second part of these guidelines (*Implementation and Effectiveness Monitoring*) is programmatic in nature, addressing watershed-level initiatives necessary to ensure that the standards and protocols are consistent with conserving salmonids and their habitats.

The following guidelines are not developed for use in areas outside of the identified mid-coastal region. NMFS and DFG may develop similar guidelines for other regions of California in the future. Those guidelines should be based on anadromous salmonid habitat requirements, hydrologic characteristics, and other specific factors for those

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areas.

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II. TERMS AND CONDITIONS TO BE INCORPORATED INTO WATER RIGHTS PERMITS FOR SMALL DIVERSIONS

1. Diversions > 3 cfs or > 200 acre-feet

For diversions larger than 3 cfs or greater than 200 acre-feet from streams in watersheds that currently or historically contained anadromous salmonids, water right permit applicants must consult with the NMFS and DFG to plan and conduct a site specific study for the purpose of determining appropriate flow related terms and conditions to be incorporated into the permitted water right. The study plan should include, at a minimum, the following:

1) A habitat based stream needs assessment that incorporates habitat, species, and life history criteria specific to each diverted stream or stream reach;

2) An evaluation of the existing level of impairment (diversion) and limiting factors for salmonid restoration based upon habitat, species, and life history specific criteria for each diverted stream or stream reach;

3) A specific proposal to provide periodic channel maintenance and flushing flows that are representative of the natural hydrograph; and

4) A plan to monitor the effectiveness of stipulated flows and procedures for making subsequent modifications, if necessary.

2. Small Diversions <3 cfs and <200 acre-feet

1) Geographic Limitations

For small diversions less than or equal to 3 cfs and less than or equal to 200 acre-feet, default guidelines have been developed for coastal watersheds from the Mattole River to San Francisco, and for coastal streams entering northern San Pablo Bay. This area generally includes streams within California's Mendocino, Sonoma, Marin, and Napa Counties, as well as a few coastal streams in Humboldt County south of the Eel River. The default guidelines are based on the hydrology and life history requirements of resident anadromous salmonids in this area. For streams within this area, the default guidelines may be incorporated into the terms and conditions of a permitted water right, in lieu of results from site-specific biological studies.

For coastal streams north of the Mattole River or coastal watersheds to the south of San Francisco, DFG and NMFS have yet to develop detailed default guidelines for maintaining stream flows to protect fisheries resources downstream from water diversions. However, until such guidelines are developed, these agencies recommend that, in the absence of site-specific studies, in watersheds north of the Mattole River or south of San Francisco: 1) the diversion season for new water rights permits should be limited to the period of seasonal "high-flows", 2) additional on-stream reservoirs should not be constructed or permitted unless consistent with the exemptions provisions described below, 3) sufficient minimum bypass flows should be maintained to protect fisheries resources, 4) the cumulative maximum rate of withdrawal should be limited to maintain a near natural hydrograph and avoid cumulative impacts, 5) adequate passage and protection measures must be provided to facilitate instream movements of fishes and avoid entrainment in diversion intakes, and 6) the applicant should describe the project specific mechanism(s) that adequately ensure compliance with diversion limits. For coastal watersheds north of the Mattole River or south of San Francisco, default guidelines for the bounds of the diversion season, minimum bypass flows, and cumulative maximum rates of withdrawal have yet to be determined. Until detailed guidelines are available for diversions in these watersheds, applicants seeking diversion permits for those areas should consult with DFG and NMFS for stream flow recommendations.

2) <u>Seasonal Limits on Additional Diversions</u>:

The diversion season will be limited to the period December 15 to March 31. From April 1 to December 14 instantaneous inflow to the point of diversion must equal the instantaneous outflow to downstream reaches past the point of diversion.

Justification: In its water rights proceedings for the Russian River, Navarro River, and Napa River watersheds, the SWRCB has found that new water diversions should be confined to the period December 15 to March 31. This period is the time of highest winter flow and the time when water withdrawals would be least likely to adversely affect fisheries resources. Additional water withdrawals between April 1 and mid-May may adversely affect anadromous salmonids, because flows generally subside during that time, and juveniles typically emigrate during the higher flow events in that period. Additional water withdrawals between May 1 and October 1 may adversely affect salmonids, because rainfall in north-central coastal streams is minimal during that period, and diversions during that time would probably reduce the availability of already limited habitat for juvenile salmonids. Additional water withdrawals between September 1 and December 15 may unnecessarily affect salmonids, because that is a time when flows are relatively low, and high flows are infrequent and sporadic.

3) <u>No Additional Permitting of Small On-stream Reservoirs</u>:

Water diversion projects requiring new permits should avoid construction or maintenance of on-stream dams and reservoirs, including existing unpermitted storage ponds. Thus, storage must be to an off-stream reservoir. Exceptions are provided for special circumstances involving Class III streams as defined by 14 CCR 916, riparian management regulations for protecting watercourses and lake protection zones (see Exemptions below).

Justification: On-stream reservoirs should be prohibited, because they 1) eliminate, within the reservoir footprint, free-flowing stream habitat that may either support listed salmonids or the production of riffle-dwelling aquatic invertebrates that serve as food sources for downstream fishes (Corrarino and Brusven 1983; Resh and Rosenberg 1984; Keup 1988), 2) eliminate or reduce the magnitude and frequency of naturally occurring intermediate and high flows necessary for natural channel maintenance processes, 3) trap coarse bedload material and impede bedload transport, 4) act as barriers to migrating fishes, and 5) provide habitat for non-native aquatic species (*e.g.*, bullfrogs).

4) <u>Maintenance of Minimum Bypass Flows</u>:

Provide bypass flow regimes that adequately protect salmonids and aquatic resources in reaches downstream from the point of diversion. The determination of the bypass flow's adequacy can be based on site specific biological investigations conducted in consultation with NMFS and DFG, or in the absence of site-specific data, it would be not less than the estimated unimpaired February median flow at the point of diversion.

Justification: The unimpaired February median flow guideline is based partly on the observation that (at relatively low to moderate flows) available spawning and incubation habitat is generally positively correlated with discharge, but that naturally higher flows must be sustained for a substantial period of time in order to have "effective spawning and incubation habitat". The February median flow is a conservatively high bypass flow because it conserves "typical" winter flows to which native fishes are adapted. February is generally the wettest month in the 4-county area, and therefore the long-term February median flow is a hydrologic metric that permits diversions only during the higher flows of winter. This is appropriate given uncertainties regarding site specific flow needs for numerous aquatic biological processes (including both invertebrate and vertebrate production). However, it must be recognized that a minimum bypass flow equivalent to the February median does not protect all stream functions including channel maintenance flows, migratory flows in headwaters, and in many small watersheds, spawning flows for salmonids. To protect these latter functions it is necessary to protect the natural hydrograph as described in Item 5 below. The unimpaired February median flow can be estimated using a modification of the SWRCB Stream Simulation model for the Russian River Watershed Region or comparable hydrologic analytical techniques.

5) <u>Protection of the Natural Hydrograph and Avoidance of Cumulative Impacts</u>:

The diversion will be operated with a maximum rate of withdrawal that preserves a natural hydrograph with no appreciable diminishment (<5%) in the frequency and magnitude of unimpaired high flows necessary for channel maintenance (e.g., unimpaired flows with a recurrence interval of 1.5 or 2 years). The diversion will also not appreciably reduce the frequency and magnitude of unimpaired moderate and high flows (*e.g.*, flows higher than median February) used by migrating and spawning fishes in small streams. Unless there is compelling site-specific biological and hydrologic information indicating that additional water can be diverted without adversely impacting anadromous salmonids, diversions should not be permitted or otherwise sanctioned if 1) the <u>cumulative</u> maximum rate of instantaneous withdrawal at the point of diversion exceeds a flow rate equivalent to 15% of the estimated "winter 20% exceedence flow" <u>OR</u> 2) the total cumulative volume of water to be diverted from the stream at historical points of anadromy exceeds 10% of the unimpaired runoff between October 1 and March 31 during normal water years. For projects contributing to a cumulative diversion of 5 to 10% of the normal unimpaired runoff between October 1 and March 31, hydrologic analysis must demonstrate that the project will not cause or exacerbate significant adverse cumulative effects to migration and spawning flows for salmonids. The "winter 20% exceedence flow" is the 20% exceedence value of the stream's daily average flow duration curve for the period December 15 to March 31. Cumulative reduction refers to the effects of this and other permitted or licensed projects as well as diversions under riparian rights.

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Justification: Natural, periodic, intermediate and high flows should be maintained downstream of diversion sites (Barinaga 1996; Poff et al. 1997). High flows are essential for 1) cleansing fine sediments from coarse substrates, 2) removing encroaching vegetation and contributing to the deposition of instream woody cover, and 3) serving as cues for and facilitating the migratory movements of fishes. Protection of intermediate and high flows during winter months must be accomplished through an assessment of cumulative impacts and placing limits on the cumulative rate of instantaneous water withdrawals from the stream, or on the total volume of water diverted. A discussion of the need for and rationale for limiting cumulative maximum instantaneous withdrawals to a portion of the "winter 20% exceedence flow" in northern coastal California streams is provided in NMFS (2000). Procedures for assessing cumulative impacts of water diversions based on the cumulative total volume of diverted water are described in Addendum A.

6) Fish Passage and Protection Measures:

The potential effect of stream flow diversions on upstream and downstream movements of anadromous salmonids must be addressed. If anadromous salmonids have the likely potential to ascend the stream to the point of diversion, then adequate passage facilities and screening at the diversion intake must be provided. Screening must be in accordance with NMFS and DFG's screening criteria.

Justification: Diversion structures and instream reservoirs may block fishes from reaching their natal spawning areas. Diversion structures also have the potential to entrain fishes, with resulting mortality.

7) **Special circumstances allowing onstream reservoirs:**

If a proposed diversion is located 1) in a stream reach where fishes or non-fish aquatic species were not historically present upstream, and 2) where the project could not contribute to a cumulative reduction of more than 10% of the natural instantaneous flow in any reach where fish are at least seasonally present, and 3) where the project would not cause the dewatering of any fishless stream reach supporting non-fish aquatic species, then no stream flow or fish passage protection measures are required. By cumulative reduction we refer to the effects of this and other permitted or licensed projects as well as diversions under riparian rights. For diversion sites meeting the above three criteria, on-stream reservoirs may be permitted.

Justification: The need for the above instream flow and fish protection measures is dependent upon the quality of the stream at the diversion site. Instream diversions and on-stream reservoirs on a limited number of ephemeral headwater streams naturally without fish or other aquatic species (*i.e.*, Class 3 streams, under 14 CCR 916) will not significantly impact fisheries resources, if the flows of streams with fishes (*i.e.*, Class 1 streams, under 14 CCR 916) are not reduced by more than10% from unimpaired levels. Exemptions under the above criteria will enable water users to develop small on-stream reservoirs while ensuring that stream reaches containing fishes (either year-round or seasonally) will not have additional on-stream dams or stream flows reduced more than 10% from unimpaired levels. Stream reaches containing aquatic species without fishes (*i.e*, Class 2 streams, under 14 CCR 916), will not be dewatered. These exemptions are consistent with allocating water for beneficial uses and protecting fishery resources.

8) <u>Quantify All Water Rights of Applicant</u>

To facilitate assessment of stream diversion impacts to fisheries, the applicant must identify all other basis of rights (appropriative, riparian, adobe, pre-1914), in streams potentially affected by the proposed diversion.

Justification: The determinations of maximum rate of withdrawal and potential impacts of cumulative withdrawals require information concerning all water withdrawals within the impacted watershed. Records concerning existing water rights are limited. Applicants seeking additional appropriative rights should provide known information concerning their diversion activities within the affected watershed.

9) <u>Compliance and Monitoring Measures</u>:

Prior to issuance of permit, the applicant must identify, to the satisfaction of NMFS, DFG, and the SWRCB the mechanism(s) that assure that the bypass flows will be maintained and rates of diversion will not be exceeded at the project. The applicant will provide a description of mechanism(s) for assuring bypass flows and rates of diversion to the SWRCB. The SWRCB will provide this information to NMFS and DFG for review and comment. Diversion projects will provide DFG personnel access to all points of diversion and places of use for the purpose of conducting routine and or random monitoring and compliance inspections.

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However, the responsibility for ensuring compliance and enforcement of water rights issued by the SWRCB and/or any other permit or regulatory instrument that approves or allows water diversion or causes reduction in stream flows, rests with that permitting agency.

Justification: In order to protect anadromous salmonid habitat, mechanisms must be provided to ensure that bypass flows and constraints on diversion rates are maintained. Mechanisms to verify compliance with permit conditions may vary and be dependent on site-specific conditions. The determination of the specific mechanisms for assuring compliance with the diversion guidelines is the responsibility of the applicant and subject to approval by NMFS, DFG, and SWRCB.

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III COMPLIANCE AND EFFECTIVENESS MONITORING

Inherent in the application of this, as well as any other, instream flow standard setting technique is the need for effectiveness monitoring to address and corroborate assumptions used in developing the flow standard. In addition, a prerequisite for reasonable flow allocation and habitat protection, is an accounting of existing diversions and enforcement of unpermitted diversions. It is essential, if instream resources are to be protected and over-allocation is to be avoided, that an accurate evaluation of all existing diversions be conducted prior to the issuance of any new water rights permits. Therefore, DFG and NMFS recommend the following initiatives:

1) Program to Verify Effectiveness and Refine the Flow Standard as Necessary

The SWRCB, DFG, and NMFS will cooperate in the development and implementation of an evaluation plan to monitor the effectiveness of flow standards being applied in the water rights process. This program should include specific monitoring activities to determine whether the standard provides a consistent and protective level of salmonid habitat conservation for streams of various size, order, elevation and geomorphic characteristics. The effectiveness monitoring program should also contain a protocol for making any refinements to the flow standard, as necessary to mitigate adverse affects on anadromous salmonid resources and their habitats.

2) Compliance and Enforcement Program

A compliance and enforcement program should be developed. This program should include flow gaging and routine, random compliance inspections. This program should be focused on a watershed approach and include the installation of stream flow gaging and recording devices at key locations within each stream basin for determining compliance with bypass flow requirements and current level of impairment. In addition, a separate schedule for routine, random compliance inspections should be developed for each watershed, based upon the level of impairment and sensitivity of anadromous salmonid habitat. As part of this program the SWRCB should require applicants to develop and implement measures that will ensure compliance with the bypass terms. The plans should specify measuring and recording devices and bypass facilities to be installed, the criteria for operation of the reservoir, and other measures that will be taken by the applicant to confirm compliance with permit terms. DFG and NMFS encourage water rights permit applicants to install "passive" bypass facilities (*i.e.*, facilities that will automatically bypass flows without any action by the permittee) whenever feasible. The plan should also include a measure for documenting that facilities have been installed and are being maintained.

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Guidelines for Maintaining Instream Flows to Protect Fisheries Resources Downstream of Water Diversions in Mid-California Coastal Streams

(An update of the May 22, 2000 Guidelines)

California Department of Fish and Game

and the

National Marine Fisheries Service

June 17, 2002

(Errata note, dated 8-19-02)

California Department of Fish and Game
1416 Ninth Street
Sacramento, California 95814

National Marine Fisheries Service
Southwest Region
777 Sonoma Ave, Rm 325
Santa Rosa, California 95404

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3) Preventing Stream Over-Allocation

In order to prevent the over-allocation of anadromous salmonid streams by new diversions and to identify those streams currently over-allocated, it is necessary to document actual and potential levels of impairment. Prior to issuance of any new water rights the SWRCB should provide an evaluation and comprehensive accounting of all diversions currently in place including a disclosure of all basis of right in effect on the stream to be diverted and quantify the total maximum volume and maximum rate of withdrawal possible at any given time including rights not fully and/or currently exercised. The results of this evaluation should be compared on a month by month basis to the estimated unimpaired hydrograph to ensure that sufficient flow remains in the stream to provide a sufficient minimum bypass flow to protect salmonids in downstream reaches. Further, that the maximum cumulative rate of withdrawal from proposed and existing diversions will not appreciably diminish the natural hydrograph (<5%) in the frequency and magnitude of unimpaired high flows necessary for channel maintenance and will not appreciably reduce the frequency and magnitude of unimpaired moderate and high flows (*e.g.*, flows higher than median February) used by migrating and spawning fishes.

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Addendum A

Procedures for assessing cumulative impacts of water diversions based on the cumulative total volume of diverted water

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Procedures for assessing cumulative impacts of water diversions based on the cumulative total volume of diverted water

Determination of water availability:

Before issuing any new Water Rights permits, the State Water Resources Control Board (SWRCB) must first determine whether water is available for diversion. This determination is achieved through a Water Availability Analysis (WAA). Among other things, the WAA must estimate expected unimpaired stream flow (the natural flow without diversions) at the diversion site. In addition, it must then consider the water that has already been allocated to existing water rights holders (both riparian and senior appropriative) and the water that is required for the protection of public trust resources.

Requirements for resource protection based on potential cumulative impacts:

Minimum bypass flows must be maintained to ensure that threatened and endangered salmonid species are protected. At the same time, additional mechanisms must be employed to conserve intermediate and high flows (*i.e.*, maintaining a near natural hydrograph) so that other life history requirements of these species are met (see guidelines section for justification).

In the central coastal counties (Napa, Marin, Sonoma, and Mendocino), near natural hydrographs can be preserved by 1) limiting cumulative maximum instantaneous rates of withdrawal consistent with the DFG and NMFS guidelines (*i.e.*, 15% of the "winter 20% exceedence flow"), or 2) by limiting the cumulative volume of water diverted from the watershed. The guidelines section of this document addresses preserving the natural hydrograph using the "maximum instantaneous rate of withdrawal" approach. This addendum describes an alternative "volumetric" cumulative impact assessment method based on the total volume of water being diverted.

An analysis of site-specific flow requirements of anadromous salmonids in many western streams indicates that in small watersheds the optimal flows for spawning are variable, and often higher than the long-term, unimpaired February median flow (Hatfield and Bruce 2000). Hydrologic analysis indicates that adequate spawning flows, and near natural hydrographs, are generally maintained when the natural volume of winter runoff is impaired (*i.e.*, reduced) by less than 10% (SWRCB unpublished data). Spawning habitat for anadromous salmonids can be adversely affected by diverting more than 10% of winter runoff. Cumulative diversions of even 5 to 10% of annual runoff can also impact spawning habitats if the diversions reduce stream flows to minimum levels for several days during critical spawning periods in early winter.

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Determining the Cumulative Flow Impairment Index (CFII):

To evaluate the potential cumulative effects of water diversions using a "volumetric" approach, the volume of water that is naturally available must be compared with the total volume of water that is, or can be, legally diverted from the watershed through existing water rights. The potential level of impairment to stream flow caused by these cumulative diversions can be evaluated by calculating the Cumulative Flow Impairment Index (CFII), as follows:

$$\text{CFII} = \frac{\text{Cumulative Diverted Volume (CDV)}}{\text{Estimated Unimpaired Runoff (EUR)}}$$

where,

CDV = potential volume of water diverted under all bases of right between October 1 and March 31 in a normal water year (in AF)

EUR = estimated volume of surface flow in the stream passing the point of interest between December 15 and March 31 in a normal water year (in AF)

Calculating the Cumulative Diverted Volume portion of the equation (Impaired flow):

The Cumulative Diverted Volume (CDV) is the volume of water diverted under all water rights potentially affecting the stream flow at a given Point of Interest (Points of Interest are discussed in more detail below). An October 1 to March 31 season is used to calculate the CDV because it reflects the season of diversion for many existing permits. Therefore, use of the CDV season facilitates a more accurate assessment of the cumulative effect of authorized diversions upon flows within a watershed. Calculations of the CDV must include all existing legal diversions (including pre-1914 rights, riparian rights, small domestic and stockpond registrations, and other appropriative rights) together with the proposed project under consideration for a new water right. The computation of CDV is done for average (*i.e.*, normal) water years.

If a portion of the direct or riparian diversion is highly unlikely to occur during most or all of the CDV season, then that portion of the volume of riparian or direct diversion may be discounted when computing the CDV. This is appropriate in situations with year-round water rights that are typically not exercised during the winter months (*e.g.*, when irrigation of a particular crop does not occur during wet winter months). However, riparian diversions for frost protection must be included when calculating CDV. All computations

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of CDV must be accompanied by a list of the diversions used in the calculation. The list must also include: 1) the season of diversion, 2) the potential maximum instantaneous rate of diversion, 3) the potential maximum volume of diversion, 4) the existing water rights excluded from the computations, and 5) any other assumptions related to the calculations for each diversion listed.

Calculating the Estimated Unimpaired Runoff portion of the equation (Unimpaired flow):

The Estimated Unimpaired Runoff (EUR) is calculated for the high flow (winter) season from December 15 to March 31. This season represents the period during which it is assumed that some water may still be available for diversion without additional environmental impact. All computations must be done using standard hydrologic techniques that may include prorating known gauge data, application of precipitation runoff models, or other accepted methods. Calculations of EUR (unimpaired flow) will be accompanied with descriptions of computational methods, input data, data sources, and assumptions sufficient for reviewers to fully understand and replicate the results. As with the CDV, these computations are done for average (*i.e.*, normal) water years.

Locations requiring CFII calculations for a project:

A CFII is typically calculated for several Points of Interest (POI's) within the watershed. Generally a POI is calculated at the Point of Diversion (POD) and then again for points immediately downstream at each confluence of a major intervening tributary between the project site and the mainstem of coastal rivers. In the case of small mainstem coastal streams (*e.g.*, Sonoma Creek), points of interest extend to the stream's estuary.

The location of the Points of Interest requiring CFII values will be determined by DFG and NMFS staff. To ensure consistency, POI's will be provided directly by NMFS and DFG to SWRCB staff for dissemination to Applicants, their consultants, and other interested parties.

Level of potential cumulative impact based on the CFII calculations:

The level of impairment identified by the CFII will determine the likely study effort needed to address the significance of cumulative impacts of the new water right project.

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- If the CFII is greater than 10%, then there is a reasonable likelihood of significant cumulative impacts. When the CFII is greater than 10%, site specific studies will be required to assess impacts and the water right permit Applicant is referred to NMFS and DFG for the scoping of site-specific fisheries studies to assess these impacts.

- When the CFII is between 5 and 10%, the Applicant must provide additional hydrologic analysis documenting the estimated effects of cumulative diversions on the stream hydrograph at the POI's during three representative normal and two representative dry years. If the natural hydrograph is appreciably impaired during the migratory and spawning period of anadromous salmonid species, additional site specific study may be warranted.

- If the CFII is less than 5%, there is little chance of significant cumulative impacts due to the diversion and the project does not require additional studies to assess these impacts.

Scope and purpose of site specific studies:

Site-specific studies prompted by a CFII greater than 10% (or when there is an appreciable impairment of the hydrograph on projects with CFII between 5-10%) are performed to establish terms and conditions that ensure that habitats for anadromous salmonids are not further degraded. For most projects, three issues need to be addressed:

1) What are the cumulative effects of this and other projects on channel maintenance (flushing) flows needed to protect geomorphological processes downstream from the project site? Does the project under consideration contribute to a significant adverse effect on flushing flows needed to maintain the stream channel and avoid exacerbating stream sedimentation? Does the project affect the timing of the opening or closure of estuarine mouths with sand bars?

2) What minimum bypass flow and maximum instantaneous rate of withdrawal are needed for the project to protect spawning habitat for anadromous salmonids downstream from the project site?

3) What minimum bypass flow and maximum instantaneous rate of withdrawal are needed for the project to facilitate migratory movements of anadromous salmonids downstream from the diversion site(s)?

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The Applicant should consult with NMFS and DFG concerning the scope and methods of site-specific studies to address these issues. Performance of site-specific studies does not guarantee that stream flow terms and conditions will be consistent with an economically viable project.

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REFERENCES

Barinaga, M. 1996. A recipe for river recovery? Science 273: 1648-1650.

Corrarino, C.A., and M.A. Brusven. 1988. The effects of reduced stream discharge on insect drift and stranding of near shore insects. Freshwat. Invertebr. Biol. 2:88-98.

Hatfield, T., and J. Bruce. 2000. Predicting salmonid habitat-flow relationships for streams from Western North America. N. Am. J. Fish. Mgmt. 20: 1005-1015.

Keup. L.E. 1988. Invertebrate fish food resources of lotic environments. Instream Flow Information Paper No. 24. U.S. Fish Wildl. Serv. Biol. Rep. 88(13). 96 pp.

National Marine Fisheries Service (NMFS). 2000. Comments on the State Water Resources Control Board report on proposed actions on pending water right applications within the Russian River watershed and NMFS draft recommended guidelines for maintaining instream flows to protect fisheries resources in tributaries of the Russian River. NMFS Santa Rosa, California Field Office, January 2000. 124 pp.

Poff, N.L. and seven coauthors. 1997. The natural flow regime: a paradigm for river conservation and restoration. Bioscience 47: 769-784.

Resh, V.H., and D.M. Rosenberg. 1984. The ecology of Aquatic Insects. Praeger Scientific, New York, NY. 400 pp.

State Water Resources Control Board (SWRCB). 2001. Assessing site specific and cumulative impacts on anadromous fishery resources in coastal watersheds in Northern California. Division of Water Rights, Staff Report. January 23, 2001. 6 pp.

Exhibit [redacted]

Exhibit #4

STATE WATER RESOURCES CONTROL BOARD

RESOLUTION NO. 68-16

STATEMENT OF POLICY WITH RESPECT TO
MAINTAINING HIGH QUALITY OF WATERS IN CALIFORNIA

WHEREAS the California Legislature has declared that it is the policy of the State that the granting of permits and licenses for unappropriated water and the disposal of wastes into the waters of the State shall be so regulated as to achieve highest water quality consistent with maximum benefit to the people of the State and shall be controlled so as to promote the peace, health, safety and welfare of the people of the State; and

WHEREAS water quality control policies have been and are being adopted for waters of the State; and

WHEREAS the quality of some waters of the State is higher than that established by the adopted policies and it is the intent and purpose of this Board that such higher quality shall be maintained to the maximum extent possible consistent with the declaration of the Legislature;

NOW, THEREFORE, BE IT RESOLVED:

1. Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies.

2. Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.

3. In implementing this policy, the Secretary of the Interior will be kept advised and will be provided with such information as he will need to discharge his responsibilities under the Federal Water Pollution Control Act.

BE IT FURTHER RESOLVED that a copy of this resolution be forwarded to the Secretary of the Interior as part of California's water quality control policy submission.

CERTIFICATION

The undersigned, Executive Officer of the State Water Resources Control Board, does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on October 24, 1968.

Dated: October 28, 1968

Kerry W. Mulligan
Executive Officer
State Water Resources
Control Board

Exhibit

Exhibit # 5

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
777 Sonoma Avenue Room 325
Santa Rosa, CA 95404

In response refer to:
April 12, 2001 151422SWR01SR323

Ray Hall
Planning &Building Services Department
County of Mendocino
501 Low Gap Road
Ukiah, California 95482

Dear Mr. Hall:

This concerns your agency's regulation of grading activities in northern California coastal watersheds. While many agencies and other groups are working toward fish and water conservation efforts in northern California coastal watersheds, we believe that more immediate action needs to be taken to address certain existing land management practices that are adversely impacting steelhead.

Last February 20, you and I discussed the National Marine Fisheries Service's (NMFS) interest in Mendocino County's Chapter 70 exemptions for grading activities that are determined to be self contained and at isolated locations. You advised me then that a committee is being formed to focus on a new County grading ordinance and that the first meeting would occur in April. You also suggested that the new ordinance would probably be effective by October, 2001. Further, you suggested that I write and request to be informed of committee schedules and activities. Please do keep NMFS informed on this issue.

I would like to explain our interests in more detail than I did during our earlier conversation and how the federal Endangered Species Act (ESA) might apply to grading activities in Mendocino County. In June, 2000, the NMFS adopted protective regulations under section 4(d) of the ESA prohibiting "take" of 14 groups of salmon and steelhead listed as threatened under the ESA. Take is defined within the ESA as: harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. The definition of harm is further expanded to include altering the essential behavior patterns of spawning, rearing, and migrating. Habitat modification or degradation can be considered take if the modification actually kills or injures a protected species. It is important to note that the injury can include the death of future generations of the listed species. The consequences of being responsible for take under the ESA can result in either civil or criminal penalties.

The 4(d) protective regulations went into effect on September 8, 2000. They describe certain activities that are most likely to cause harm resulting in a violation of the ESA. These activities, as they may pertain to grading activities, include in part:

> Constructing or maintaining barriers that eliminate or impede a listed species' access to habitat or ability to migrate...Constructing or operating dams or water diversion structures with inadequate fish screens or fish passage facilities in a listed species' habitat...Conducting land-use activities in riparian areas and areas susceptible to mass wasting and surface erosion, which may disturb soil and increase sediment delivered to streams....

How does the 4(d) rule apply to Mendocino County grading ordinances? Basically, there must be a listed species, and/or its designated critical habitat, specified under the 4(d) rule and affected by the County's regulation of grading activities. Central California Coast steelhead trout (CCC steelhead), listed as threatened under the ESA, are included in the 4(d) rule and are known historically to inhabit coastal watersheds in Mendocino County. Also, critical habitat is designated for CCC steelhead to include all river reaches and estuarine areas accessible to listed steelhead in coastal river basins from the Russian River to Aptos Creek, California (inclusive). Critical habitat elements potentially impacted by the County's regulation of grading activities include, the channel, substrate, adjacent riparian area, and water quality. Specifically, we are concerned with individual and cumulative effects of authorizing or condoning new on-stream water impoundments, such as Section 70 Exemptions being issued by the county.

I realize the implications of the ESA can be confusing, and I therefore emphasize the importance of the County and its applicants (1) to fully understand ESA obligations and liabilities, and (2) to fully understand and eliminate any impacts. We would like to work cooperatively with the County to conserve and begin restoring steelhead in the Russian River and other coastal watersheds and hope to hear from you soon on the committee's progress. If you have any questions concerning NMFS responsibilities or need clarification on ESA issues please contact us.

Sincerely,

James R. Bybee
Habitat Manager
Northern California

cc: NMFS, D. Torquemada
CDFG, Don Richardson

Exhibit [illegible]

Exhibit #6

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404

August 8, 2000 F/SWR4:WH

Ms. Laura Vasquez
State Water Resources Control Board
Division of Water Rights
P.O. Box 2000
Sacramento, California 95812-2000

Dear Ms. Vasquez:

By this letter the National Marine Fisheries Service (NMFS) registers its protest to applications for appropriative water righ[redacted]and [redacted] filed by [redacted] and [redacted] to divert water from Witherell Creek, tributary to Anderson Creek, thence the Navarro River in Mendocino County. The total diversion amounts to 30 acre-feet storage per year, plus a direct diversion of 2 cfs. It involves, in part, storage in an on-stream reservoir. Witherell Creek, which lies within the Navarro River watershed, may support or contribute to sustaining populations of the Central California Coast Evolutionarily Significant Unit (ESU) of coho salmon and the Northern California ESU of steelhead trout.

Background

Coho salmon (*Oncorhynchus kisutch*) comprising the Central California Coast ESU are listed as threatened (61 Fed. Reg. 56138; Oct. 31, 1996) under the Endangered Species Act (ESA). Protective regulations were published for coho on October 31, 1996. These protective regulations make it unlawful to "take" coho under section 9 of the ESA. "Take" as defined in the ESA, includes, in part, to harm or harass the species. These protective regulations describe certain activities that may impact coho and result in legal liability. These activities include, in part:

> *Unauthorized destruction/alteration of the species' habitat, such as removal of large woody debris or riparian shade canopy, dredging, discharge of fill material, draining, ditching, diverting, blocking, or altering stream channels or surface or ground water flow.*

In contrast to the life history patterns of other anadromous salmonids, coho salmon in California generally exhibit a relatively simple 3-year life cycle. Adult salmon typically begin the freshwater migration from the ocean to their natal streams with the first fall rains. Upstream migration will continue from October to March, generally peaking in December and January.

(Shapovalov and Taft 1954).

Coho fry emerge from redds, in 38 to 101 days depending on stream temperature (Laufle et al. 1986). After emergence, the stream flow conditions and water temperature play a large role in survival. Low summer flows reduce potential rearing areas, may cause stranding in isolated pools, and increase vulnerability to predators (Sandercock 1991). Also the combination of reduced flows and high ambient air temperatures can raise the water temperature to the upper lethal limit of 25°C for juvenile coho (Brett 1952). Later in the year, high winter flows in typical coastal streams may be hostile to juvenile coho, causing displacement and disrupting their habitat and food sources. Juvenile coho show a preference for habitat containing deep pools (1 m or more), logs, rootwads, or boulders in heavily shaded sections of stream. Structurally complex streams that contain stones, logs and bushes in the water support larger numbers of fry (Scrivener and Andersen 1982). Although coho juveniles are found in both pool and riffle areas of a stream, they are best adapted to holding in pools (Hartman 1965).

Steelhead trout (*Oncorhynchus mykiss*) comprising the Northern California ESU are listed as threatened (65 Fed. Reg. 36074, June 7, 2000) under the ESA. NMFS intends to designate critical habitat and promulgate regulations under section 4(d) of the ESA for this ESU in separate rulemakings. These regulations will likely be similar to those published for coho salmon and identify water diversion as an activity that may impact the species.

Winter steelhead may enter rivers in the late fall and begin spawning in December. Steelhead are capable of repeat spawning. Up to thirty percent survive to spawn a second or third time, but in large drainages where fish migrate long distances, the proportion is much lower (Meehan and Bjornn 1991). Upon emerging from the gravel, fry rear in edgewater habitats and move gradually into pools and riffles as they grow larger. Juvenile steelhead will spend one to three years in fresh water before migrating to the ocean (Busby et al. 1996). Winter steelhead prefer water temperatures in the 10°C-15°C (50°-59°F) range with a sustained upper limit of 20°C (68°F) (Barnhart 1986). They can survive short periods up to 27°C (81°F) with saturated dissolved oxygen conditions and a plentiful food supply. Fluctuating diurnal water temperatures also aid in survivability of salmonids (Busby et al. 1996).

Proposed Diversion

Appropriation of water would be accomplished by storing 30 acre-feet of water behind an existing (constructed in 1980) 30-foot high dam located on Witherell Creek. In addition to this onstream storage, which is the subject of Application 30718, the applicant seeks (under Application 31003) the right to directly divert 2 cfs by pumping directly from Witherell Creek at the reservoir via an existing 8 inch pipeline. The applicants have requested to divert water through storage from October 1 through May 31, and to directly divert water by pumping from March 1 through May 31. Witherell Creek, like other North Coast streams, is rain fed and subject to critical low flows during much of the year. Granting the proposed diversion will reduce flows in Witherell Creek, Anderson Creek, and the Navarro River, and it may degrade habitat necessary to the existence of certain life stages of coho salmon and steelhead. Alteration of stream flows can result in salmonid mortality for a variety of reasons: migration delay resulting from insufficient flows or habitat blockages; loss of sufficient habitat due to dewatering and blockage; stranding of fish resulting from rapid flow fluctuations; entrainment of juveniles into poorly screened or unscreened diversions; and increased juvenile mortality resulting from increased water temperatures (Bergen and Filardo 1991; California Advisory Committee on Salmon and Steelhead Trout 1988; California Department of Fish and Game 1991; Columbia Basin Fish and Wildlife Authority 1991; Chapman et al. 1994; Cramer et al. 1995; Palmisano et al. 1993; Reynolds et al. 1993).

Based upon the need to protect and recover runs of listed coho salmon and steelhead in the Navarro River watershed, we find it necessary to protest the proposed project because:

1) the Navarro River watershed supports federally listed coho salmon and steelhead. Witherell Creek, upon which the proposed diversion would occur, lies within the Navarro River watershed and may support or contribute to the survival of these species.

2) by reducing and periodically interrupting stream flows in downstream reaches, the project may reduce available habitat for coho salmon and steelhead. Even if coho salmon or steelhead, or their habitats are not located "immediately" downstream of the point of diversion, the affected stream reach may be an important area for the production or transport of invertebrate foods that subsequently drift downstream to rearing juveniles. In addition, headwater tributaries collectively contribute flow to downstream reaches that support listed salmonids.

3) the Applicants have not proposed to mitigate the effects of those reductions in available habitat by providing an adequate minimum bypass flow.

4) the proposed onstream reservoir may potentially eliminate or appreciably reduce the magnitude or frequency of naturally occurring intermediate and high flows necessary for natural channel maintenance processes and the successful movements of migrating fishes (Barinaga 1996; Poff et al. 1997). The potential cumulative effect of the proposed diversion and other existing permitted and licensed diversions on biologically-important intermediate and high flows within Witherell Creek and Anderson Creek have not been assessed. Limits on the rate of water withdrawal and restrictions on the number of onstream storage reservoirs must be established in order to preserve a natural hydrograph that provides biologically and geomorphologically important intermediate and high flows.

5) the impoundment of water in an onstream reservoir will eliminate free-flowing stream habitat that may either support listed salmonids or the production and transport of riffle-dwelling aquatic invertebrates, which serve as important food sources for downstream fishes (Corrarino and Brusven 1983; Resh and Rosenberg 1984; Keup 1988).

6) The proposed diversion is one of numerous proposed and existing diversions in the Navarro River watershed. Multiple diversions can collectively adversely affect listed salmonids by 1) reducing available habitat for these species and related forage species, 2) reducing flows necessary for upstream and downstream passage of listed salmonids, and 3) interfering with natural stream channel processes. The cumulative effect of this project and other existing permitted and licensed projects in this watershed must be addressed before this permit is granted. If the proposed project and the existing water right permits and licenses have a significant, cumulative adverse effect on listed salmonids, this project should not be permitted. The State Water Resources Control Board (SWRCB) has a duty to disclose, evaluate, and mitigate the potential adverse cumulative impacts of the proposed project and other water diversion projects in the Anderson Creek and Navarro River watersheds on threatened populations of coho salmon and steelhead.

7) The potential effect of the water diversion structure and proposed onstream reservoir on upstream and downstream movements of listed salmonids have not been addressed. Diversion structures and instream reservoirs may block fishes from reaching their natal spawning areas. Diversion structures also have the potential to entrain fishes, with resulting mortality.

8) The applicants have requested the right to divert water each year through storage during the period October 1 through May 31 of the succeeding year. They have requested the right to directly divert at a rate up to 2 cfs during March 1 through May 31. In its water rights proceedings for the Navarro River, the SWRCB has rightfully found that new water diversions in this watershed should be confined to the period December 15 to March 31. This latter period is the time of highest winter flows and the period when water withdrawals would be least likely to adversely affect fisheries resources. NMFS agrees with that finding and encourages the SWRCB to adopt this diversion period to this project. The applicants proposal to withdraw water between October 1 and December 14 may unnecessarily affect salmonids, because that is a time when flows are relatively low, high flows are infrequent and sporadic, and it is a time when coho and steelhead ascend coastal streams to spawn. The applicants proposal to extend the water withdrawal period to May 31 may also unnecessarily affect anadromous salmonids. Flows generally subside during April, although downstream emigration of juveniles often occurs during the higher flow events in this month. Flows are much less during May, and thus diversions during this month would probably reduce the availability of already limited habitat for juvenile steelhead.

Recommendations

Based upon the above concerns and potential impacts of the proposed project, we recommend that the project be modified to include several mitigative provisions. The level of action needed to mitigate the project is dependent upon the quality of the stream at the diversion site. If a proposed diversion is located 1) in a stream reach where fishes or non-fish aquatic species were not historically present upstream, and 2) where the project could not contribute to a cumulative reduction of more than 10% of the natural instantaneous flow in any reach where fish are at least seasonally present, and 3) where the project would not cause the dewatering of any fishless stream reach supporting non-fish aquatic species, then we do not object to that proposed diversion. By cumulative reduction we refer to the effects of this and other permitted or licensed projects as well as diversions under riparian rights. If the proposed diversion is located on a stream where 1) fishes or aquatic invertebrates were historically present upstream, or 2) the project could contribute to a cumulative reduction of more than 10% of the natural instantaneous flow in any reach where fish are at least seasonally present, then the following terms and conditions must be made part of the proposed water right permit. Failure to incorporate these recommendations may impact listed salmonids.

a) Limit the diversion season to the period December 15 to March 31. From April 1 to December 14 instantaneous inflow to the point of diversion must equal the instantaneous outflow to downstream reaches past the point of diversion.

b) The plan should avoid construction or maintenance of an on-stream dam across, and it should avoid onstream storage. Therefore, storage must be to an off-stream reservoir if fishes or non-fish aquatic species are either always or seasonally present upstream from the point of diversion, or where the project could contribute to a cumulative reduction of more than 10% of the natural instantaneous flow in any reach where fish are at least seasonally present.

c) provide a minimum bypass flow that adequately protects coho salmon and steelhead in reaches downstream from the point of diversion. The determination of the bypass flow's adequacy can be based on site specific biological investigations conducted in consultation with California Department of Fish and Game (CDFG) and NMFS staff, or in the absence of site specific data, it would be not less than the estimated unimpaired February median flow at the point of diversion. A discussion of the need for and rationale for maintaining minimum bypass flows equivalent to the unimpaired February median flow in north coastal California streams is provided in NMFS draft guidelines for maintaining instream flows to protect fisheries resources in tributaries of the Russian River. These draft guidelines are on file with the SWRCB.

d) Natural, periodic, intermediate and high flows should be maintained immediately below the diversion site. This is a complex issue that concerns potential cumulative impacts of this and other upstream permitted and licensed water diversions within the Anderson Creek and Navarro River watersheds. Protection of intermediate and high flows can be accomplished through an assessment of cumulative impacts and placing limits on the rate of instantaneous water withdrawals from the stream. We recommend that the project be operated so that the cumulative maximum rate of instantaneous withdrawal at the point of diversion not exceed a flow rate equivalent to 15% of the estimated "winter 20% exceedence flow". The "winter 20% exceedence flow" is the 20% exceedence value of a daily average flow duration curve for the period December 15 to March 31. A discussion of the need for and rationale for limiting cumulative maximum instantaneous withdrawals to a portion of the "winter 20% exceedence flow" in northern coastal California streams is provided in NMFS draft recommended guidelines for maintaining instream flows to protect fisheries resources in tributaries of the Russian River. These draft guidelines are on file with the SWRCB.

e) The potential effect of the project on upstream and downstream movements of anadromous salmonids must be addressed. If anadromous salmonids ascend or have the likely potential to ascend Witherell Creek to the diversion site, then adequate passage facilities and screening at the diversion intake must be provided.

Regardless of the quality of stream at the point of diversion, the proposed project should provide California Department of Fish and Game personnel access to all points of diversion and places of use for the purpose of conducting routine and or random monitoring and compliance inspections.

Thank you for your cooperation in the above. We look forward to continued opportunities for NMFS and the State Water Resources Control Board to cooperate in the conservation of listed species. If you have any questions or comments concerning the contents of this letter please contact Dr. William Hearn at (707) 575-6062.

Sincerely,

James R. Bybee
Habitat Manager
Northern California

cc: T. and M. Elke, applicants
R. Hight, CDFG, Sacramento
R. Floerke, CDFG, Yountville

References

Barinaga, M. 1996.A recipe for river recovery? Science 273:1648-1650.

Barnhart, R.A. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest) -- steelhead. U.S. Fish and Wildl. Serv. Biol. Rep. 82(11.60). U.S. Army Corps of Engineers, TR EL-82-4. 21 pp.

Bergen, J.J. anf M.J. Filardo. 1991. An analysis of variables influencing the migration of juvenile salmonids in the Snake and Lower Columbia Rivers. Fish Passage Center, Portland, Oregon 97201.

Brett, J.R. 1952. Temperature tolerance in young Pacific salmon, genus *Oncorhynchus*. J. Fish. Res. Bd. Can. 9:265-323.

Brown, L.R., P.B. Moyle, and R.M. Yoshiyama. 1994. Historical decline and current status of Coho Salmon in California. N.Amer.J.Fish.Man., 14(2):237-61.

Bryant, G.J. 1994. Coho salmon populations in Scott and Waddell Creeks, Santa Cruz County, California. Status Report. NMFS, PSMD, SW Region. 102 p.

Busby, Peggy J., Thomas C. Wainwright, Gregory J. Bryant, Lisa J. Lierheimer, Robin S. Waples, F. William Waknitz, and Irma V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-NWFSC-27, 261 pp.

California Advisory Committee on Salmon and Steelhead Trout. 1988. Restoring the balance, 1988 annual report. Annual report to Cal. Dep. Fish Game and California Legislature. Sacramento, California. 84p.

California Department of Fish and Game. 1991. Sport fishing for anadromous salmonid fishes. California Department of Fish and Game draft environmental/satellite document. August 1991. 62p. + appendix.

Chapman, D., C. Peven, T. Hilman, A. Giorgi, and F. Utter. 1994. Status of summer steelhead In the Mid-Columbia River. Don Chapman Consultants, Inc. 235 p. + appendices.

Columbia Basin Fish and Wildlife Authority. 1991a. The biological and technical justification for the flow proposal of the Columbia Basin Fish and Wildlife Authority. Columbia Basin fish and Wildlife Authority, Portland, Or. 72 p.

Corrarino, C.A., and M.A. Brusven. 1988. The effects of reduced stream discharge on insect drift and stranding of near shore insects. Freshwat. Invertebr. Biol. 2:88-98.

Hartman, G.F. 1965. The role of behavior in the ecology and interaction of underyearling coho salmon (*O. kisutch*) and steelhead trout (*S. gairdneri*). J. Fish. Res. Bd.Can. 22:1035-1081.

Keup. L.E. 1988. Invertebrate fish food resources of lotic environments. Instream Flow Information Paper No. 24. U.S. Fish Wildl. Serv. Biol. Rep. 88(13). 96 pp.

Kondolf, G.M., and J.G. Williams. 1999. Flushing flows: a review of concepts relevant to Clear Creek, California. Prepared for the U.S. Fish and Wildlife Service, Red Bluff, CA. 29 pp

Laufle, J.C., G.B. Pauley, and M.F. Shepard. 1986 Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (pacific Northwest)--coho salmon. U.S. Fish and Wildlife Service Biological Report 82(11.48). U.S. Army Corps of Engineers, TR EL-82-4. 18pp.

Maahs, M., and J. Gilleard. 1994. Anadromous salmonid resources of Mendocino coastal and inland rivers 1990-92: An evaluation of rehabilitation efforts based on carcass recovery and spawning activity. (Draft Final). CDFG Contract FG-9364. 66 p.

Meehan, W.R. and T.C. Bjornn, 1991. Salmonid distributions and life histories. In: W.R. Meehan, ed.; Influences of forest and rangeland management on salmonid fishes and their habitats. Amer. Fish. Soc. Special Publication 19.

National Marine Fisheries Service. Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. National Marine Fisheries Service, August 1996.

Palmisano, J. F., R.H. Ellis, V.W. Kaczynski. 1993. The impact of environmental and management factors on Washington's wild anadromous salmon and trout. Washington Forest Protection Association and the State of Washington Department of Natural Resources, Olympia, Washington. January, 1993. 371p.

Poff, N.L., J.D. Allan, M.B. Bain, J.R.Karr, K.L. Prestegaard, B.D.Richter, R.E.Sparks, and J.C.Stromberg. 1997. The natural flow regime, a paradigm for river conservation and restoration. Bioscience 47:769-784.

Reiser, D.W., M.P. Ramey, and T.A. Wesche. 1989. Flushing flows, Chapter 4 in Alternatives in Regulated River Management, edited by J.A.Gore and G.E. Petts, pp. 91-135, CRC Press, Boca Raton, Florida.

Resh, V.H., and D.M. Rosenberg. 1984. The ecology of Aquatic Insects. Praeger Scientific, New York, NY. 400 pp.

Sandercock, F.K. 1991. Life history of coho salmon, p 397-445. *In*: C. Groot and L. Margolis (eds.) Pacific Salmon Life Histories. UBC Press, Vancouver, B.C.

Scrivener, J.C., and B.C. Andersen. 1982. Logging impacts and some mechanisms which determine the size of spring and summer populations of coho salmon fry in Carnation Creek, p.p. 257-72. *In*: G.F. Hartman (ed.) Proc. Carnation Creek Workshop, Pacific biological Station, Nanaimo, B.C.

Shapovalov, L. and A.C. Taft. 1954. The life histories of the steelhead rainbow trout (*Salmo gairdneri*) and silver salmon (*Oncorhynchus kisutch*). Cal. Dep. Fish Game, Fish.Bull. No.98.

Reynolds, F.L., T.J. Mils, R. Benthin, and A. Low. 1993. Restoring Central Valley streams: a plan for action. Cal. Dep. Fish Game, Inland Fisheries Division, Sacramento, California. 129p.

Exhibit [illegible]

Exhibit #7

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404

November 22, 2000 F/SWR4:WH

Ms. Laura Vasquez
State Water Resources Control Board
Division of Water Rights
P.O. Box 2000
Sacramento, California 95812-2000

Dear Ms. Vasquez:

On August 8, 2000, we submitted to you our letter of protest to the application for appropriative water rights [redacted] filed by Thomas and Mary Elke. That letter provided terms for dropping this protest. On October 26, 2000 representatives of the National Marine Fisheries Service (NMFS), California Dept. of Fish & Game (CDFG), the State Water Resources Control Board (SWRCB), and various environmental groups conducted a field investigation at the project site. Based on this investigation, it appears that the project reservoir is located directly on Witherell Creek in a fish bearing reach. Although Witherell Creek is an intermittent stream at the project site, it probably does or has the potential to support anadromous salmonids in the reaches immediately below the dam during winter and spring. The culvert under Route 128, which is only a few hundred feet below the dam, poses no substantial barrier to upstream migration of anadromous salmonids. The fisheries-related impacts of this on-stream dam must be mitigated.

CDFG/NMFS guidelines for water diversions in coastal watersheds strongly recommend that on-stream impoundments be avoided in fish-bearing stream reaches. On-stream impoundments have the capacity to completely alter stream hydrographs -- reducing stream flows to minimum bypass requirements and eliminating intermediate and high flows necessary for successful spawning, fish migrations, and channel maintenance. The 20+ year old dam may be a barrier to fish migrations; however, the extent and significance of spawning and rearing habitat in the seasonal stream above the dam is unknown. Because it may be a barrier to salmonids, the project dam may cause "harm or take" prohibited under the federal Endangered Species Act. The applicants have indicated to NMFS and CDFG that they wish to explore the possibility of relocating their impoundment to an off-stream site (*i.e.*, a pit-type reservoir). We encourage the SWRCB to support and help facilitate such a project modification. If the impoundment were relocated, we would recommend that the project be operated with 1) a minimum bypass flow equivalent to the long-term, February median flow at the site, and 2) a maximum rate of withdrawal limited such that the cumulative maximum rate of withdrawal would not exceed 15% of the "winter 20% exceedence flow". By cumulative rate of withdrawal, we refer to withdrawals from this project combined with upstream withdrawals from other permitted or licensed projects and upstream diversions under riparian rights. It is important that the cumulative rate of withdrawal be limited in order to maintain intermediate flows necessary for fish passage and active spawning within the stream channels, and to maintain high flows necessary for channel maintenance. In addition to the bypass flow and a limited withdrawal rate, structural mechanisms and compliance terms should be in place for ensuring that these conditions are maintained.

If the Applicant is unable or chooses not to relocate the project impoundment to an off-stream site, NMFS recommends that the project be operated with 1) a minimum bypass flow equivalent to the annual 10% exceedence flow or inflow (whichever is less), 2) demonstrated assurance that the unimpaired 1.5 year high flow event will not be appreciably altered, and 3) demonstrated assurance that flows necessary for upstream fish passage will not be appreciably altered. We recommend the higher minimum flow (10% annual exceedence) if the impoundment remains on-stream, because the project would be unable to limit the maximum rate of diversion during the period of filling. In some small headwater streams, anadromous salmonids may principally spawn at relatively high stream flows that are approximated by the 10% annual exceedence flow (Trush 2000). "Flatlining" the stream to the February median would appreciably reduce available spawning habitat. We recommend that the SWRCB or applicant conduct a site-specific investigation of Witherell Creek to evaluate flow needs to facilitate upstream fish passage in the reaches below the project dam.

Thank you for your consideration and opportunity to provide comment following the site investigation. We look forward to continued opportunities for NMFS and the State Water Resources Control Board to cooperate in the conservation of listed species. If you have any questions or comments concerning the contents of this letter, please contact Dr. William Hearn at (707) 575-6062.

Sincerely,

Patrick J. Rutten
For

James R. Bybee
Habitat Manager
Northern California

cc: T. and M. Elke, Applicant
R. Floerke, CDFG, Yountville
S. Griffin, Trout Unlimited
H. Adams, NWPA
S. Hall, Friends of Navarro

Exhibit ~~H~~

Exhibit #8

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404

January 11, 2000 F/SW03:SAE

Harry Schueller, Chief
Division of Water Rights
State Water Resources Control Board
Division of Water Rights
Box 2000
Sacramento, California 95812-2000

Dear Mr. Schueller :

Thank you for your invitation to participate in the January 31 Technical Workshop on Fish Bypass Flows for Coastal Watersheds. The January 31 technical workshop and subsequent peer review process represent a significant cooperative effort toward integrating the water rights process with anadromous salmon conservation. As per your December 9 letter announcing the technical workshop, attached is our NMFS Draft Guidelines for Maintaining Instream Flows to Protect Fisheries Resources in Tributaries of the Russian River.

We would appreciate the opportunity to meet with your staff to discuss the peer review process and participate in developing questions and guidelines for the peer review panel. I believe that continued inter-agency cooperation can lead to methods of establishing minimum flows in the Russian River and other North Coast streams that are consistent with requirements for conservation of salmonid populations.

If you have questions, please contact Dr. William Hearn at (707) 575-6062 or Mr. Steve Edmondson at (707) 575-6080.

Sincerely,

James Bybee
Habitat Manager
Northern California

Enclosure

DRAFT

EXECUTIVE SUMMARY

Comments on the State Water Resources Control Board (SWRCB) report on Proposed Actions on Pending Water Rights Applications with the Russian River Watershed
And
NMFS Draft Recommended Guidelines for Maintaining Instream Flows to Protect Fisheries Resources in Tributaries of the Russian River

NMFS agrees with the SWRCB staff that tributaries of the Russian River should be listed as fully appropriated for the period April 1 to December 14. We are also supportive of the SWRCB's concept of a bypass flow policy that identifies a minimum stream flow below which new withdrawals will be prohibited during winter months. However, NMFS is concerned with, 1) the adequacy of a bypass flow standard set at 60% of unimpaired mean annual flow, and 2) the absence of clear guidelines for maintaining adequate flushing flows and flows that facilitate migratory movements of anadromous fishes.

Reasons why 60% of mean annual flow does not appear to be a sufficient low flow standard for winter water withdrawals are that

1) it is based on a dry year criterion that places threatened salmonid populations at considerable risk,

2) instream flow studies cited by the SWRCB indicate that optimal flows for salmonid spawning are considerably higher than 60% of mean annual flow,

3) the SWRCB's analysis is based on the erroneous assumption that there is a typical weighted useable area curve that can be applied to derive an estimate of percent maximum habitat,

4) the method is not grounded in a consideration of biological needs during the winter diversion period, and

5) additional analysis of flow hydrographs for Russian River tributaries indicates that a bypass flow standard equivalent to 60% of mean annual flow would appreciably reduce naturally sustained winter flows that provide important spawning habitat for anadromous salmonids.

Given the potential variability of stream flow and habitat-flow relations in Russian River tributaries, any flow standard applied without site-specific information and used over a wide geographic area should be conservatively, yet reasonably biased toward salmon conservation. A bypass flow standard based on the February median flow for tributaries would approximate flows needed to protect salmonid populations and provide a conservative, practical alternative to the SWRCB's 60% mean annual standard. Reasons why February median is a practical winter minimum bypass flow standard for protecting salmonid populations include:

1. Unlike statistics based on the arithmetic mean, February median flow is not biased upward or downward by a few very high or low flow events. Therefore, it approximates typical flows during winter months.

2. It can be based on the winter hydrology of discrete watershed segments.

3. Based on a review of 81 annual records of winter flows in five tributaries of the Russian River, a bypass flow standard equivalent to the February median flow is a better conservator of sustained winter flows useful to spawning salmonids than a 60% mean annual flow standard.

4. February median flow is higher than monthly median flows for December, January, and March in many tributaries. Thus, the maintenance of the February median flow would likely protect spawning and egg incubation habitat of salmonids, during all months of the winter.

5. A minimum flow standard based on February median flow provides for water diversions during winters. High flow events associated with storm run-off are not sustained, and therefore diversion of a portion of those high flows can be done without significantly impacting spawning and egg incubation. Water users would generally be able to extract and store water about half of the time during normal and wet winters (Dec 15 - Mar 31) and during the higher flow events in dry winters.

Site-specific studies should be required for those seeking a minimum bypass flow lower than the February median. A lower minimum bypass flow should be granted only in cases in which it can be demonstrated that a lower bypass flow would have no signficant adverse effect on aquatic resources. The bypass flow should be maintained at diversions in tributary headwaters even if salmonids or their habitat are not located "immediately" downstream. Headwater tributaries may be important areas for the production or transport of invertebrate foods that subsequently drift downstream to rearing juveniles. Headwater tributaries also contribute flow to downstream reaches that may support salmonids.

In addition to a standard for minimum flows, water diversion guidelines should contain provisions for maintaining the natural hydrograph. The preservation of natural flow variability and high stream flows is highly important for maintaining stream ecosystem function and protecting stream fisheries (Baringa 1996; Poff et al. 1997). Flow hydrographs for tributaries of the Russian River indicate that stream flow is especially high during about 20% of the time during the winter months. Removal of a portion of this high flow would probably have no adverse affect on salmonids or stream ecosystem function. Comparisons of alternative rates of withdrawal suggest that limiting the instantaneous rate of diversion to less than 20% of the "winter 20% exceedence flow" would 1) preserve the natural high flow events needed for channel maintenance, 2) preserve days with intermediate flows, and 3) provide substantial quantities of water to irrigators and other water users. This should be done in conjunction with the maintenance of a minimum flow equivalent to the February median flow. The institution of a maximum rate of instantaneous withdrawal equivalent to 20% of the "winter 20% exceedence flow" represents a cumulative rate for all diversions located at and upstream of a diversion site.

In summary, NMFS recommends that the SWRCB modify its water diversion guidelines by incorporating the following changes:

1. Adopt the February median flow as the minimum bypass flow standard

2. Protect the natural hydrograph by limiting the cumulative instantaneous rate of withdrawal to 20% of the "winter 20% exceedence flow"

3. Coordinate permitting so that cumulative withdrawals from upstream reaches do not exceed the maximum instantaneous withdrawal rate at any point on the stream.

DRAFT

EXECUTIVE SUMMARY

Comments on the State Water Resources Control Board (SWRCB) report on Proposed Actions on Pending Water Rights Applications within the Russian River Watershed

And

NMFS Draft Recommended Guidelines for Maintaining Instream Flows to Protect Fisheries Resources in Tributaries of the Russian River

NMFS agrees with the SWRCB staff that tributaries of the Russian River should be listed as fully appropriated for the period April 1 to December 14. We are also supportive of the SWRCB's concept of a bypass flow policy that identifies a minimum stream flow below which new withdrawals will be prohibited during winter months. However, NMFS is concerned with, 1) the adequacy of a bypass flow standard set at 60% of unimpaired mean annual flow, and 2) the absence of clear guidelines for maintaining adequate flushing flows and flows that facilitate migratory movements of anadromous fishes.

Reasons why 60% of mean annual flow does not appear to be a sufficient low flow standard for winter water withdrawals are that

1) it is based on a dry year criterion that places threatened salmonid populations at considerable risk,

2) instream flow studies cited by the SWRCB indicate that optimal flows for salmonid spawning are considerably higher than 60% of mean annual flow,

3) the SWRCB's analysis is based on the erroneous assumption that there is a typical weighted useable area curve that can be applied to derive an estimate of percent maximum habitat,

4) the method is not grounded in a consideration of biological needs during the winter diversion period, and

5) additional analysis of flow hydrographs for Russian River tributaries indicates that a bypass flow standard equivalent to 60% of mean annual flow would appreciably reduce naturally sustained winter flows that provide important spawning habitat for anadromous salmonids.

Given the potential variability of stream flow and habitat-flow relations in Russian River tributaries, any flow standard applied without site-specific information and used over a wide geographic area should be conservatively, yet reasonably biased toward salmon conservation. A bypass flow standard based on the February median flow for tributaries would approximate flows needed to protect salmonid populations and provide a conservative, practical alternative to the SWRCB's 60% mean annual standard. Reasons why February median is a practical winter minimum bypass flow standard for protecting salmonid populations include:

1. Unlike statistics based on the arithmetic mean, February median flow is not biased upward or downward by a few very high or low flow events. Therefore, it approximates typical flows during winter months.

2. It can be based on the winter hydrology of discrete watershed segments.

3. Based on a review of 81 annual records of winter flows in five tributaries of the Russian River, a bypass flow standard equivalent to the February median flow is a better conservator of sustained winter flows useful to spawning salmonids than a 60% mean annual flow standard.

4. February median flow is higher than monthly median flows for December, January, and March in many tributaries. Thus, the maintenance of the February median flow would likely protect spawning and egg incubation habitat of salmonids, during all months of the winter.

5. A minimum flow standard based on February median flow provides for water diversions during winters. High flow events associated with storm run-off are not sustained, and therefore diversion of a portion of those high flows can be done without significantly impacting spawning and egg incubation. Water users would generally be able to extract and store water about half of the time during normal and wet winters (Dec 15 - Mar 31) and during the higher flow events in dry winters.

Site-specific studies should be required for those seeking a minimum bypass flow lower than the February median. A lower minimum bypass flow should be granted only in cases in which it can be demonstrated that a lower bypass flow would have no signficant adverse effect on aquatic resources. The bypass flow should be maintained at diversions in tributary headwaters even if salmonids or their habitat are not located "immediately" downstream. Headwater tributaries may be important areas for the production or transport of invertebrate foods that subsequently drift downstream to rearing juveniles. Headwater tributaries also contribute flow to downstream reaches that may support salmonids.

In addition to a standard for minimum flows, water diversion guidelines should contain provisions for maintaining the natural hydrograph. The preservation of natural flow variability and high stream flows is highly important for maintaining stream ecosystem function and protecting stream fisheries (Baringa 1996; Poff et al. 1997). Flow hydrographs for tributaries of the Russian River indicate that stream flow is especially high during about 20% of the time during the winter months. Removal of a portion of this high flow would probably have no adverse affect on salmonids or stream ecosystem function. Comparisons of alternative rates of withdrawal suggest that limiting the instantaneous rate of diversion to less than 20% of the "winter 20% exceedence flow" would 1) preserve the natural high flow events needed for channel maintenance, 2) preserve days with intermediate flows, and 3) provide substantial quantities of water to irrigators and other water users. This should be done in conjunction with the maintenance of a minimum flow equivalent to the February median flow. The institution of a maximum rate of instantaneous withdrawal equivalent to 20% of the "winter 20% exceedence flow" represents a cumulative rate for all diversions located at and upstream of a diversion site.

In summary, NMFS recommends that the SWRCB modify its water diversion guidelines by incorporating the following changes:

1. Adopt the February median flow as the minimum bypass flow standard

2. Protect the natural hydrograph by limiting the cumulative instantaneous rate of withdrawal to 20% of the "winter 20% exceedence flow"

3. Coordinate permitting so that cumulative withdrawals from upstream reaches do not exceed the maximum instantaneous withdrawal rate at any point on the stream.

Exhibit 4

Exhibit # 9

State of California - The Resources Agency
DEPARTMENT OF FISH AND GAME
http://www.dfg.ca.gov
1416 Ninth Street
Sacramento, CA 95814
(916) 653-7667

GRAY DAVIS, Governor

Mr. Marc J. Del Piero
Russian River Flood Control &
Water Conservation Improvement District
Post Office Box 2980
Ukiah, California 95482

Dear Mr. Del Piero:

The Department of Fish and Game's Central Coast Region staff has reviewed your request regarding information on 1600 agreements issued for diversions from the upper Russian River in Mendocino County. We understand your agency's concerns and certainly are willing to work with the District. The issue of water diversions is one of the most problematic facing the 1600 program. The issue is the cumulative effect of many small diversions which by themselves may have minimal impacts, particularly if appropriately screened.

The normal process for providing public and agency review of streambed alteration agreements is through the environmental review process (California Environmental Quality Act). The Department is currently working to develop a method for adequately reviewing the impacts of diversions from the Russian River without stopping diversions altogether while the review is completed. We would be interested in sitting down with the District to discuss how this could be done.

Regional staff will also look at ways by which we can provide the District with summary information on 1600 applications which are of interest to the District.

Mr Carl Wilcox, Habitat Conservation Manager, Central Coast Region, will be contacting you to arrange a meeting to discuss these issues. You may reach Mr. Wilcox at Department of Fish and Game, Central Coast Region, Post Office Box 47, Yountville, California 94599, telephone (707) 944-5525.

Sincerely,

Robert C. Hight
Director

cc: Mr. Edward Anton, Executive Director
State Water Resources Control Board
Sacramento, California

Conserving California's Wildlife Since 1870

Exhibit J

Exhibit #10

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

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NAT. MARINE FISHERIES SVC.
SANTA ROSA, CA

In Response Ref:
151416SWR03SR

MAY 23 2003

DOC NO. SR59168
AR NO. 151416SWR03SR3677
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DESK COPY ☐

Mr. Arthur G. Baggett, Jr., Chair
State Water Resources Control Board
1001 I Street
P.O. Box 100
Sacramento, California 95812-0100

Dear Mr. Baggett:

The National Marine Fisheries Service (NOAA Fisheries) has only recently become aware of the State Water Resources Control Board (SWRCB) proceedings and hearing on Applications 18334X02, 30521, 30522, and 30552 of Pajaro Valley Water Management Agency (PVWMA) to appropriate water from College Lake (Salsipuedes Creek), Harkins and Watsonville Sloughs, and the Pajaro River in Santa Cruz County. The Certified Mail and also Regular Mail Service Lists prepared and submitted by the SWRCB's staff to all parties for the Public Notice of Hearing, do not show that NOAA Fisheries was served with a copy of the Public Notice for this Water Rights Hearing, although numerous other agencies and parties were served.

The Notice for this hearing states that the proposed amount of water to be appropriated under State Filed Application (SFA) 18334X02 is 200 cubic feet per second (cfs) (maximum diversion rate) to be diverted from January 1 to December 31 of each year to offstream storage at a proposed 21,000 acre-feet (af) reservoir. That SFA, which was filed by SWRCB in 1958 can be released from priority or a portion assigned to any application with some restrictions. On December 23, 1996, PVWMA filed a petition for partial assignment of SFA 18334X02. However, in the event that PVWMA's petition for partial assignment is not approved by the SWRCB, PVWMA seeks a release from priority of SFA18334 in favor of additional water rights Applications 30521, 30522, and 30552, all of which were filed in 1996. The total amount of water to be diverted under PVWMA's petition or the applications is 10,600 acre-feet annually (afa) at a combined maximum rate of diversion of 65 cfs.

NOAA Fisheries is responsible for conserving, protecting, and recovering anadromous salmonid species listed under the Federal Endangered Species Act (ESA). In 1997, NOAA Fisheries listed steelhead in the South-Central California Coast Evolutionarily Significant Unit (ESU), which includes the steelhead of the Pajaro River, as a federally listed threatened species (62 FR 43937 August 18, 1997). At this time, we are concerned that the scheduled hearing for Application SFA 18334, and Applications 30521, 30522, and 30552 would likely lead to decisions that have the potential to significantly impact this local, already threatened steelhead population. We are also concerned that diversions under these proposed applications would cause the "take" of many individuals of this species.

Reasons for our concern that steelhead will likely be adversely affected by the development of these diversion projects are:

1. The final Program EIR on the Pajaro Valley Water Basin Management Plan was completed and certified in 1993 before the South-Central Coast ESU was listed for protection under the provisions of the ESA.

2. The volume of water and maximum instantaneous rate of withdrawal requested by PVWMA is large relative to natural stream flows in the Pajaro River. Therefore, there is significant potential that the diversions will substantially diminish the availability of habitat for steelhead. For example, at the Rte 129 bridge on the Pajaro River, the long-term median flow for the months of February and March (the wettest winter months) are 9[illegible] and 96 cfs, respectively, for the period of record 1939 though 1999. [*The USGS gage records from which these statistics are derived are from a gaging site that monitors flow downstream from more than 90% of the Pajaro River watershed area.*] With a maximum instantaneous diversion rate of 15 cfs at Murphy's crossing and a total diversion rate of 65 cfs in the lower watershed, the proposed project could substantially reduce winter flows that facilitate upstream migration and spawning of steelhead.

3. The proposed season of diversion for SFA 18334x02 is September 15 through May 31. Under A30521, A3052[illegible], and A30552, the proposed diversion season is November 1 to May 31. Stream flows are relatively low during the months of November, December, April and May (see Table 1). The results are flows that were exceeded 20, 30, 40, and 50 percent of the time during the specified months. The large volume of water and high maximum diversion rates proposed for this project could potentially have a significant adverse effect on stream flows that facilitate downstream migration of juvenile steelhead during spring and adverse effects on flows that sustain over-wintering and rearing juvenile steelhead.

Table 1. Average daily stream flows (cfs) expressed as percent exceedence at the USGS gage located on the Pajaro River at Chittenden during April, May, November, and December for the period 1939 to 1999.

	Month			
Exceedence	April	May	November	December
20%	225	[illegible]6	18	54
30%	134	[illegible]6	13	26
40%	76	[illegible]7	9	19
50%	47	[illegible]0	7	14

In addition, given that the EIR prepared for the proposed project was completed prior to the listing of steelhead in the Pajaro River, the adequacy of that environmental analysis is questionable. NOAA fisheries requests additional consideration of flow needs to protect steelhead, including site specific analysis conducted in consultation with NOAA Fisheries and the California Department of Fish and Game. Because of the magnitude of the volume of water and the maximum instantaneous rate of diversion requested by PVWMA, we recommend that the SWRCB postpone the hearing on this project until its impacts to threatened species are sufficiently understood and adequate terms and conditions for mitigating those impacts can be developed.

We appreciate the difficulties that this issue of threatened steelhead brings to this proceeding. However, given our lack of notification, the pre-existing environmental assessment, the appreciable time needed for adequate assessment, and the potential significant impacts of the project, NOAA Fisheries believes it is reasonable to delay actions on the PVWMA project.

Thank you for your consideration on this matter and willingness to work with our agency to avoid adverse impacts to Federally listed anadromous salmonids. If you have technical questions concerning this letter, please call Dr. William Hearn at 707-575-6062.

Sincerely,

for Rodney R. McInnis
Acting Regional Administrator

cc: M. Capelli, NOAA Fisheries
M. Croom, NOAA Fisheries
R. Floerke, DFG (Yountville)
N. Murray, DFG (Sacramento)
C. McNiesh, PVWMA
A. Orton-Palmer, USFWS (Ventura)
Santa Cruz County Supervisors, Chair
Monterey County Supervisors, Chair
R. Baiocchi
R. Roos-Collins, Natural Heritage
S. Griffin, TU
B. Rutemoeller, Sierra Club
J. Crenshaw, CalSPA

Exhibit 2

Exhibit #11

Fish Bypass Flows for Coastal Watersheds

A Review of Proposed Approaches for the State Water Resources Control Board

Peter B. Moyle
Department of Wildlife, Fish and Conservation Biology
University of California Davis

G. Mathais Kondolf
Department of Landscape Architecture and Environmental Planning
and Department of Geography
University of California Berkeley

With Technical Assistance From
John G. Williams
Bay-Delta Modeling Forum

June 12, 2000

1. Introduction

In the Russian River watershed increasing pressure to develop hillside agriculture (especially vineyards) has led to a proliferation of water rights applications for diversions from headwater streams, which support federally listed coho salmon or steelhead, or support larger streams that do. Similar conditions occur in other coastal watersheds. The State Water Resources Control Board (SWRCB) is presently wrestling with the issue of how to condition permits for water rights to protect ecological resources, a task made difficult by the lack of information on the physical and ecological functioning of these channels, and their influence on downstream channels. For example, proposed methods for determining minimum instream flows in these streams have been developed using stream gauge data - all of which are from larger channels downstream, where scale differences lead to a very different hydrology. Similarly, the need for streamside protection zones along these headwater channels is not widely recognized, because most guidance has been developed for larger channels. In any case, existing institutions are poorly suited to regulating activities that impact these streams. The State Board can decide how much water (if any) should be diverted but has limited authority to regulate land use changes that influence runoff and erosion rates. Similarly, the Department of Fish and Game can put conditions on activities within the stream itself, but has limited authority beyond the stream banks. Land-use decisions are made at the county level, with varying levels of scientific analysis and political concerns influencing decisions. The most advanced county-level ordinance in the region is the Napa County Conservation ordinance, which is now under review in part because of concerns over its effectiveness in addressing the effects of multiple headwater impacts. Moreover, there is presently no mechanism for taking cumulative effects into account. The SWRCB has proposed analyzing cumulative hydrologic changes from numerous headwater diversions at the upstream point used by anadromous fishes, but this limit is changing in many streams as human-made barriers (such as culverts) are corrected as part of watershed restoration programs.

This review is intended to provide the SWRCB with guidance regarding minor water rights applications on streams in coastal watersheds, with particular focus on the Russian River basin. Many of these streams support coho salmon or steelhead rainbow trout, which are listed as threatened under the federal Endangered Species Act (ESA). Although there is general agreement that there is little if any water available for diversion in the dry season, frequent winter flooding in the Russian River basin supports the view that water could be diverted in some winter months without harmfully affecting instream flows required by salmon, steelhead, and other public trust resources. The SWRCB staff has developed an approach that, when embodied into permit conditions, is designed to allow for a "negative declaration" under the California Environmental Quality Act (CEQA) for diversions from small coastal steams; that is, a finding that exercise of a new permit will not have a significant effect on the environment. In other words, the conditions of each permit are supposed to be strict enough so that the diversion will not have negative effect on salmon, steelhead, or other significant aquatic life, either individually or cumulatively. Such findings have been made for several water rights applications in the basin of the Navarro River (SWRCB 1998), which supports coho and steelhead, and the SWRCB staff proposes to use the same approach in the basin of the Russian River, which also supports both species (SWRCB 1997).

The approach has been controversial, however, and has been criticized by the National Marine Fisheries Service (NMFS), Trout Unlimited (TU), the California Sports Fishing Protection Alliance (CALSPA), and others. This caused the SWRCB staff to seek review of the approach by qualified experts acceptable to the various parties, and the authors of this review were selected. The SWRCB also secured the services of the Executive Director of the Bay-Delta Modeling Forum, of which the SWRCB is an institutional member, to act as staff for the review. As part of the review, the SWRCB staff conducted a workshop, on 31 January 2000, in which the SWRCB staff approach and alternatives suggested by NMFS and TU were presented. The California Department of Fish and Game, CALSPA, and engineers from two private firms who frequently represent applicants for water rights, Wagner & Bonsignore and Napa Valley Vineyard Engineering, also participated in the workshop and provided comments.

In this review, we do not recommend a definitive method for determining what flows should be left in each stream to the SWRCB staff and interested parties. Instead, we give our views on topics raised in the workshop and related issues, give suggestions for improved formulation of permit conditions instream flow standards that are well suited for adaptive management, and recommend an approach to apply within the context of adaptive management.

2. General comments on instream flow standards:

Scientific uncertainty and Adaptive Management:

The implications of uncertainty for public policy and environmental management have been a topic of discussion in the scientific literature for some time (e.g. Holling 1978), but particularly in the last decade (e.g., Ludwig et al. 1993; Hilborn and Peterman 1995; Mangel et al. 1996; Chrisentsen et al. 1996; Francis and Shotton 1997; Healey 1997). The discussions have concerned environmental management generally, and management of fisheries or fish populations in particular, and have been motivated by rampant management failure: many stocks of commercially important fish have recently collapsed (Thompson 1993; Horwood 1993), and many runs of Pacific salmon and steelhead are either extinct or in trouble (Nehlsen et al. 1991; Stanley et al. 1996; Mills et al. 1997; Brown et al. 1994; Yoshiyama et al. 2000).

Briefly stated, it is now generally recognized among professionals that management of wild living resources involves such large amounts of uncertainty that (1) management actions are experiments and should be treated as such, and (2) irreversible actions should be avoided. This point of view is embodied in the widely advocated approach of "adaptive management" (e.g., Holling 1978; Walters 1986; Volkman and McConnaha 1993; Healey and Hennessey 1994; Healey 1997, Williams 1998). In 1996, we joined others in declaring that "currently no scientifically defensible method exists for defining the instream flows needed to protect particular species of fish or ecosystems," and in calling for the application of adaptive management to the problem of setting instream flow standards (Castleberry et al. 1996), with a focus on flows below existing dams. We made three basic recommendations:

First, conservative (i.e., protective) interim standards should be set based on whatever information is available, but with explicit recognition of its deficiencies. The standards should prescribe a reasonable annual hydrograph as well as minimum flows. Such standards should try to satisfy the objective of conserving fishery resources, the first principle of adaptive management (Lee and Lawrence 1986).

Second, a monitoring program should be established and should be of adequate quality to permit the interim standards to serve as experiments. Active manipulation of flows, including temporary imposition of flows expected to be harmful, may be necessary for the same purpose. This element embodies the adaptive management principles that management programs should be experiments and that information should both motivate and result from management actions. Often, it also will be necessary to fund ancillary scientific work to allow more robust interpretation of monitoring results.

Third, an effective procedure must be established whereby the interim standards can be revised in light of new information. Interim commitments of water that are in practice irrevocable must be avoided.

Here, we expand on these ideas, particularly as they relate to diversions from small streams.

The fact of relevant scientific uncertainty is perhaps best illustrated by recent developments in stream ecology. The role of high flows in structuring food webs in streams like those under consideration here has been elucidated only in the past decade (Wootton et al. 1996). Understanding of the substantial ecological importance of subsurface (hyporheic) flow, which is affected by the frequency with which stream sediments are mobilized, has also developed rapidly over the same period (Jones and Mulholland 2000). Although a great deal is known about salmonids and about stream ecosystems, these examples show that we should expect more surprises, and not assume that our current understanding is sufficient to support permanent decisions regarding management of streams.[1]

In adaptive management, uncertainty is acknowledged, management actions are recognized as experiments, and developing new information is an explicit management objective that can justify actions that may be sub-optimal in terms of other objectives. Deliberate manipulation of the system is required when there is otherwise little variation in the factor of management concern. For example, an adaptive approach to evaluating flows in a regulated stream with fairly constant flows would require a deliberate change in management; it is impossible to learn much about the relation between flow and public trust benefits in a stream if the flow does not vary. In other situations, an adaptive approach may not require deliberate manipulation of the system in question. Delta outflow in the spring, for example, varies naturally much more from year to year than it could from any plausible deliberate manipulation of outflows. The key in such situations is to describe the conceptual model upon which management is based as explicitly and quantitatively as possible so that the rationale for the standards can be formulated as testable hypotheses, and to establish a monitoring program by which the hypotheses can be tested.

[1] The great complexity of ecosystems and the practical impossibility of accurately measuring many relevant aspects of them explains the apparent paradox that scientists know a great deal about ecosystems but remain unable to make good specific predictions about how they will behave in response to small or intermediate perturbations. See Healey (1997) for a good discussion of this point.

Thus, adaptive management of instream flows may or may not require deliberate, experimental manipulation of flows, depending on the amount of variation that occurs in flows regardless of management. Generally, there will be large variation in flows within and between years in Russian River tributaries and in other California coastal streams. However, to depend on natural variation in flow for management "experiments" increases the risk that results will be confounded by other variables. For example, water quality might be better in high-flow years, so that benefits of improved water quality could be mistakenly interpreted as results of some hypothesized flow-habitat relationship. In any event, the rationale for the instream flow standards or permit conditions must be made clear, so that it can be tested against new information.

This can best be done if objectives and conditions or standards are stated in terms of explicitly biological criteria, with a method specified to convert these into hydrological terms. This allows the condition or standard to be articulated as a testable hypothesis or set of hypotheses. In the present context, for example, a winter flow standard or by-pass condition might be stated as a flow that allows enough spawning to occur to saturate the rearing capacity of the stream, stated quantitatively as enough flow to allow spawning to occur in 75% of the potential spawning habitat in the stream. To make this criterion operational it could be translated, based on some explicitly stated reasoning or evidence, as some particular value on the flow duration curve or some other parameter of the flow data. The standard or condition now involves two hypotheses, one harder to test than the other, but both at least conceptually testable. The more easily testable hypothesis would be that the selected flow criterion actually does allow for spawning in 75% of the potentially available habitat. The more difficult hypothesis would be that 75% of the potential spawning habitat will provide the desired level of biological protection, say lack of harm to listed species. The conceptual model in this case would be density-dependent effects such that spawning on 75% of the potential spawning habitat would saturate the rearing capacity of the stream, so that making more spawning habitat available would not result in greater production of juveniles or returning adults. In any event, the reasoning behind the standard or condition should be spelled out, so that is possible to specify the kind of information that would justify a change.

Under adaptive management, in other words, management decisions should *invite* change, by emphasizing uncertainty, by making clear what kind of new information would justify a change in the management action, and by requiring monitoring that can provide the relevant information. We emphasize this to clarify the difference between adaptive and traditional management, in which management actions typically are designed to be durable, and the reasoning given for the decision may be deliberately vague to further that end. Formulations such as "Careful consideration of all the evidence leads to the conclusion that a by-pass standard of X cfs best balances the competing needs for water," without further elaboration, are incompatible with adaptive management.

Similarly, the large scientific uncertainty regarding instream flows means standards or conditions must be based on explicit conceptual models and formulated as testable hypotheses. To depend on consensus of technical experts for the parties or stakeholders in a given situation, without these elements, may be convenient for decision-makers but damaging to the resource. Consensus on conceptual models and testable hypotheses would be very useful, but if the technical experts cannot articulate their recommendations in this way, the consensus is most likely based on non-scientific considerations, and as noted by Mangel et al.(1993) this approach has often failed:

> We believe that a principal reason for the routine overexploitation of resources is that the scientific community often fails to differentiate between science and policy, that is, to separate fact and value judgements. For example, scientists are often expected to reach "consensus" amid considerable scientific uncertainty about cause and effect. Instead of telling policy makers that they cannot accurately predict the consequences of alternative management strategies, scientists allow themselves to be forced into negotiated agreement. As a result, decision makers (usually not scientists themselves) are often not fully aware of the uncertainties and cannot be help fully accountable for the consequences of their actions.
>
> The International Whaling Commission, for example, asks its Scientific Committee to recommend catch quotas. Available information is often insufficient to determine catch levels that can be sustained, and many Scientific Committee members have different views about what should be done in the face of uncertainty; some believe that, when there is uncertainty, the benefit of the doubt should be afforded to the industry while others believe that it should be afforded to the resource. Instead of reporting the uncertainty and the possible consequences of this uncertainty to the Commission, the Committee generally has sought a "scientific consensus" that represents a middle ground. In hindsight, the consequence of attempting to reach a consensus is clear: one stock after another of the world's large whales have been driven to economic and near biological extinction.

In the current context, uncertainty in estimates of flows in small, ungaged streams is a major problem. The SWRCB has tried to address this problem through development of a rainfall-runoff model for the Russian River watershed, but the accuracy of this or any other model is fundamentally constrained by the scarcity of data on rainfall and runoff, which can be highly variable spatially in coastal watersheds. We make recommendations for addressing this problem below.

Other Types of Uncertainty and Other Factors to Consider:

Experience with fisheries management has demonstrated that uncertainty regarding non-scientific factors also needs to be taken into account for effective management, and doubtless the same is true for management of diversions from streams. Most obviously, uncertainty regarding compliance with permit conditions must be taken into account,[2] and the SWRCB should avoid allocating water to uses that would suffer seriously in dry years when permit conditions would limit diversions, unless it can assure compliance with the conditions. Uncertainty regarding future diversions under riparian rights, or expansions of diversions under appropriative rights, should be taken into account in such situations. Stated differently, effective management needs to take human motivation into account (Ludwig et al. 1993). In many situations, including the approach

[2] We appreciate the frank comments by Wagner and Bonsignore and Napa Valley Vineyard Engineering on this point.

under review, uncertainty about existing diversions under riparian or pre-1914 rights will be important, as will illegal diversions. Similarly, the SWRCB needs to consider the indirect effects of water allocations on streams. For example, if a small diversion from a headwater stream makes possible a use that will be accessed through the winter by a dirt road, then sediment from the road may have a greater effect on the stream than the diversion itself. Simply depending on other agencies to control such effects puts the puts the public trust at undue risk. Effective management needs to deal with the world as it is, not as it is supposed to be, and not as it is bounded by agency jurisdictions.

Limitations on Adaptive Management for Minor Water Rights Applications:

Water rights granted for vineyard development or other capital-intensive activities are for practical purposes irrevocable and their environmental effects should be evaluated in that light. This reduces the applicability of adaptive management to the process under review. Nevertheless, adaptive management still has a role, because much of the concern about the minor water rights applications involves cumulative impacts, so that future modification of the process for evaluating individual permits, in light of new information, can still be effective. However, the practical irrevocability of such allocations of water creates a greater need for caution than would otherwise be the case.

The practicality of effective monitoring of the efficacy of conditions on minor water rights permits also limits the applicability of adaptive management in such cases. Effective monitoring is almost always expensive, and the cost per unit of water diverted will be particularly high for small diversions. It seems to us that this difficulty can best be overcome by monitoring the effectiveness of permit conditions on a sample of diversions, with some method for spreading the cost over all diversions. Requiring inadequate monitoring of all diversions would be a waste of resources.

The need to protect high flows and flow variability:

The importance of maintaining high flows and flow variability seemed to be recognized by all parties at the workshop. We agree. There has been a spate of recent articles that emphasize the importance of variation in flow in rivers for creating and maintaining aquatic and riparian habitat and ecosystems (e.g., Ligon et al. 1995, Power 1995, Reeves et al. 1995, Sparks 1995, Power et al. 1996, Stanford et al. 1996, Wootton et al. 1996, Richter et al. 1997, Nilsson et al. 1997). As stated in the abstract of Power et al. (1996):

> Responses of rivers and river ecosystems to dams are complex and varied, as they depend on local sediment supplies, geomorphic constraints, climate, dam structure and operation, and key attributes of the biota. Therefore, "one-size-fits-all" prescriptions cannot substitute for local knowledge in developing prescriptions for dam structure and operation to protect local biodiversity. *One general principle is self-evident: that biodiversity is best protected in rivers where physical regimes are the most natural. A sufficiently natural regime of flow variation is particularly crucial for river biota and food webs.* We review our research and that of others to illustrate the ecological importance of alternating periods of low and high flow, of periodic bed scour, and of floodplain inundation and dewatering. The fluctuations regulate both the life cycles of river biota and species interactions in the food webs that sustain them. Even if the focus

of biodiversity conservation efforts is on a target species rather than whole ecosystems, a food web perspective is necessary, because populations of any species depend critically on how their resources, prey, and potential predators also respond to environmental change. ... (Emphasis added.)

Brian Richter and his colleagues at the Nature Conservancy have developed an approach to evaluating instream flows from this point of view (Richter et al. 1996, 1997, 1998), although they acknowledge that the approach only provides a "first cut" that should be implemented in the context of adaptive management. The approach involves comparing up to 33 statistics developed from observed or simulated daily flow records for "project" and "no project" conditions, to develop and "index of hydrologic alteration," or IHA. A computer program to perform the analysis is available. The approach is strictly empirical, however.

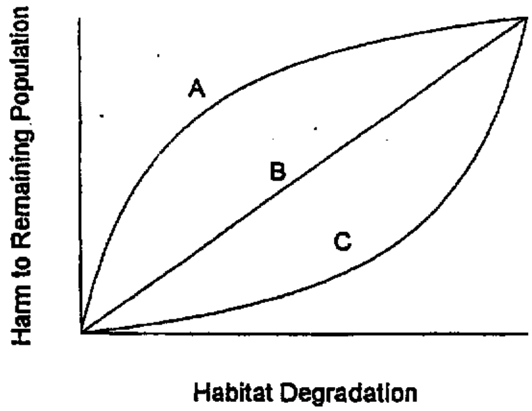
Issues of Spatial Scale:

Issues of spatial scale are important in several aspects of the problem under consideration, as emphasized by TU. As one example, flows that provide adequate depth for migration of adult salmonids or for spawning become less frequent as the drainage area decreases. As another example, the flow in a stream reflects the integrated effects of rainfall over the basin, which may be highly variable if area of the basin covers more than a few square miles, so flow in the lower reaches is less variable than flow in the smaller tributaries. Therefore, applying hydrological generalizations developed from gage data to headwater streams is perilous, since gages typically are located in the lower reaches of stream systems.

At another level, there is ordinarily a need to balance instream and consumptive uses of water.[3] This balancing needs to be conducted at an appropriate spatial scale, however, if it is to be effective. Any such balancing in Russian River tributaries, for example, must place in the balance the amount of habitat that is blocked by Warm Springs Dam or otherwise degraded. This will create equity concerns on the part of water rights applicants on less modified streams, but meeting these concerns at the expense of the remaining habitat is a recipe for environmental disaster.

The equity concern just described raises an important question: how should we regard the incremental effect of additional habitat degradation in an already degraded system? The figure below shows three conceptual alternatives: Curve A reflects the idea that if an environment is already highly degraded, then a little more damage won't hurt much. Curve B shows a linear relationship, in which the harm to remaining members of a population does not depend on the general level of degradation, while Curve C reflects the idea that a high level of degradation makes any remaining habitat even more important. Of course, these curves grossly simplify a highly complex situation, but in our experience people do tend to evaluate evidence in terms of such simple conceptual models, so it useful to make them explicit.

[3] Our impression is that where federally listed species are involved, the balancing has already been done by Cong ress, but this point may still be relevant for tributaries too small to support salmon and steelhead.



For the situation at hand, we think that Curve C is most appropriate, although it should be regarded as a rebuttable presumption. In other words, the burden should be on applicants to show that Curve C is not appropriate. One reason for this is the essentially irrevocable nature of appropriative water rights, which makes the effects of choosing the wrong curve asymmetrical. For example, if Curve A really is the correct conceptual model, then acting as if Curve C is correct and denying a permit will result in temporary economic loss, since the water could be allocated after Curve A is shown to be appropriate. On the other hand, if Curve C is correct, then the consequences of issuing permits on the assumption that Curve A is correct will be serious and cause permanent harm to the population. This kind of asymmetry of effects, together with the scientific and other types of uncertainty described above, is the basis of the "precautionary principle" for fisheries management (Cameron and Abouchar 1991; Hilborn and Peterman 1996; Gordon and Munro 1996; Richards and Maguire 1998).

Legal barriers to rational water management:

California water law is a curious patchwork that has evolved in response to changing conditions in the state. Although it is possible to understand how the law came to be as it is, the law is nevertheless ill-suited for coping with the difficult allocation problems now facing the state. To scientists such as ourselves, for example, the different legal treatment of surface water and groundwater is fundamentally irrational and seriously compromises the state's ability to deal with its water problems. This is true at the state-wide scale at which we are currently advising CALFED, and it is also true at the scale of minor tributaries of the Russian River. The Public

Trust Doctrine provides the SWRCB with a powerful tool for accommodating appropriative water rights with protection of the public trust. However, demand in an area may be supplied partly by surface water diverted under riparian rights, partly by surface water diverted under appropriative rights, partly by "small domestic" certificates,[4] and partly by pumping of groundwater that is non-jurisdictional but is hydrologically linked to the surface streams. In such cases, developing rational and equitable conditions to impose on the exercise of appropriative rights is a task that we do not envy. The SWRCB is, in effect, working with one foot and one hand tied behind its back. Especially given the presence of listed species in a basin, the inability of the state to control effectively all water use within a basin means that even greater caution should be exercised regarding water use that the SWRCB can control than might otherwise be the case.

Existing unauthorized diversions:

The presence of many unauthorized diversions, some of long standing, creates a dilemma for the SWRCB. On the one hand, effective government depends upon the consent of the governed, and taking too strong a position against people who honestly do not realize that they need a permit for their diversions is likely to be counterproductive. On the other hand, taking too weak a position invites non-compliance, and deals with the problem at the expense of the public trust. We are not confident that there is a good resolution to this dilemma, but a vigorous program to identify unauthorized diversions and bring them into the water rights process would be an important step in the right direction. If the problem is ignored it will only get worse.

3. General comments on approaches discussed:

The SWRCB staff is attempting to develop an approach that, when embodied into permit conditions, will allow for a finding that the project in question will not have a significant effect on the environment. Under the ESA, harm to listed species is by definition a significant effect, so for the Russian River basin the approach must also allow for a finding that the project will not harm coho salmon or steelhead. Given the depressed condition of the populations of salmon and steelhead in the basin and the our limited knowledge of these fish and the ecosystems that support them, a finding of "no harm" can only mean that there is an acceptably low risk of a significant effect on the environment or harm to listed species. Reasonable people can differ in their assessment of what is an acceptable risk of harm. We emphasize, however, that given the condition of the stocks, the "reasonable range" of assessments includes the view that the Russian River and its tributaries are already over-appropriated, that existing diversions should be cut back, and that no new diversions should be allowed.

Although the condition of coho and steelhead populations the Russian River basin and elsewhere in California justifies particular attention to the effects of water diversions on these species, it bears emphasizing that the need for protection does not end with anadromous fish. In regions with Mediterranean climates, much of the drainage network is composed of intermittent headwater streams that flow seasonally. These channels support a distinct biota that has received

[4] Individual small domestic diversions can adversely affect very small tributaries even when they are not abused, and we suspect that abuse is not uncommon. Small domestic diversions also raise serious concerns regarding cumulative impacts. We think § 1228 et seq. of the Water Code should be reconsidered.

little attention, but deserves protection in its own right.[5] The seasonal streams may be particularly important for the breeding by amphibians (especially frogs), which are declining worldwide.

Such channels also convey water, sediment, organisms, organic litter, and large woody debris to perennial reaches downstream. As noted in Welsh et al. (2000), at the conclusion of a discussion of the critical role of large woody debris for pool formation:

> ... In a natural stream with intact riparian forests, a large proportion of these logs would enter streams from the highest channels in the stream network ... during large storm events (Sedell et al. 1998). Because they provide large woody debris and a variety of sediment types, headwater or first-order stream channels strongly influence the type and quality of downstream fish habitat (Sedell et al. 1998). Stated succinctly, "Reaches that are themselves inhospitable to salmonids may contribute to the maintenance of salmonid populations downstream" (G. Reeves in Reid 1998).

The ecological linkages between small headwater streams and the larger streams farther down the watershed mirrors the cumulative impact problem with minor diversions. Just as small headwater streams combine to form the larger streams that support anadromous fish, so many small diversions, which individually may be inconsequential, can combine to contribute substantially to the degradation of the stream system as a whole.

In some cases seasonal streams are even used directly by anadromous fish. For example, Trush (1991) observed that steelhead trout may ascend seasonal streams during winter freshets, spawn, and descend before flows drop below the minimum level for adult passage Their eggs hatch and the alevins emerge and migrate downstream in the spring before the channel dries up. Some juvenile chinook salmon in the Sacramento drainage also use seasonal tributaries for rearing habitat, and the same may be true of steelhead and coho salmon in the coastal streams.

Although most consideration has been given to steelhead and coho adults and to flows needed for spawning, winter habitat for juveniles is a major factor limiting recruitment for coho in coastal streams in Oregon (Nickelson et al. 1992) and British Columbia (McMahon and Hartman 1989; Hartman et al. 1996). The importance of winter habitat for juveniles in California is poorly understood but it clearly deserves more attention than it has received.

Finally, It seems to us that applying a single, "one size fits all" approach to instream flow standards for Russian River tributaries and other headwater streams in coastal watersheds is ill advised. The more general the approach, the more margin for error is required to support a finding of no significant effect. At the least, a distinction should be made between diversions from perennial streams or seasonal streams that carry continuous flow for part of the rainy season in most years, on one hand, and ephemeral streams or swales that flow only during or shortly after storms on the other. We discuss these separately below.

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[5] See Gasith and Resh (1999) and Welsh et al. (2000) for recent reviews.

4. Proposed conditions on diversions from perennial or seasonal streams:

Summary of proposals:

The SWRCB staff proposed standard conditions that include three restrictions on diversions: (1) the season of diversion is restricted to December 15 to March 31; (2) the maximum rate of diversion is restricted, as determined on a case-by-case basis; and (3) diversions must allow a by-pass flow of 60% of the estimated mean annual unimpaired flow at the site. SWRCB permit terms in the Navarro watershed also include the provision that water diverted under claim of riparian rights not be used in the same area as water diverted under the permit, and we understand that this fourth constraint would apply elsewhere as well. NMFS agrees with the general form of the SWRCB staff proposal and the proposed season of diversion, but maintains that the by-pass standard should be the February median daily unimpaired flow, and that total diversions from a stream be limited to 20% of the 20% exceedence flow. TU also finds the basic form of the staff proposal and the season of diversion acceptable, but proposed that the by-pass flow be the 10% exceedence flow (90th percentile) daily unimpaired flow, that by-pass flows allow a minimum passage depth of 0.8 to 1.0 ft, and that total diversions from a stream not advance the recession of storm hydrographs to the by-pass flow by more than 0.5 to 2 days, depending on the size of the watershed. Wagner and Bonsignore and Napa Valley Vineyard Engineering also found the basic form of the staff recommendation acceptable, although impractical and overly burdensome in some specifics. At the workshop, there seemed to be convergence of opinion toward the general limit to total diversions proposed by NMFS.[6] In summary, there is agreement regarding the basic approach, but differences regarding several of the specifics of its implementation.

We are not persuaded that it is wise to issue any new permits until effective recovery programs for coho salmon and steelhead are in place, but with that caveat we also find the general form of the approach acceptable, and agree that a hydrologically-based approach is reasonable provided that the hydrological criteria are explicitly linked to biological criteria by testable hypotheses. The form of the NMFS proposal for limiting total diversions seems reasonable, although we have not evaluated the specific criterion that NMFS has proposed. Effective implementation of this approach would require knowledge of all existing legal and illegal diversions, however, for which data are largely lacking at present. We also agree with NMFS that negative declarations are inappropriate for proposals for impoundments on perennial or seasonal streams. Such impoundments are likely to have a significant effect on the environment, even if conditions requiring by-pass flows are made part of the permit. Apart from concerns regarding compliance with by-pass requirements, such impoundments will drown stream habitat that has ecological value even if it does not support fish, and will effect other stream habitat by interfering with the migration of organisms and downstream movement of sediment and organic matter as well as water. We also agree with TU that a separate minimum depth criterion may be necessary, particularly for smaller streams.

SWRCB staff proposal for by-pass standards:

The 60% mean annual flow by-pass flow proposed by the SWRCB staff is based largely several PHABSIM studies that indicate that 60% of the mean annual flow will provide 80% of "weighted usable area" (WUA) for coho and steelhead spawning. During the workshop, the SWRCB staff clarified that their proposed by-pass flow is intended to allow for substantial

[6] This approach is detailed in pp. 28-29 in NMFS (2000).

spawning, and not just to provide holding habitat between high flow events during which spawning might take place.

In form, this recommendation is close to what we think is needed. That is, there is a biological objective, and the approach is based on a conceptual model (which underlies PHABSIM) that can easily be formulated as testable hypotheses. We cannot endorse this standard, however, for several reasons, some of them raised in comments by NMFS and TU. A first reason concerns scale effects: some minimum depth is required for adult passage and spawning, but the depth provided by some fixed percentage of the mean annual flow will decrease with the watershed area. Accordingly, applying the results of studies on relatively larger streams to smaller ones is dubious. A second reason concerns the uncertainty associated with the results of any method for estimating spawning habitat, and the presumed dome-shaped relation between flow and spawning habitat in a given stream. Even if PHABSIM results involved relatively little uncertainty, small underestimates of the flow that would produce 80% of maximum spawning habitat could produce relatively large reductions in the actual spawning habitat, particularly because the flow-habitat curves tend to be steeper to the left of the selected point.[7] In other words, the SWRCB staff approach does not provide an appropriate margin for error.

More seriously, the uncertainty in the results of PHABSIM studies is very large. PHABSIM is based on the premises that habitat value of a point in a stream can be described in terms of the depth, water velocity, and the substrate, and that the area of a reach of stream with given values of depth, velocity and substrate can be estimated using hydraulic models. The descriptions are based on "preference" or "suitability" curves that vary between 0 and 1 as a function of depth, velocity, and substrate, using different curves for different life stages. The hydraulic modeling is normally done with one-dimensional models, which describe the stream in terms of a set of transects, as was the case with the studies cited. Problems with PHABSIM using one-dimensional hydraulic modeling are described by Williams (1996) and Kondolf et al. (in press, attached as an appendix), and references cited therein. Briefly, there is a good deal of uncertainty in model results at the transects, and much more uncertainty from extending results at the transects to the rest of the stream. In terms of spawning, there is a clear additional problem with the conceptual model underlying PHABSIM: salmonids select spawning sites partially in terms of "hyporheic" or subsurface flow, so depth, velocity and substrate do not adequately describe spawning habitat.

In short, we believe that the PHABSIM studies cited by the SWRCB staff report do not provide an appropriate basis for by-pass conditions or flow standards, so the 60% criterion is essentially arbitrary. This does not mean that the 60% criterion is necessarily wrong, but rather that it lacks a suitable proximate rationale against which it could be judged. It seemed to us, however, that the discussions in the workshop and in the NMFS comments (p. 16) raised serious questions about the adequacy of the 60% criterion to avoid harm to spawning by steelhead and coho salmon, especially in smaller tributaries.

Finally, as noted above, we are concerned about the uncertainty in estimates of mean annual flow (or estimates of any point on the flow-duration curve) from the streamflow simulation model, that is proposed for use as part of the SWRCB staff approach. Probably a good deal of

[7] See Figure 4.1-2 in Attachment B to SWRCB (1997) for an example.

this uncertainty is unavoidable; precipitation in mountainous areas is highly variable temporally and spatially, and gages tend to be concentrated in more populated areas at lower elevation and relief. Measurements of stream flow from gage data are more accurate than estimates of areally-averaged precipitation, but 95% confidence intervals for flow measurements at gages are probably about +/- 5%, so even with measured data there is some uncertainty. Although we are not rainfall-runoff experts and have not carefully reviewed the model, it also seems to us that uncertainty in the estimates will increase as the size of the basin under consideration decreases, so the tests of the model presented in the SWRCB's 1997 Russian River Watershed Staff Report (errors of 7.6 and 10.3%) most likely underestimate the errors that should be expected when the model is applied to smaller areas.[8]

NMFS Proposal:

The February-median flow by-pass standard proposed by NMFS is based on two considerations: that more flow (within some limit) provides more spawning habitat, on the one hand, and that the flow must be sustained for a considerable period for the spawning to be successful, on the other. NMFS finds that the February-median flow is an easily defined criterion that reasonably balances these considerations, or in other words that the median February flow approximates the flow that will maximize the habitat in which coho salmon and steelhead can successfully spawn. NMFS also assumes that maximizing the effective spawning habitat will maximize production of steelhead and coho salmon (i.e., survival of juveniles is not strongly density-dependent, at least given current population levels). These assumptions can easily be cast as hypotheses, so the NMFS proposal is consistent with the form that we recommend. The first hypothesis, that the February median flow approximates the flow that maximizes effective spawning habitat, would be much easier to test than the second.

The NMFS criterion is more conservative than the 60% of mean annual flow standard proposed by SWRCB staff, and as noted above a more conservative approach is appropriate. Given the status of salmon and steelhead in the Russian River basin, and the absence of a realistic recovery plan, it is reasonable to maintain maximum spawning habitat in tributaries that do or could support these fishes, until good evidence is developed to show that less spawning habitat is required. This is particularly appropriate for an approach that is intended to allow for use of negative declarations under CEQA,.

NMFS also proposes that the cumulative diversion at any point on a stream not exceed 20% of the "winter 20% exceedence flow," following a procedure outlined at p. 28 in their comments, for which "winter" means December 15 to March 15. As noted above, there seemed to be convergence towards this approach in discussion at the workshop, and with the caveat noted

[8] We are also concerned by the statement at the end of Section 5 in Attachment A of the Staff Report that the model results were more variable when it was used with rainfall and runoff data for the same period (e.g., 1961-1981 for Macama Creek). We are not sure we that understand this statement, but it raises questions in our minds about the model testing. We also do not understand why the model tends to shift peaks in the average weekly flow data forward in time, especially later in the year (Figures 5 and 6 in Attachment A to SWRCB 1997) but this raises more questions. It seems to us that the model is really more of an empirical model than a physically-based model, and that explicitly empirical regression models might do as well or better for the intended use.

above it seems reasonable to us, although we have not done independent analyses of the specific criterion. Presumably NMFS agrees with the SWRCB staff that the maximum rate for individual diversions should be determined on a case by case basis.

Trout Unlimited Proposal:

The proposal by Trout Unlimited (TU) is also described in terms of hydrology, although two of the three criteria proposed are explicitly linked to biology. As described in the 1/10/00 letter from Bill Trush to Jerry Johns, TU proposes that:

(1) "No streamflow between December 15 and March 31 should be diverted below a stage height equivalent to the 10% daily average flow exceedence (p) on an unimpaired daily average flow duration curve."

(2) By-pass flows should allow a minimum passage depth of 0.8 to 1.0 ft (which will be more restrictive than (1) in smaller watersheds).

(3) In any stream, diversions should not advance the recession of storm hydrographs to the base flow determined (1) or (2) by more than 0.5 to 2 days, depending on the size of the watershed.

According to Trush's letter of 1/10/00, criterion 1 is "...associated with an hydraulic break in the channel's hydraulic geometry and is readily identified in the field as a morphologically distinct inner channel." This is also described as the "active channel" in the McBain and Trush commentary of 3/12/98, identifiable by "(1) the lower limit of rooted mature white alders, (2) the crest of an abrupt berm along the outer margin of bars, and (3) a bench of finer alluvium along glide and riffle margins." The commentary also summarizes observations regarding use of the active channel by steelhead from Trush's graduate research (Trush 1991). Criterion (2), regarding depth of flow, would be converted to a specific discharge by means of a relationship between depth and drainage area that Trush is developing under a contract with NMFS.

A basic difficulty with the TU proposal is that criteria (1) and (2) are based upon observations that have not been described in the peer- reviewed literature, and have not been subjected to ordinary professional scrutiny. We have reviewed materials provided to us by Trush (Trush 1991, Trush undated) and find that they would not persuade a skeptical reader that there is a morphologically distinct inner channel that is corresponds to the area occupied by the 10% exceedence flow in his study area, Elder Creek. Such an inner-channel may well exist, but the evidence for it has not yet been presented effectively. In any event, the generality of Trush's Elder Creek observations would need to be established before they would provide a reasonable basis for regulation.[9]

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[9] The active channel shelf feature identified reported by McBain and Trush (1998) and Trush (1991) has been reported from other river systems in the peer-reviewed literature. As noted in Trush (1991), Osterkamp and Hedman (1977:256) described the active channel shelf as:

> ...a short-term geomorphic feature subject to change by prevailing discharges. The upper limit is defined by a break in the relatively steep bank slope of the active channel to a more gently sloping

TU's third criterion raises an important point that should be considered before a specific total limit on diversions in the form proposed by NMFS is adopted; diversions will reduce the duration of flows greater than the by-pass standard, as well as the magnitude of such flows. With a small enough storm, a diversion could remove a flow pulse entirely, so the criterion as proposed may not be workable, but we think this point should be evaluated in some quantitative way, for example by use of the IHA software (Richter et al. 1996; 1997), as well as by visual evaluation of "with project" and "without project" hydrographs.[10]

5. Proposed Impoundments on ephemeral streams or swales:

For the reasons described above, the SWRCB staff should use caution and judgement in approving impoundments on ephemeral streams,[11] but in many situations this may be acceptable,

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> surface beyond the channel edge. The break in slope normally coincides with the lower limit of permanent vegetation so that the two features, individually or in combination, define the active channel reference level.

While the features appear to be the same, the frequencies of inundation are reported to be rather different. From a study of channel geometry at 70 gauging stations on mostly intermittent or ephemeral streams in the semi-arid western US, Hedman and Osterkamp (1982:3-4) reported these relations between the active channel and flow regime:

> At most perennial and intermittent streams the active channel level is exposed between 75 and 94 percent of the time. The active-channel level of many ephemeral streams may be exposed more than 99 percent of the time. The stage corresponding to mean discharge of most perennial streams approximates that of the active-channel level ... but is lower than the active channel level of the highly ephemeral stream channels...

In the (perennial) Passage Creek drainage basin in Virginia, Hupp and Osterkamp (1986) found that the active channel shelf was inundated between 5-25% of the time, and supported a riparian-shrub forest.

Thus, while the association of the active channel feature with the 10% exceedence level in north coastal California channels proposed by Trush is plausible, results in the published literature suggest considerable variation in the percentage of time that the active channel shelf is inundated. Scale issues are important. As shown by Hupp (1986), as one goes headward along a drainage, features like the floodplain and then the active channel shelf disappear completely. Thus, the relevance of the 'active channel' in headwater streams needs to be confirmed before being adopted as a basis for establishing instream flows there. At the least, the applicability. of the return periods and exceedence levels observed on larger channels to headwater channels is questionable. As Trush (1991) pointed out, "The case study of Elder Creek main channel morphology and steelhead spawning ecology has a sample size of one. Conclusions derived from monitoring and hypothesis testing cannot be statistically extrapolated to other drainage's or to tributaries within the Elder Creek Watershed" (p. 72).

Kondolf and Williams have observed the active channel shelf feature on many coastal California streams, but in some cases it was clearly the result of deposition of debris flow material brought in by steep tributaries. It is not clear to us why such deposits should be related to any particular point on a flow-duration curve, rather than the particular conditions existing just after the debris flow.

[10] People tend to underestimate differences represented by a pair of sloping lines because the normal distance between the lines is much easier to see than the more significant vertical and horizontal distances.
[11] We recognize that the SWRCB does not have jurisdiction over impoundments that capture "diffuse surface waters."

and in some cases it may be necessary to allow storage from diversions from larger seasonal or perennial streams. We agree with the suggestion made by CDFG during the workshop that there must be a limit to the percentage of a watershed controlled by impoundments, although there remains the question from which point to calculate this percentage. Clearly, 100% of the watershed above each impoundment will be so controlled, and the percentage will decrease moving downstream from each dam, unless there is a confluence with a more heavily regulated stream. Probably there is no rigid formula that will make sense in all cases. One possible approach would be to specify the limit in terms of a percentage of the watershed of first order streams, with recognition that there will be areas, for example swales that drain directly into second or higher order streams, to which this formula would not sensibly apply. The effects of these impoundments on high flows downstream should also be taken into account in estimates of total diversions and limits on cumulative diversions.

We recommend that impoundments only be permitted under negative declarations only when "fill and spill" operation is acceptable, so that permit compliance issues are minimized.[12] More flexibility regarding the season of diversion may also be appropriate for such cases, so that the effects of different diversions can be distributed temporally.

Additionally, we recommend a requirement that impoundments be emptied annually, for two reasons. The first and most important reason is that perennial ponds provide habitat for exotic species such as bullfrogs. The danger from these exotics far outweighs any incidental or opportunistic use of such ponds by native species, including listed natives. Secondly, a requirement that ponds be emptied will greatly facilitate compliance monitoring; a pond will either be effectively empty before the allowed season of diversion, or it will not.

6. Minimum level of analysis:

Even with conservative bypass standards, field investigations will always be necessary to provide the information necessary for a Negative Declaration. More importantly, the SWRCB can learn whether its permit conditions adequately protect public trust resources only if it has information regarding current conditions to which future conditions can be compared. We recommend that one set of field investigations be used for both purposes. We have reviewed the negative declarations prepared for several Navarro River and Russian River applications, and find that the level of analysis is less than is needed. Although any rigid formula for field investigations is likely to be burdensome for some cases and inadequate for others, we think a typical field investigation probably should include the following:

Reconnaissance survey: After inspecting topographic maps and recent aerial photography,[13] SWRCB staff or DFG staff should walk the channel from the project site downstream to the confluence with a substantially larger stream (unless the diversion is directly from a stream known to be easily accessible to salmonids) to detect and evaluate unusual conditions that call for special

[12] For example, we are concerned about compliance problems with by-pass conditions such as those proposed for Application No. 29711, because it appears that inflow to the impoundment will be much less than capacity in dry years, when the need for the water will be greatest.

[13] Aerial photography is readily available from commercial sources, and applicants should be required to submit images of the project area and the affected reach of stream as part of the application.

treatment. For example, a waterfall that partially blocks fish migration may make upstream diversions even of high flows problematic, since the high flows may be needed to allow passage over the barrier. We realize that securing access may be a problem, but this burden can be placed on the applicant. We do not see how a finding of no significant impact can be made if the affected reach of stream cannot be inspected.

Photodocumentation: Channel conditions should be recorded by photographs showing both typical and unusual conditions. The photographs should be annotated using notes made during the reconnaissance or other field visits.

Discharge measurements: SWRCB or CDFG staff should measure the discharge in the stream whenever they visit a project site. Even one or a few discharge measurements can provide an important check on calculated estimates of flow. If the discharge is less than about 3/4th to 1 cfs the measurement should be make using a portable flume; if it is larger, current meters should be used. Measurements made between storms during the season of diversion will be most valuable, and if possible field visits should be scheduled to allow for them.

Channel characteristics: SWRCB staff should characterize the channel geometry near the project site and downstream. This should include sketched channel transects, with dimensions estimated using a staff or tape, measurements of slope[14], and estimates of channel roughness. These should be used to estimate stage over a range of discharges, to provide a check on the plausibility of calculated estimates of flow at the site, and to provide a baseline description of the channel to allow for future assessments.[15] If there are sites such as bridges that provide convenient sites for future measurements that can show incision or aggradation, then more care should be taken in depicting the transect accurately at these sites. Channel substrate should be described, using quantitative methods such as pebble counts (Kondolf 1997) where they are appropriate..

Vegetation: Vegetation in the project area, especially riparian vegetation, should be characterized and common species should be listed. Exposed roots or drowned trees that reflect channel incision or aggradation should be recorded, as should stands of even-age riparian trees, the elevation of flood scars on riparian trees, or other features that provide evidence regarding stream processes.

Characterization of aquatic fauna: Perennial stream should be examined at least twice, once in late summer at minimum flow and once in winter when spawning salmonids are likely to be present. Seasonal streams should be examined in late winter or early spring. The wetness or dryness of the year should be taken into account.[16] Direct sampling of fish (e.g., electrofishing) should be used if possible; at the least observations should be made of the presence or absence of

[14] Adequate measurements of slope can be with a hand level in steeper streams (say >2% slope), but an auto level should be used for streams with lower slopes; the slope should be measured over a distance of at least 10 channel widths.

[15] Problems with simple before/after comparisons, described in Schmitt and Osenberg (1996), need to be kept firmly in mind, but probably there is no practical way to avoid them in the present context.

[16] Ideally, streams should be inspected twice in both wet and dry years. As an alternative, appropriately sized streams in the same area could be inspected in a space for time substitution.

fish (species if possible), presence of redds, or other evidence of fish using the steam. Presence of amphibians (adults and larvae) should also be noted. Invertebrate communities should be characterized using CDFG's rapid bioassessment procedure or some other procedure that identifies the abundances of major aquatic taxa. It is important that careful, standardized notes be taken at each note, preferably on a special form.

The success of field investigations depends critically upon the skill, experience and attitude of the investigator. No methodology, procedures, checklists or forms to fill out can substitute for the ability to "read" streams and associated landforms. Similar skills are required to assess whether the proposed diversion as constrained by the by-pass conditions makes economic sense, or whether there will be an unacceptably large motivation to cheat. Essentially this means that to be successful, the SWRCB must be able to maintain competent staff and provide for their continuing education.

In the negative declaration, the analysis of the amount of water available at the site should be reported in enough detail (probably in an appendix) to allow others to repeat the calculations, and should describe the assumptions of the method used and how well the assumptions are met at the site in question. Put differently, in order that the assumptions of the method be testable, the method used needs to be described well enough that it can be checked against discharge measurements in the stream, should such measurements be made in the future. In any event, the main body of the study should include an assessment of the likely accuracy of the reported estimates, and field conditions should be used to check the plausibility of the estimates.[17] The analysis should also include a discussion of the availability of water during severe drought as well as of a typical dry year, since the project is most likely to have a significant effect on the environment during severe droughts, and uncertainty regarding compliance with permit conditions will also be greatest.

7. Comments on monitoring and research:

Estimates of the flows that should be expected in ungaged tributaries is a major source of uncertainty that could be reduced substantially by a well-designed monitoring and research program. Developing the design for such a program is beyond the scope of this review, and should involve knowledgeable people for agencies such as the USGS, NRCS, DWR, and county or local agencies, as well as academics. The SWRCB should take the initiative in promoting the design and implementation of such a program, and it should be willing to exercise its power to re-

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[17] We are concerned about the methods used in the Navarro River basin negative declarations to estimate the amount of water available at the project sites. Without data, no method will be very accurate, so it is appropriate to use a simple method. Making reasonable estimates with such methods requires considerable skill knowledge and experience with the region in question, to guide selection of parameters for the model; simply plugging in numbers for a table can lead to gross errors. It is also important that the method not be biased. The initial studies refer to the Rational Method, which is intended to predict peak flows. It is not clear to us what method was used for estimating average annual flows. Unfortunately, such methods for predicting peak flows are intended for sizing culverts or similar applications where the harm from underestimates is much greater than the harm from overestimates, so the methods are biased high. For estimating the amount of water available for appropriation, or the amount that will be left in the stream, a bias in the opposite sense is appropriate.

open existing permits to add conditions needed for implementing the program. Future permits should include requirements for collecting and reporting precipitation and flow data, although the specific requirements should be tailored to individual cases.[18]

Since making assessments of the availability of water for proposed projects is a routine part of the SWRCB's work, however, the SWRCB should have strong in-house expertise in this area. Based on the SWRCB documents that we have reviewed, this expertise is currently lacking. Therefore, we recommend that the SWRCB create a staff position at a sufficiently high level to attract an individual with demonstrated knowledge and experience in this area. This person would also represent the SWRCB in the development of the coordinated monitoring and research program described above, and participate actively in its implementation.

As with hydrological uncertainty, research and monitoring intended to address the biological uncertainties involved in assessments of the effects of water diversions should be coordinated with other efforts, if this is possible. A better understanding of the biology of coho salmon, steelhead, and the coastal streams that support them is also needed to address important issues regarding timber harvest, for example, and this understanding could best be developed by a coordinated effort. Again, scientists from various agencies and from universities should to be involved, but the SWRCB can and should work for the creation of such a coordinated program.

Four biological topics stand out as requiring particular attention for testing the hypotheses implicit in the NMFS approach to conditioning permits and for reducing uncertainty about the environmental effects of diversions with such conditions: the use of streams by coho salmon and steelhead as spawning habitat; the nature of density-dependent mortality among juvenile salmon and steelhead; the use of streams as winter rearing habitat by these fishes, and characterization of ecosystems in seasonal or small perennial streams.

Trush's (1991) observations of steelhead spawning in Elder Creek, combined with geomorphically informed attention to channel conditions, exemplify the kind of work that is needed regarding spawning habitat. These need to be repeated in other streams, however, particularly because there is now greater awareness of the importance of hyporheic flow as an aspect of salmonid spawning habitat.

Observational studies are also needed of the use of winter rearing habitat by juvenile coho and steelhead. Studies of winter habitat use by salmonids in other areas should provide conceptual models and hypotheses to be tested in coastal California, but streams here are typically warmer in the winter and this should be taken into account. Winter habitat as been identified as a factor limiting survival of juvenile coho, so this topic overlaps with the general issue of density-dependent mortality among juvenile salmon and steelhead. This is a difficult issue but strong density-dependent mortality in the fry life stage has been demonstrated in anadromous brown trout (Elliott 1994), so the assumed lack of strong density-dependent mortality underlying the NMFS proposal needs to be examined carefully.

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[18] A fee to help cover costs of the monitoring program could be substituted for data collection in some cases, especially in areas for which other data are available.

Studies of the ecosystems of seasonal and small perennial streams should be guided by the conceptual models and hypotheses that are already in the literature (e.g., Gasith and Resh (1999) and Welsh et al. (2000)), but there is also a basic need for simply characterizing the biota.

8. Summary and Recommendations

1. There is substantial uncertainty regarding the conditions needed to allow recovery of coho salmon and steelhead populations in coastal watersheds in California, and regarding the flow regime needed to maintain ecosystems in small headwater streams. There is also substantial uncertainty in estimates of the expected flow in streams at project sites, and about the actual effectiveness of mitigation measures prescribed by water right permits.

2. The historical decline and current status of coho salmon and steelhead populations, the pervasive modification of aquatic habitats in coastal watersheds in California, the unknown cumulative effects of legal and illegal diversions, and the scarcity of basic data on headwater streams are sufficient reasons to justify deferring approval of any new water rights, particularly in the Russian River watershed, until information is developed that shows that the diversions can be conditioned to avoid unacceptable risk of harm to listed species or other public trust resources.

3. If SWRCB feels obligated to approve diversions from seasonal or perennial streams using negative declarations, despite incomplete knowledge of both local and cumulative impacts of the diversions, we suggest using the NMFS approach, with the addition of a separate depth criterion for smaller streams that are used by anadromous fishes, and with consideration of the effects of diversions on the duration of high flows. In doing this, the SWRCB should confront uncertainty and pursue adaptive management by:

- Basing by-pass standards and flow requirements on clearly defined objectives;
- Using biological and hydrological criteria that can expressed as testable hypotheses;
- Requiring a monitoring program that can test the hypotheses; and
- Modifying standards in light of new information.

4. Impoundments should not be approved on seasonal or perennial streams using negative declarations. Impoundments should be approved on ephemeral streams using negative declarations only where a "fill and spill" approach is acceptable, and the impoundments should be emptied annually to control exotic species, especially bullfrogs.

5. The SWRCB should work with other state, federal and local agencies and academic institutions to promote improved hydrological and biological data collection and research to reduce the uncertainties identified above, and to test the hypotheses underlying management decisions and permit conditions. The SWRCB should develop a process whereby monitoring that is intensive enough to be effective can be focused on selected sites. The SWRCB should develop greater in-house expertise in estimating flow at the sites of proposed projects.

9. References:

Allan, J.D. 1995. Stream Ecology: structure and function of running waters. Chapman and Hall.

Benda, L.E. 1994. Stochastic geomorphology in a human mountain landscape. Doctoral dissertation. University of Washington, Seattle.

Brown, L. R., P. B. Moyle, R. M. Yoshiyama. 1994. Historical decline and current status of coho salmon in California. North American Journal of Fisheries Management. 14:237-261.

Cameron, J. and J. Abouchar. 1991. The precautionary principle: a fundamental principle of law and policy for the protection of the global environment. Boston College International & Comparative Law Review 14:1-27.

Castleberry, D.T., J.J. Cech, D.C. Erman, D. Hankin, M. Healey, G.M. Kondolf, M. Mangel, M. Mohr, P.B. Moyle, J. Nielsen, T.P. Speed, and J.G. Williams. 1996. Uncertainty and instream flow standards. Fisheries 21(8):20-21.

Christensen, N.L., A.M. Bartruska, J.H. Brown, S.R. Carpenter, C.D'Antonio, R. Francis, J.F. Franklin, AJ.A. MacMahon, R.F. Noss, D.J. Parsons, C.H. Peterson, M.G. Turner, and R.G. Woodmansee. 1996. The report of the Ecological Society of America report on the scientific basis for ecosystem management. Ecological Applications 6:665-691.

Connel, J.H. 1978. Diversity in tropical rain forests and coral reefs. Science 199:1302-1310.

Elliott, J.M. 1994. Quantitative Ecology and the Brown Trout. Oxford University Press.

Francis, R.I.C.C. and R. Shotton. 1997. "Risk" is fisheries management: a review. Canadian Journal of Fisheries and Aquatic Sciences 54:1699-1715.

Gasith, A. and V.H. Resh. 1999. Streams in Mediterranean Climate Regions: abiotic influences and biotic response to predictable seasonal events. Annual Review of Ecology and Systematics 30:51-81.

Geist, D.R. and D.D. Dauble. 1998. Redd site selection and spawning habitat use by fall chinook salmon: the importance of geomorphic features in large rivers. Environmental Management 22:655-669.

Gordon, D.V. and G.R. Munro, editors. 1996. Fisheries and uncertainty: precautionary approach to resource management. University of Calgary Press, Calgary, Canada.

Hartman, G.F., J.C. Scrivener, and M.J. Miles. 1996. Impacts of logging in Carnation Creek, a high energy coastal stream in British Columbia, and their implication for restoring fish habitat. Canadian Journal of Fisheries and Aquatic Sciences 53 (Supplement 1):237-251.

Healey, M. 1997. Paradigms, policies and prognostication about watershed ecosystems and their management. In Naiman, R.J. and R.E. Bilby (eds). River Ecology and Management: Lessons from the Pacific Coastal Ecoregion. Sppringer-Verlag, New York.

Healey, M.C. and T.M. Hennessey. 1994. The utilization of scientific information in the management of estuarine ecosystems. Ocean and Coastal Management 23:167-191.

Hedman, E.R., and W.R. Osterkamp. 1982. Streamflow characteristics related to channel geometry of streams in western United States. US Geological Survey Water-Supply Paper 2193. US Geological Survey, Washington DC.

Hilborn, R. and R. M. Peterman. 1996. The development of scientific advice with incomplete information in the context of the precacutionary approach. United Nations Food and Agriculture Organization Technical Paper No. 350/2:77-102.

Holling, C.S. (ed.) 1978. Adaptive Environmental Assessment and Management. John Wiley & Sons.

Horwood. J. Stochastically optimal management of fisheries. ICES CM D:26. ICES, Copenhagen.

Hupp, C.R. 1986. The headward extent of fluvial landforms and associated vegetation on Massanutten Mountain, Virginia. Earth Surface Processes and Landforms 11:545-555.

Hupp, C.R., and W.R. Osterkamp. 1985. Bottomland vegetation distribution along Passaage Creek, Virginia, in relation to fluvial landforms. Ecology 66:670-681.

Jones, J.B. and P.J. Mulholland. 2000. Streams and Ground Waters. Academic Press.

Kondolf, G.M. 1997.Application of the pebble count: notes on purpose, method, and variants. Journal of the American Water Resources Association 33(1): 79-87.

Lee, Kai N, and Jody Lawrence. 1986. Adaptive management: learning from the Columbia River Basin fish and wildlife program. Environmental Law 16:431-460.

Ligon, F.K., W.E. Dietrich, and W.J. Trush. 1995. Downstream ecological effects of dams. Bioscience 45:183-192.

Ludwig, D., R. Hilborn, and C. Walters. Uncertainty, resource exploitation, and conservation: lessons from history. 1993. Science 260:17,36; reprinted with responses in Ecological Applications 3:547-549.

Mangel, M., R.J. Hofman, E.A. Norse, and J.R. Twiss, Jr. 1993?, Sustainability and ecological research. Ecological Applications 3:573-575.

Abstract

Detailed measurements of depth and velocity in natural channels, although rare, show that the velocity fields are complex and irregular even in streams with moderate gradients and gravel substrates. This complexity poses a challenge for instream flow studies, most of which use PHABSIM, a set of computer models that combine the results of hydraulic modeling, estimates of channel substrate or cover, and habitat suitability criteria to compute weighted usable area (WUA), an index of habitat. Some recent studies have replaced the transect-based one-dimensional (1-D) hydraulic modeling in PHABSIM with 2-D models that allow better definition of the depth and velocity fields in the modeled stream reach. The accuracy of the estimates as a function of channel geometry and data collection effort remains unclear, however, as does the utility of the estimates for evaluating instream flow needs. Here we review the assumptions, accuracy and precision of hydraulic modeling and of the measurements that provide input data for the models, and consider some implications of the consequent limitations of hydraulic modeling for describing fish habitat and assessing instream flows. Highly accurate hydraulic modeling seems unfeasible for streams with complex channel geometry, and in any event practical hydraulic modeling cannot resolve flow patterns at the short length scales at which fish often respond to the hydraulic environment. Information on depth, velocity, and substrate is important for assessing instream flows, but information developed from hydraulic models should be treated with great caution and is not a substitute for biological understanding.

Healey, M. 1997. Paradigms, policies and prognostication about watershed ecosystems and their management. In Naiman, R.J. and R.E. Bilby (eds). River Ecology and Management: Lessons from the Pacific Coastal Ecoregion. Sppringer-Verlag, New York.

Healey, M.C. and T.M. Hennessey. 1994. The utilization of scientific information in the management of estuarine ecosystems. Ocean and Coastal Management 23:167-191.

Hedman, E.R., and W.R. Osterkamp. 1982. Streamflow characteristics related to channel geometry of streams in western United States. US Geological Survey Water-Supply Paper 2193. US Geological Survey, Washington DC.

Hilborn, R. and R. M. Peterman. 1996. The development of scientific advice with incomplete information in the context of the precacutionary approach. United Nations Food and Agriculture Organization Technical Paper No. 350/2:77-102.

Holling, C.S. (ed.) 1978. Adaptive Environmental Assessment and Management. John Wiley & Sons.

Horwood. J. Stochastically optimal management of fisheries. ICES CM D:26. ICES, Copenhagen.

Hupp, C.R. 1986. The headward extent of fluvial landforms and associated vegetation on Massanutten Mountain, Virginia. Earth Surface Processes and Landforms 11:545-555.

Hupp, C.R., and W.R. Osterkamp. 1985. Bottomland vegetation distribution along Passaage Creek, Virginia, in relation to fluvial landforms. Ecology 66:670-681.

Jones, J.B. and P.J. Mulholland. 2000. Streams and Ground Waters. Academic Press.

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Lee, Kai N, and Jody Lawrence. 1986. Adaptive management: learning from the Columbia River Basin fish and wildlife program. Environmental Law 16:431-460.

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Ludwig, D., R. Hilborn, and C. Walters. Uncertainty, resource exploitation, and conservation: lessons from history. 1993. Science 260:17,36; reprinted with responses in Ecological Applications 3:547-549.

Mangel, M., R.J. Hofman, E.A. Norse, and J.R. Twiss, Jr. 1993?, Sustainability and ecological research. Ecological Applications 3:573-575.

Mangel, M.C. and 41 others. 1996. Prinicples for the conservation of wild living resources. Ecological Applications 6:338-362.

McMahon, T.E. and G.F. Hartman. 1988. Influence of cover in habitat use by juvenile coho salmon (Oncorhynchus kisutch). Canadian Journal of Fisheries and Aquatic Sciences 46:1551-1557.

Mills, T.J., D. McEwan, and M.R. Jennings. 1997. Califoriia salmon and steelhead: beyond the crossroads. Pages 91-112 in D.J. Strouder, P.A. Bisson, and R.J. Naiman (eds), Pacific Salmon and their Ecosystem. Chapman & Hall.

NMFS National Marine Fisheries Service). 2000, Draft, Guidelines for maintaining instream flows to protect fishery resources in tributaries of the Russian River. Unpublished report, NMFS, Southwest Region, Santa Rosa, California.

Nehlsen, W., J.E. Williams, and J.A. Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho, and Washington. Fisheries 16(2):4-21

Nickelson, T.E., J.D. Rodgers, S.L. Johnson, and M.F. Solazzi. 1991. Seasonal changes in habitat use by juvenile coho salmon (Oncorhynchus kisutch) in Oregon coastal streams. Canadian Journal of Fisheries and Aquatic Science 49:783-789.

Nilsson, C., R. Jansson, and U. Zinko. 1997. Long-term responses of river-margin vegetation to water-level regulation. Science 276:798-800.

Osterkamp, W.R., and E.R. Hedman. 1977. Variation of width and discharge fornatural high-gradient stream channels. Water Resources Research 13:256-258.

Pickett. S.T.A. and P.S. White (eds.). 1985. The Ecology of Natural Disturbance and Patch Dynamics. Academic Press.

Power, M.E. Floods, food chains, and ecosystem processes in rivers. 1995. Pages 52-60 in C.G. Jones and J.H. Lawton. Linking species and ecosystems. Chapman and Hall, N.Y.

√ Power, M.E., W.E. Dietrich, and J.C. Finlay. 1996. Dams and downstream aquatic biodiversity: potential food web consequences of hydrologic and geomorphic change. Environmental Management 20:887-895.

Reid, L.M. and S. Hilton. 1998. Buffering the buffer. Pages 75-85 in R.Ziemer, ed., Proceedings of the conference on coastal watersheds: the Casper Creek story. USDA FS PS-GTR 165.

Reeves, G.H. L.E. Benda, K.M. Burnett, P.A. Bisson, and J.R. Sedell. 1995. A disturbance-based ecosystem approach to maintaining and restoring fresh-water habitats of evolutionarily significant units of anadromous salmonids in the Pacific Northwest. American Fisheries Society Symposium 17:334-349.

Richards, L.J. and J.J. Maguire. 1998. Recent international agreements and the precautionary approach: new directions for fisheries management science. Canadian Journal of Fisheries and Aquatic Sciences 55:1545-1552.

Richter, B.D., J.V. Baumgartner, J. Powell, and D.P. Braun. 1996. A method for assessing hydrologic alteration within ecosystems. Conservation Biology 10:1163-1174.

Richter, B.D., J.V. Baumgartner, R. Wigington, and D.P. Braun. 1997. How much water does a river need? Freshwater Biology 37:231-249.

Richter, B.D., J.V. Baumgartner, D.P. Braun, and J. Powell. 1998. A spatial assessment of hydrologic alteration within a river network. Regulated Rivers: Research and Management 14:329-340.

Schnidt, R.J. and C.W. Osenberg (eds.) 1996. Detecting Ecological Impacts: concepts and applications in coastal habitats. Academic Press.

Sedell, J.R., P.A. bission, F.J. Swanson, and S.V. Gregory. 1998. What do we know about large trees that fall into streams and rivers. Pages 47-81 in From the Forest to the Sea: a story of fallen trees, C. Maser, R.F. Tarrant, J.M. Trappe, and J.F. Franklin , editors. Pacific Northwest Research Station PNW-GTR-229, Portland, OR: USDA Forest Service.

Sparks, R.E. 1995. Need for ecosystem management of large rivers and their floodplains. Bioscience 45-:168-182.

Stanford, J.A., J.V. Ward, W.J. Liss, C.A. Frissell, R.N. Williams, J.A. Lichatowich and C.C. Coutant. 1996. A general protocol for the restoration of regulated rivers. Regulated Rivers, Research and Management 12:391-413.

Stanley, T.L., K.D. Hyattm, T.G. Northcote, and R.J. Fielden. 1996. Status of anadromous salmon and trout in British Columbia and Yukon. Fisheries 21(10):20-35

State Water Resources Control Board, Divsion of Water Rights. (SWRCB). 1998. Navarro River Watershed, Mendocino County, Draft Division Decision, Pending Applications 29711, 29810, 29907, 29910, and 19911.

State Water Resources Control Board, Divsion of Water Rights. (SWRCB). 1997

Thompson, G.G. 1993. A proposal for a threshold stock size and maximum fishing mortality rate. Pages 303-320 in Smith, S.J., J.J. Hunt, and D. Rivard, eds., Risk evalatuion and biological referenced points for fisheries management. Canadian Special Publications in Fisheries and Aquatic Sciences 120.

Trush, W.J. 1991. The influence of channel morphology and hydrology on spawning populations of steelhead trout in South Fork Eel River tributaries. PhD dissertation, Wildland Resrouce Science, University of California, Berkeley, California, 195 pp.

Volkman, J.M. and W.E. McConnaha. 1993. Through a glass darkly: Columbia River salmon, the Endangered Species Act, and adaptive management. Environmental Law 23:1249-1272.

Walters, C.J. 1986. Adaptive Management of Renewable Resources. McGraw-Hill, New York.

Welsh, H.H. Jr., T.D. Roelofs, and C.A. Fissell. 2000. Aquatic ecosystems of the redwood region. Pages 165-199 in The Redwood Forest, R.F. Noss (Editor). Island Press.

Williams, J.G. 1998. Thoughts on adaptive management. Interagency Ecological Program for the Sacramento-San Joaquin Estuary Newsletter 11(3):5-11.

Wootton, J.T., M.S. Parker, and M.E. Power. 1996. Effects of disturbance on river food webs, Science 273:1558-1561

Yoshiyama, R. M., E. R. Gerstung, F. W. Fisher, and P. B. Moyle. 2000. Chinook salmon in the California Central Valley: an assessment. Fisheries 25(2): 6-20. JOPP

Attachment 1
to
Fish Bypass Flows for Coastal Watersheds

A review of proposed approaches for the State Water Resources Control Board

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Measuring and Modeling the Hydraulic Environment for Assessing Instream Flows

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In Press
(2000 or 2001)
North American Journal of Fisheries Management

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Key words: Instream flow, hydraulic models, velocity measurement, PHABSIM

Abstract

Detailed measurements of depth and velocity in natural channels, although rare, show that the velocity fields are complex and irregular even in streams with moderate gradients and gravel substrates. This complexity poses a challenge for instream flow studies, most of which use PHABSIM, a set of computer models that combine the results of hydraulic modeling, estimates of channel substrate or cover, and habitat suitability criteria to compute weighted usable area (WUA), an index of habitat. Some recent studies have replaced the transect-based one-dimensional (1-D) hydraulic modeling in PHABSIM with 2-D models that allow better definition of the depth and velocity fields in the modeled stream reach. The accuracy of the estimates as a function of channel geometry and data collection effort remains unclear, however, as does the utility of the estimates for evaluating instream flow needs. Here we review the assumptions, accuracy and precision of hydraulic modeling and of the measurements that provide input data for the models, and consider some implications of the consequent limitations of hydraulic modeling for describing fish habitat and assessing instream flows. Highly accurate hydraulic modeling seems unfeasible for streams with complex channel geometry, and in any event practical hydraulic modeling cannot resolve flow patterns at the short length scales at which fish often respond to the hydraulic environment. Information on depth, velocity, and substrate is important for assessing instream flows, but information developed from hydraulic models should be treated with great caution and is not a substitute for biological understanding.

Detailed measurements of depth and velocity in natural channels are rare, but those that do exist show that the velocity fields are complex and irregular, often with significant cross-stream components (Dietrich and Smith 1983, Petit 1987, Whiting and Dietrich 1991; Larsen 1995; Whiting 1997). This complexity in the flow patterns in natural channels poses a challenge for methods of assessing instream flows that depend upon hydraulic modeling, such as the Physical Habitat Simulation Model (PHABSIM).

PHABSIM consists of a set of computer models that combine hydraulic and biological models to evaluate the habitat value of a reach of stream for a given fish species and life stage. The weighted sum of calculated habitat values for the reach is expressed as "weighted usable area" (WUA), which is taken to represent the "living space" available for the organism; water quality and temperature are evaluated separately. PHABSIM is widely used in North America as a tool to quantify the biological effects of alternations in flow regimes or the relative habitat benefits of different flow release regimes from reservoirs (Reiser et al. 1989), and has increasingly been applied overseas as well, either directly or in modified form (Jowett 1989; Pouilly et al. 1995). PHABSIM has even been used to evaluate the instream flow needs of blue ducks (*Hymenolaimus malacorhynchos*), which forage for invertebrates in steep, boulder-bedded upland streams of New Zealand (Collier and Wakelin 1996). However, the hydraulic and biological aspects of PHABSIM have also been the subject of continuing criticism (e.g., Marthur et al. 1985; Shrivell 1986, 1994; Osborne et al. 1988; Gan and McMahon 1990; Elliott 1994; Castleberry et al. 1996; Ghanem et al. 1996; Heggenes 1996; Williams 1996; Lamouroux et al. 1998).

In this paper, we consider the adequacy of hydraulic models in general, and PHABSIM in particular, for making predictions of the depth and velocity fields in natural rivers that are useful for assessing instream flows. We begin with data from the literature that demonstrate the complexity of the depth and velocity fields in natural steams. We then consider the sampling and measurement problems associated with developing data for modeling the flow fields in natural channels, or for describing the flow fields empirically . We next consider modeling approaches, given practical restrictions on data collection. Finally, we consider some biological aspects of the problem, and offer some recommendations. We confine ourselves to the problem of estimating the habitat value of a stream for a single species and life stage of fish, although we recognize the inadequacy of that perspective for real environmental protection. We do not consider recently reported hydrologically-based methods for assessing instream flow regimes (Richter et al. 1996, Richter et al. 1997); these appear promising, but do not explicitly link physical characteristics of channels to flows or biological habitats.

Depth and Velocity Fields in Natural Streams

The data of Whiting and Dietrich (1991) illustrate the complexity of patterns in natural channels. They took detailed measurements on Solfatara Creek, a 5-m-wide gravel bed stream draining 62 km^2 in Yellowstone National Park, Wyoming. The 20 m-long study reach was located downstream of a bend, where the creek flows over and around a mid-channel bar; the substrate is coarse sand to medium gravel, and the average channel slope is 0.001 (Figure 1). Measurements were made at about one-third bankfull stage, using an array of small current meters suspended from a portable wooden bridge, across eleven cross sections spaced 2 m apart.

Although the stream appears relatively tranquil at this discharge, the velocity field is quite complex (Figure 2), displaying large variations vertically and horizontally within a given section, as well as between closely spaced sections. The large variation in channel form and velocity distributions from one section to the next, despite the close spacing of the sections, illustrates the spatial sampling problems inherent in any transect-based methods for evaluating instream flows. Results would vary substantially depending on the precise location of transects. Spatial sampling problems would be even more severe in steeper streams with larger substrate.

The measured velocity fields show that vertical velocity profiles often deviate substantially from the logarithmic profile commonly assumed (Figure 2), as has been noted elsewhere (e.g., Dingman 1989, Beebe 1996); in particular, the highest velocities are sometimes near the bed (e.g., cross sections 1 and 2). This implies that measurements of velocity at 0.6 depth may give only an approximation of the true column velocity. To illustrate this point, we obtained data for eight of the sections or transects shown in Figure 2 (not all data are available because of a storage media failure) and compared the vertically averaged velocity computed from measurements spaced 5 cm or less apart with the velocity at 0.6 depth (Figure 3). The velocity at 0.6 depth overestimates the vertically averaged velocity in most cases (the median difference is about +6%), but underestimates the vertically averaged velocity by almost 60% at some verticals in Section 10, where the flow deepens after passing over a mid-channel bar. In steep streams with large roughness elements, flow patterns would be even more complex. It may be possible to model the spatially averaged vertical velocity gradient in such streams (Wiberg and Smith 1991), but only if the stream is straight and the roughness elements are distributed approximately randomly, i.e., not organized into bars. These conditions are fairly restrictive, and as is often noted in discussions of instream flows, fish do not live in averages.

Details of the flow can vary in important ways even where general patterns are similar. This is illustrated in Sections 1-4, which have approximately the same shape and general lateral distributions of velocity, with higher velocity in the deeper part of the channel. Yet, the velocity gradients are quite different in Sections 1 and 2 compared to Sections 3 and 4. At Sections 1 and 2, the vertical gradient is almost nonexistent near the outside of the bend, but then becomes very steep under the high velocity core, which is near the bottom. Such steep gradients do not occur at Sections 3 and 4. If velocity gradients are important for fish, as indicated by the literature (e.g., Jenkins 1969; Bachman 1984; Heggenes 1994, 1996), then such differences would be important, but would remain undetected without detailed measurements of velocity and bed topography.

Note that the change in channel shape with distance downstream forces significant changes in the velocity field, termed convective accelerations. This has implications for modeling, because one-dimensional (1-D) models ignore convective accelerations.

Velocity Measurement in Streams:

For each cross section or transect measured at Solfatara Creek, Whiting and Dietrich took an average of 160 point velocity measurements, each a time-average over two minutes, requiring 8-10 hours to complete. In most practical applications, it is not possible to spend 8-10 hours per transect to measure velocity. PHABSIM procedures are typically modeled after the standard procedures of the US Geological Survey for measuring velocity in discharge measurements near stream gauges, described in Rantz et al. (1982).

Velocity is measured at 20-30 stations across the channel by wading or from a cable or bridge, using a Price AA current meter or the smaller mini current meter, consisting of cups that spin around a vertical axis in response to moving water. For depths less than 0.8 m, velocity is measured at 0.6 depth (i.e., 40% of the vertical distance from the bed to the water surface), which is assumed to reflect the mean column velocity. In deeper flow, the average of measurements at 0.8 depth and 0.2 depth is taken as reflecting the mean column velocity. The mean column velocities for each point are multiplied by the measured water depth and by the width of the vertical slice of the cross section represented by this measurement, to obtain the discharge for that vertical slice. The discharges for the individual "verticals" are summed to obtain the total discharge past the cross section.

To obtain a good measurement of flow, the hydrographer measures the stream by wading when possible, selecting the cross section with the most uniform flow conditions available on the channel, i.e., with flow lines that are parallel and that do not vary downstream. The hydrographer will often "improve the [measurement] cross section by removing rocks and debris within the section and in the reach of channel immediately upstream and downstream from the section," or by constructing "... temporary dikes to eliminate slack water...", all in an effort to transform flow conditions in the irregular natural channel into more uniform flow conditions (Rantz et al. 1982). Each measurement is rated as excellent, good, fair, or poor, with assumed error margins of 3%, 5%, 8%, or >8%, respectively, assigned based on the hydrographer's judgement (Rantz et al. 1982).

Ratings of "excellent" are uncommon in natural streams, despite the hydrographer's freedom to select the most uniform reach available and to modify channel geometry. The reaches selected for discharge measurements are probably not the preferred habitats for fish, or at least they are not typically the sites where anglers would look for fish. In essence, the hydrographer seeks the reach of channel that most closely resembles a canal. Highly irregular channels with shallow marginal areas, back eddies, still water, or boulder beds, which may be important as fish habitats, are sites that a hydrographer would avoid for flow measurement (unless the stream offered nothing better) because the resulting measurement would be poor.

Sources of Error in Measurements

Errors in point measurement of depth are usually small. At some locations the depth of flowing water can fluctuate by several centimeters at constant discharge, but this can be detected by reasonably careful observation of the section. Errors in estimating the average depth of a vertical are most likely to be sampling errors, especially when the cross section is irregularly shaped or the substrate is coarse. These conditions should be obvious, especially when measurements are made by wading, and with reasonable care a good estimate should be possible.

Potential sources of error in velocity measurements include the inherent limits of accuracy of the meter in registering downstream current velocity, temporal variations in velocity at a point, vertical and cross sectional components of velocity, and sampling errors within each vertical. Instrument errors associated with measuring unidirectional flow with Price meters are relatively minor; in the controlled environment of a tow tank, Carter and Anderson (1963) found that Price meters register within 0.6% of the actual downstream velocity. However, these meters were in excellent condition; poorly maintained meters, or meters clogged with sediment or organic debris, would not perform so well.

Replicate discharge measurements in rivers using Price and Ott current meters (a screw-type meter) were found to differ by up to 2.8% in total discharge (Carter and Anderson 1963). Agreement between the two meters seems acceptable, although the actual differences in point velocity measurements not reported. However, PHABSIM studies often use Marsh-McBirney current meters, which use the distribution of pressure around a rounded sensor to estimate velocity. This is conceptually attractive, and Marsh-McBirney meters can provide instantaneous or time-averaged readings of velocity. Manufacturer's specifications for the Marsh-McBirney meter state the accuracy as +/- 2% of reading, with a +/- 0.05 ft/s offset. Although one Marsh-McBirney meter performed well in initial tests by the US Geological Survey (Fulford et al. 1994), subsequent tests with a number of meters showed variable performance, under- and over-registering low velocities (Janice Fulford, US Geological Survey, pers. comm. 1998). In our experience the meters can be unstable and require frequent calibration, and after informal field comparisons with a Price current meter we are skeptical of data collected with Marsh-McBirney meters.

The vertical and cross-channel components of velocity are not well captured in the standard US Geological Survey flow measurement. The Price AA meter does not measure flow direction. Although any cross-channel flow can be accounted for using the hydrographer's estimate of the angle of approach, the existence of cross-channel flow at a vertical indicates a complex flow structure, so that one or two measurements may give a poor estimate of the spatially averaged velocity in the vertical. The Price meter is also affected by vertical velocity components in steep, turbulent channels but cannot measure them separately from the downstream components (Townsend and Blust 1960, Linsley et al. 1982). The velocities recorded in such channels may be greater than the true downstream velocities (Marchand et al. 1984). A modified Price meter that has solid cups composed of a polycarbonate polymer (The PAA meter) initially appeared to be less affected by vertical velocity components than the standard AA meter with stainless steel cups (Marchand et al. 1984), but subsequent experience has shown the polymer cups less accurate than the original stainless steel cups (R. Jarrett, U.S. Geological Survey, pers. comm. 1998).

There can be considerable temporal variation in velocity at a point in a stream, particularly one with a rough bed. The standard US Geological Survey approach is to take the velocity measurement over at least 40 seconds. Carter and Anderson (1963) took measurements continuously for an hour in 23 different rivers, at four different depths. They recorded data every 15 seconds, which allowed them to calculate the deviations of velocity measured over shorter intervals around the one-hour average (Figure 4). Although there are some problems with these data, they show that sampling errors are still significant at 40 seconds. Errors are also greater near the bed, where "focal point" velocity measurements are often made. Thus, the 40-second rule reflects a compromise between the gain in accuracy from averaging over a longer period and the cost of the additional time required. However, this compromise was developed for discharge measurements, where random errors in individual measurements tend to average out over the transect. In PHABSIM, measurements are not averaged over the transect, and it is not clear that the same compromise is appropriate. Moreover, the data are from reaches selected for discharge measurements, and greater temporal variation should be expected in reaches with more complex geometry.

Spatial sampling errors within each vertical will depend on the complexity of the flow field. In canal-like sections, the spatial sampling errors are small enough to allow good or excellent discharge measurements. In a complex flow field, however, even for a relatively tranquil stream such as that illustrated in Figures 1 and 2, the spatial sampling errors in estimating the average velocity of a vertical from one or two velocity measurements can be substantial.

Commonly, the discharge during a PHABSIM study is assumed to be known from a nearby gage, and if the total flow calculated by summing the individual PHABSIM measurements differs from the "known" discharge, the individual velocity measurements are adjusted by "velocity adjustment factors," which are percentage changes applied equally to all the measurements across the channel (Milhous et al. 1984). Although this adjustment may account for systematic errors, it does nothing to change the distribution of sampling and measurement errors across the channel.

In summary, instrument errors with well-maintained and properly used Price or Ott current meters are likely to be small, relative to temporal and spatial sampling errors. Figure 4 provides some guidance regarding temporal sampling errors. Although the figure probably underestimates the magnitude of the errors for transects with complex flow patterns, a similar decrease in the sampling error with increased measurement time can be expected. With standard methods, spatial sampling errors are probably as large or larger than temporal sampling errors. Herschy (1978) provides for a more detailed discussion of measurement errors at sites selected for discharge measurements, and gives "rules of thumb" for estimating 95% confidence intervals around measurements at such sites (Table 1). Unfortunately, there have been too few detailed studies of the flow field in natural channels to allow quantitative generalizations about measurement errors in channel reaches more typical of those to which PHABSIM is applied, rather than those selected by hydrographers for discharge measurements. For the conditions of most instream flow studies, however, we believe that the errors in estimating the average velocity of verticals by the standard methods will be large enough to affect ultimate results, so the ordinary scientific practice of estimating errors by appropriate repetitive measurements should be followed.

Modeling Flow in Natural Streams:

One-dimensional models:

One-dimensional (1-D) models typically treat the river as a series of cross sections, for each of which a stage and cross-sectionally averaged velocity are computed based on hydraulic principles, the channel form, and calculated values of stage and velocity at downstream cross sections. Probably the best-known 1-D model is HEC-2, or HEC-RAS, which is widely used for predicting flood levels. WSP, a similar 1-D gradually varied flow model, is an option for modeling stage in PHABSIM (Milhous et al. 1984).

One-dimensional models typically assume that the channel is straight, with all flow perpendicular to the cross section, and that flow is either "uniform" or "gradually varied". Uniform flow does not change in the downstream direction, and therefore has a vertical velocity profile that reflects a balance between the acceleration of gravity and the resistance of the channel bed. These conditions can occur in canals, but generally not in natural streams. "Gradually varied" flow occurs where channel topography and roughness change only slowly along the channel, so that convective accelerations can be ignored.

These are large assumptions, and while reasonable approximations of river stage are routinely obtained with these models if they are used with adequate skill and professional judgement, by definition they can provide only cross-sectionally averaged velocity. Moreover, gradually-varied flow models are commonly used for predicting flood stage during high flows. During such high flows, variations in the bed topography may be relatively less important; for example, hydrologists speak of riffles being "drowned out" at bankfull stage and higher. Whiting (1997) has shown that convective accelerations are less important at higher flows in Solfatara Creek. Instream flow assessments, however, are typically concerned with the lower magnitude flows in which fish spend most of their time. These flows are too low to modify the bed, so they occupy a channel geometry inherited from past high flows. Downstream changes in channel geometry that are small relative to high flows may be large relative to low flows, as when low flow spills over a longitudinal bar, so that the assumption of gradually varied flow is violated, as noted by Osborne et al. (1988). As a result, a model that gives reasonable estimates of stage in a channel at high flows may fail to do so at low flows.

PHABSIM is concerned with the distribution of velocity and depth across the channel, so the hydraulic models in PHABSIM divide the cross section into vertical slices (cells) either centered on or between point measurements of velocity (much as is done in the USGS discharge measurements). The vertical cells are analyzed separately, using either a regression analysis of measurements of velocity in the cell at different stages, or a back-calculation of Manning's n from a single velocity measurement (Milhous et al. 1989). The latter approach has been properly criticized by Shirvell (1986), and more recently by Ghanem et al. (1996), who point out that the cells are no longer tied to one another through hydrodynamic principles. On this account, Ghanem et al.(1998) describe the velocity modeling in PHABSIM as "zero-dimensional". With the single measurement approach, the Manning's roughness factor is used to calculate velocity and discharge for each cell at other discharges, but the individual cell discharges are adjusted to equal the modeled flow, so the roughness factor is really a weighting factor rather than a true roughness coefficient. With the multiple measurement approach, there is a problem with obtaining the required three velocities for verticals near the bank, which may be dry at the lower measured discharges (Ghanem et al. 1996).

Errors associated with the PHABSIM approach to distributing velocity across channels were investigated by Bartz (1990), as part of a broader assessment of PHABSIM, using data from the US Fish and Wildlife Service for three streams spanning a flow range of two orders of magnitude. For each stream, he calibrated different PHABSIM hydraulic models to data at three flows, and for each vertical compared the measured and modeled velocities. The averages and standard deviations of the differences are substantial, as illustrated by data for the medium-sized stream (Figure 5): mean errors ranged from 4.6% to 12.8% and standard deviations ranged from 29.6% to 42.7%. Results for the small and large stream are similar.

Two-dimensional Models:

Two-dimensional (2-D) models are increasingly being used for instream flow studies (e.g., LeClerc et al. 1995, Ghanem et al. 1996). Two-dimensional models require the simultaneous solution of a system of governing equations, typically including relationships (expressed as differential equations) for conservation of fluid mass, conservation of downstream fluid momentum, and conservation of cross-stream fluid momentum. To simplify these relationships, certain approximations are assumed, yielding the "shallow water equations". These 2-D velocity models give only vertically-integrated velocities, but show the variation in cross-stream direction as well as in the downstream direction.

These models retain the convective acceleration terms neglected by 1-D models, but require more detailed descriptions of channel geometry, and the accuracy of the modeled results depends upon the accuracy and spatial resolution of the measurements (Leclerc et al. 1995, Ghanem et al. 1996). For example, Leclerc et al. (1995) constructed a computer representation of the bed of a large stream by measuring the bed elevation with one measurement for every 50 to 400 m^2, so their results are necessarily generalized accordingly.

However, with detailed specification of the channel bed topography and planform, more sophisticated modeling may not be necessary. One-dimensional models are not all the same, and in some settings 1-D models can be as accurate for simulating vertically integrated velocity fields as a 2-D approach. Dietrich (1987) modeled flow in Muddy Creek, Wyoming, for geomorphic purposes, with a 1-D approach that explicitly accounted for the effect of channel curvature, and predicted the distribution of velocity across the transects. Larsen (1995) applied the same 1-D approach, and compared observed velocity patterns on two gravel-and-cobble-bedded meandering rivers. He showed that, with good bed topography as input, the 1-D model performed as well as more sophisticated models. However, understanding the appropriateness and limitations of a model seems critical. For example, it is unlikely that the excellent results achieved by Dietrich (1987) and Larsen (1995) could be achieved in a straight channel with irregular bed topography, such as the reach of Solfatara Creek studied by Whiting and Dietrich (1991), for which a 2-D model that accounted for convective accelerations would be more appropriate.

Statistical Hydraulic Models

Following a suggestion by Dingman (1989), Lamouroux et al. (1995) developed an empirical model that predicts the statistical distribution of hydraulic variables (such as velocity and water depth) for reaches with intermediate and large roughness elements, for which they believe the conventional deterministic models are ineffective. The model predicts the distributions of the hydraulic variables over an entire reach based on inputs of discharge, mean width and depth, and roughness. Lamouroux et al. (1998) coupled this hydraulic model with multivariate habitat use models to estimate the habitat value of a reach as a function of discharge. The need for validation is perhaps more obvious with such straightforwardly empirical models, which is a virtue.

Model Validation:

Models by nature involve simplifications of reality, and model predictions always involve some error. For hydraulic modeling of fish habitat, the errors can arise from measurement errors, from model errors, or from sampling errors. With the standard 1-D versions of PHABSIM, one should ask how accurately depth and velocity were measured at the selected points on the transects, how well the model predicts depth and velocity at the selected points at other discharges, how well the selected points represent the verticals or cells, and how well the selected transects represent the stream.

In practical applications, it is important that the likely errors in model predications be estimated. This is typically done by "model validation," in which model predictions are compared with measured data different from those used to develop or calibrate the model. (Oreskes et al. (1994) have pointed out that this is not really validation, but we will use this common term for the process.) Lamouroux et al. (1995) present graphical comparisons of measured and predicted velocity distributions, although they acknowledge that their procedure is not strictly correct. Aceituno and Hampton (1988) compared the distributions of point measurements of depth and velocity separately with comparable distributions from PHABSIM verticals, but did not consider their joint distributions or estimates of WUA. Unfortunately, these examples are exceptions. Typically, validation is not even discussed, although validation for PHABSIM predictions seems particularly important; PHABSIM offers users a wide variety of options that can produce a wide range of results, so there is a danger that options may be selected consciously or unconsciously to produce a desired result (Bartz 1990; Gan and McMahon 1990).

The proper form of the validation will depend on the conceptual model underlying the PHABSIM modeling. As originally developed, the conceptual model for PHABSIM assumed that data from the transects applied half-way up or down stream to the next transect (Bovee 1982; Thomas and Bovee 1993). In other words, the stream is divided into horizontal cells, each of which is represented by measurements at one point on the transect. With this conceptual model, validation could simply involve measuring the depth, velocity and substrate at random points in the study reach at various discharges, and comparing these with the values assigned to the point by PHABSIM. It is important that the validation include the habitat variables and not just WUA, so that "correct" estimates of WUA that result from offsetting errors are revealed.

Recently, some PHABSIM users have used a different conceptual model in which transect data are treated as samples, stratified by habitat types, rather than as representing specific areas of the channel (e.g., CDFG 1991). The details of the validation would then depend on the details of the sampling scheme, but the basic process remains the same; model predictions of the joint distributions of depth, velocity, and substrate must be compared with independent data. Provided that transect sites are selected randomly, they would provide an unbiased estimate of conditions in the study reach, so that models could be validated at the transects, and the streamwise spatial sampling errors could be estimated separately using statistical methods such as bootstrapping (Williams 1996). Since the PHABSIM hydraulic models cannot be calibrated for the more turbulent areas of many streams, however, the condition of randomly located transects is difficult to meet in PHABSIM studies, and validating the model with data from randomly located points seems more appropriate. As with any statistic developed by sampling, estimates of WUA should be reported with standard errors or confidence intervals, so that decision makers are informed of the uncertainty associated with the estimates (Castleberry et al. 1996).

Application of Models to Aquatic Habitat

Since our discussion of habitat models is in the context of their application to evaluating habitat for a particular species and life stage of fish, the most relevant question is whether such models can capture aspects of the hydraulic environment that are most important to the organism in question. In some cases, the answer is clearly no. For example, chinook salmon select spawning sites on the basis of subsurface flow, as well as depth, velocity, and substrate (Healey 1991, Vyverberg et al. 1997), so a model that does not address subsurface flow will be seriously incomplete in its evaluation of habitat for spawning chinook salmon.

More generally, we argue that fish often respond to features in their hydraulic environments such as velocity gradients over small length scales. For example, trout may hold in the flow separation zone downstream of a boulder, as described for a Pennsylvania stream by Bachman (1984, p. 9):

> Typically, foraging sites were in front of submerged rocks, or on top of but on the downward-sloping rear surface of a rock. From there the fish had an unobstructed view of oncoming drift. While a wild brown trout was in such a site, its tail beat frequency was minimal, indicating that little effort was required to maintain a stationary position even though the current only millimeters overhead was as high as 60 to 70 cm/second. Most brown trout could be found in one of several such sites

day after day, and it was not uncommon to find a fish using many of the same sites for three consecutive years.

Contrast the precise positioning of this trout in the hydraulic environment (within millimeters of a steep vertical velocity gradient) with the detail that can be resolved in hydraulic models. Even with 2-Dflow models, the resolution is scaled by flow depths (Ghanem et al. 1996), and cannot account for vertical velocity gradients. The best that can be done is to patch on some estimated average velocity gradient, and as should be evident from Figure 2, this would give only a crude approximation. Accordingly, there is a discontinuity in the spatial scale at which it seems feasible to model the hydraulic environment, and the spatial scales at which fishes often respond to it. This seems particularly true for fishes that hold near steep velocity gradients, such as near the bed of the stream, boulders, or logs.

At best, practical modeling of the hydraulic environment for determining instream flows involves estimating the distributions or joint distributions of depth and velocity over sizable areas. Where the channel conditions are sufficiently uniform that this can be done with reasonable accuracy, this information would obviously be useful for thinking about the effects of discharge on fish habitat. If such information can be developed by mapping (Collings 1972) or by an empirical approach (Lamouroux 1995) it will be similarly useful. However, values of hydraulic variables averaged over sizable areas should not be confused with the local values to which fish and other organisms often respond (Railsback 1999; Bult et al. 1999). To combine hydraulic model results, which are accurate only on a coarse scale, with habitat preference or suitability data collected on a much finer scale, raises troubling questions about meaning. PHABSIM estimates of weighted usable area result, in effect, from multiplying biological apples by hydraulic oranges.

Railsback (1999) proposes dealing with this problem of scale mismatch by developing suitability data from observations in cells with a spatial scale comparable to the resolution of the hydraulic modeling. This raises another set of problems. If the cells are small then occupancy of each cell may be affected by occupancy of adjacent cells, as wells as by hydraulic factors, and collection of enough hydraulic data for modeling any sizable length of stream will be difficult and expensive. If the cells are large, then describing the cell by a single index for depth, velocity, and index is dubious, and the biological meaning of weighted usable area is compromised.

Conclusions

Flow fields in natural channels are complex, and it is not feasible to model this complexity for any length of channel at the finer length scales to which fish often respond. We believe that a more modest approach to using hydraulic models for instream flow assessments is appropriate. In many streams, 2-D modeling may produce reasonable estimates of the amount of habitat with given combinations of depth and average velocity, and in other streams this can probably be estimated empirically. This is important information that any of us would want to use if we were charged with making decisions about instream flows, if it can be obtained without taking up too much of the available funding.

We suggest, however, that it is prudent to leave the hydraulic and biological inquiries as separate and distinct tasks, in part because this helps avoid the appearance of models providing answers, rather than aids to thought. We suspect that the best way to evaluate the importance of hydrologic conditions for a particular fish is to have a good understanding of the way that the fish uses the hydraulic environment, the kind of understanding that is developed by careful observational studies such as Jenkins (1969), Bachman (1984), or Nielsen (1992), and especially from long-term studies such as those on Carnation Creek in British Columbia (Hartman et al. 1995), or Brows Beck in England (Elliott 1994).

Such evaluations involve use of professional judgement in considering data from hydraulic modeling or mapping, and can be criticized as subjective. However, modeling gives only an illusion of objectivity. Modeling always involves simplifying assumptions. Therefore, judgement goes into deciding just what and how to model, and good judgement requires knowledge of both the model and the thing being modeled. Models are not a substitute for knowledge and experience. Whether a model is good or bad depends upon the purpose to which it is put. For simulating depth and velocity, different models are appropriate for different kinds of channels and for different scales of resolution. However, all models have limitations. For simulating a particular reach of stream, the proper use of any model requires consideration of the statistical problems arising from sampling and measurement errors, and appropriate validation.

Acknowledgements

We thank Peter Whiting for providing us with the Solfatera Creek data and photograph, and Nicolas Lamouroux, Robert Jarrett, and Janice Fulford for helpful discussions of various topics.

References

Aceituno, M. and M. Hampton. 1988. Validation of habitat availability determinations by comparing field observations with hydraulic model (IFG-4) output. Pages 322-335 *in* K. Bovee and J.R. Zuboy, editors. Proceedings of a workshop on the development and evaluation of habitat suitability criteria. U.S. Fish and Wildlife Service Biological Report 88(11).

Bachman, R.A. 1984. Foraging behavior of free-ranging wild and hatchery brown trout in a stream. Transactions of the American Fisheries Society 113:1-32.

Bartz, B. 1990. Sources of uncertainty and effect on interpretation of results in the development of instream flows for fisheries habitat. Master's. thesis, Civil and Environmental Engineering, Utah State University, Logan, Utah.

Beebe, J.T. 1996. Fluid speed variability and the importance to managing fish habitat in rivers. Regulated Rivers: Research and Management 12:63-79.

Bovee, K.D. 1982. A guide to stream habitat analysis using the instream flow incremental methodology. Instream Flow Information Paper No. 12. U.S. Fish and Wildlife Service. FWS/OBS-82/26.

Bult, T.P., S.C. Riley, R.L. Haedrich, R.J. Gibson, and J. Heggenes. 1999. Density-dependent habitat selection by juvenile Atlantic salmon (*Salmo salar*) in experimental riverine habitats. Canadian Journal of Fisheries and Aquatic Sciences 56:1298-1306.

Carter, R.W., and I.E. Anderson. 1963. Accuracy of current meter measurements. Journal of the Hydraulics Division American Society of Civil Engineers. 89(HY4):105-115.

CDFG (California Department of Fish and Game). 1991. Instream flow requirements for brown trout, Rush Creek, Mono County, California. Stream Evaluation Report 91-2, California Department of Fish and Game, Sacramento.

Castleberry, D.T. and eleven others. 1996. Uncertainty and instream flow standards. Fisheries 21(8):20-21.

Collier, K.J. and Wakelin, M.D. Instream habitat use by blue duck (*Hymenolaimus alacorhynchos*) in a New Zealand River. Freshwater Biology 35:277-287.

Collings, M. 1972. A methodology for determining instream flow requirements for fish. Pages 72-86 *in* Proceedings of Instream Flow Methodology Workshop. Washington Department of Ecology. Olympia, Washington.

Dietrich, W.E. 1987. Mechanics of flow and sediment transport in river bends. Pages 179-227 *in* K. Richards, editor. River Channels Environment and Process. Basil Blackwell Ltd., New York.

Dietrich, W.E., and J.D. Smith. 1983. Influence of the point bar on flow through curved channels. Water Resources Research. 19(5):1173-1192.

Dingman, S.L. 1989. Probability distribution of velocity in natural channel cross sections. Water Resources Research 25:508-518.

Elliott, J.M. 1994. Quantitative ecology and the brown trout. Oxford University Press, London.

Fulford, J.M., K.G. Thibodeaux, and W.R. Kaehrle. 1994. Comparison of current meters used for stream gaging. Pages 376-385 *in* Fundamentals and Advancements in Hydraulic Measurements and Experimentation, 1994. ASCE Hydraulic Conference Proceedings.

Gan, K. and T. McMahon. 1990. Variability of results from the use of PHABSIM in estimating habitat area. Regulated Rivers: Research and Management 5:233-239.

Ghanem, A., P. Steffler, F. Hicks, and C. Katopodis. 1996. 2-D hydraulic simulation of physical conditions in flowing streams. Regulated Rivers: Research & Management. 12:185-200.

Greenberg, L., P. Svendsen, and A. Harby. 1994. Availability of microhabitats and their use by brown trout (*Salmo trutta*) and grayling (*Thymallus thymallus*) in the River Vojman, Sweden. Pages 606-624 *in* Proceedings of the 1st International Conference on Habitat Hydraulics.

Hartman, G.F., Scrivener, and M.J. Miles. 1995. Impacts of logging in Carnation Creek, a high-energy coastal stream in British Columbia, and their implications for restoring fish habitat. Canadian Journal of Fisheries and Aquatic Sciences 53(Suppl. 1):237-251.

Healey, M.C. 1991. Life history of chinook salmon. Pages 311-394 *in* Groot, C., and L. Margolis, editors. Pacific salmon life histories. University of British Columbia Press, Vancouver.

Heggenes, J. 1994. Physical habitat selection by brown trout (*Salmo trutta*) and young Atlantic salmon (*S. salar*) in spatially and temporally heterogeneous streams: implications for hydraulic modeling. Pages 12-30 *in* Proceedings of the 1st International Conference on Habitat Hydraulics.

Heggenes, J. 1996. Habitat selection by brown trout (*Salmo trutta*) and young Atlantic salmon (*S. salar*) in streams: static and dynamic hydraulic modeling. Regulated Rivers: Research and Management 12:155-169.

Herschy, R.W. 1978. The accuracy of current meter measurements. Proceedings of the Institution of Civil Engineers, Part 2: 65:431-437.

Jenkins, T.M. Jr. 1969. Social structure, position choice and microdistribution of two trout species (*Salmo trutta* and *Salmo gairdneri*) resident in mountain streams. Animal Behavior Monographs 2:56-123.

Jowett, I.G. 1989. River hydraulic and habitat simulation, RHYHABSIM computer manual. Ministry of Agriculture and Fisheries, New Zealand Fisheries Miscellaneous Report 49, Christchurch.

Lamouroux, N., Y. Souchon, and E. Herouin. 1995. Predicting velocity frequency distributions in stream reaches. Water Resources Research 31(9):2367-2375.

Lamouroux, N., H. Capra, and M. Pouilly. 1998. Predicting habitat suitability for lotic fish: linking statistical hydraulic models with multivariate habitat use models. Regulated Rivers: Research & Management 14:1-12.

Larsen, E. 1995. The mechanics and modeling of river meander migration. Doctoral dissertation. University of California, Berkeley.

Leclerk, M., A. Boudreault, J.A. Bechara, and G. Corfa. 1995. Two-dimensional hydrodynamic modeling: a neglected tool in the instream flow incremental methodology. Transactions of the American Fisheries Society 124:645-662.

Linsley, R.K., M.A. Kohler, and J.L.H. Paulhus. 1982. Hydrology for engineers. McGraw-Hill Co., New York.

Marchand, J.P., R.D. Jarrett, and L.L. Jones. 1984. Velocity profile, water-surface slope, and bed-material size for selected streams in Colorado. US Geological Survey Open-File Report 84-733, Lakewood, Colorado.

Marthur, D., W.H. Basson, E.J. Purdy, Jr., and C.A. Silver. A critique of the instream flow incremental methodology. Canadian Journal of Fisheries and Aquatic Sciences 42:825-831.

Milhous, R.T., D.L. Wegner, and T. Waddle. 1984. User's Guide to the Physical Habitat Simulation System (PHABSIM). Instream Flow Information Paper 11. U.S. Fish and Wildlife Service. FWS/OBS-81/43 Revised.

Milhous, R.T., M.A. Updike, and D.M. Schneider. 19989. Physical Habitat Simulation System (PHABSIM) Reference Manual-Version II. Instream Flow Information Paper No. 26. U.S. Fish and Wildlife Service. Biological Report 89(16).

Nielsen, J.L. 1992. Microhabitat-specific foraging behavior, diet, and growth of juvenile coho salmon. Transactions of the American Fisheries Society 121:617-634.

Oreskes, N., K. Shrader-Frechette, and K. Belitz. 1994. Verification, validation, and confirmation of numerical models in the Earth Sciences. Science 263:641-646.

Osborne, L.L., M.J. Wiley, and R.W. Latimore. 1988. Assessment of the water surface profile model: accuracy of predicted instream fish habitat conditions in low-gradient, warmwater streams. Regulated Rivers: Research and Management 2:619.631.

Petit, F. 1987. The relationship between shear stress and the shaping of the bed of a pebble-loaded river La Rulles - Ardenne. Catena 14:453-468.

Pouily, M., S. Valentin, H. Capra, V. Ginot, and Y. Souchon. 1995. Methode des microhabitats: priniples et protocoles d'application. Bulleltin Francais de la P^che et de la Pisciculture 336:41-54.

Railsback, S. 1999. Reducing uncertainties in instream flow studies. Fisheries 24(4):24-26.

Rantz, S.E. and others. 1982. Measurement and computation of streamflow: Volume 1. Measurement of stage and discharge. US Geological Survey Water-Supply Paper 2175, Washington DC.

Resier, D.W., T.A. Wesche, and C. Estes. 1989. Status of instream flow legislation and practices in North American. Fisheries 14(2):22-29.

Richter, B.D., J.V. Baumgartner, J. Powell, and D.P. Braun. 1996. A method for assessing hydrologic alteration within ecosystems. Conservation Biology 10:1163-1174.

Richeter, B.D., J.V. Baumgartner, R. Wigington, and D.P. Braun. 1997. How much water does a river need? Freshwater Biology 37:231-249.

Shirvell, C.S. 1986. Pitfalls of physical habitat simulation in the instream flow incremental methodology. Canadian Technical Report of Fisheries and Aquatic Sciences No. 1460.

Shirvell, C.S. 1994. Effect of changes in streamflow on the microhabitat use and movements of sympatric juvenile coho salmon (*Oncorhynchus kisutch*) and chinook salmon (*O.*

tshawystcha) in a natural stream. Canadian Journal of Fisheries and Aquatic Sciences 51:1644-1652.

Thomas, J.A. and K.D. Bovee. 1993. Application and testing of a procedure to evaluate the transferability of habitat suitability criteria. Regulated Rivers: Research and Management 8:285-294.

Townsend, F.W., and F.A. Blust. 1960. A comparison of stream velocity meters. Journal of the Hydraulics Division, American Society of Civil Engineers. 86(HY 4):11-19.

Vyverberg. K., B. Snider and R.G. Titus. 1997. Lower American River chinook salmon spawning habitat evaluation: October 1994. California Dept. of Fish and Game, Environmental Services Division, Sacramento.

Weiber, P.L. and J.D. Smith. 1987. Initial motion of coarse sediment in steep mountain streams of high gradient. Pages 299-308 *in* R.L. Beschta, T. Blinn, G.E. grant, G.G. Ice and F.J. Swanson, editors. Erosion and sedimentation in the Pacific Rim. International Association of Hydrological Sciences Publication No. 165.

Whiting, P.J. 1997. The effect of stage on flow and components of the local force balance. Earth Surface Processes and Landforms 22:

Whiting, P.J., and W.E. Dietrich. 1991. Convective accelerations and boundary shear stress over a channel bar. Water Resources Research. 27(5):783-796.

Williams, J.G. 1996. Lost in space: minimum confidence intervals for idealized PHABSIM studies. Transactions of the American Fisheries Society 125:458-465.

Table 1: Rules of thumb from Herschy (1978) for 95% confidence intervals for hydraulic measurements, expressed as % of measured values.

Uncertainty in or from:

current meter error	1% at 0.5 m/s, 2% at 0.25 m/s, 5% at 0.1 m/s
measurement of width	0.5%
measurement of depth	2.5%
time variation in velocity measurement	5% at 0.3 m/s, 22% at 0.1 m/s, 3 min. exposure
vertical spatial variation in velocity	7% (0.2 & 0.8 d method), 15% (0.6 d method)

Figure Legends

Figure 1. View of Solfatera Creek, looking downstream over the reach studied by Whiting and Dietrich (1991) and Whiting (1997). Note moderate gradient and apparently tranquil flow.

Figure 2: Downstream and cross-stream velocity fields at sections spaced 2 m apart in Solfatera Creek, Wyoming, reprinted from Whiting and Dietrich (1991). Isovels (lines of equal velocity) are at ten cm/s intervals; shaded areas indicate flow toward the left bank. Downstream isovels range from 0 to 70 cm/s, cross-stream isovels from 20 cm/s to the left to 30 cms to the right. The high velocity core near the bottom at Sections 1 and 2 (> 50 cm/s downstream) moves up and splits going over the bar in sections 7-10, with downstream velocity peaking at > 70cm/s in Sections 8 and 9. Velocity is highest near the right bank in Section 11 (> 60 cm/s), with a secondary maxima (> 50 cm/s) forming to the left of the bar. Water close to the right side of the bar in Section 11 is eddying upstream (< 0 cm/s). Section numbers increase in the downstream direction. See text for site description.

Figure 3. Estimates of the differences, in percentages, from estimating the vertically averaged water velocity using the velocity at 6/10s depth, and using the detailed measurements of Whiting and Dietrich (1991), for eight of the sections shown in Figure 1; the box plot summarizes the differences for all sections. Positive differences indicate that velocity at 6/10s depth is greater than the average estimated from the detailed measurements; each circle represents one vertical.

Figure 4 Standard deviations of velocity measurements averaged over different time periods, as percentages of the overall (one hour) means. Data from Carter and Anderson (1963); the anomaly in the 0.6 depth curve probably results from a typographical error.

Figure 5. Means and standard deviations of the differences between measured and modeled mean column velocities at verticals on the Williams Fork River, Colorado, for three PHABSIM hydraulic models (IFG-4, MANSQ, and WSP) calibrated at three discharges. Data from Table 4.5 in Bartz (1990).

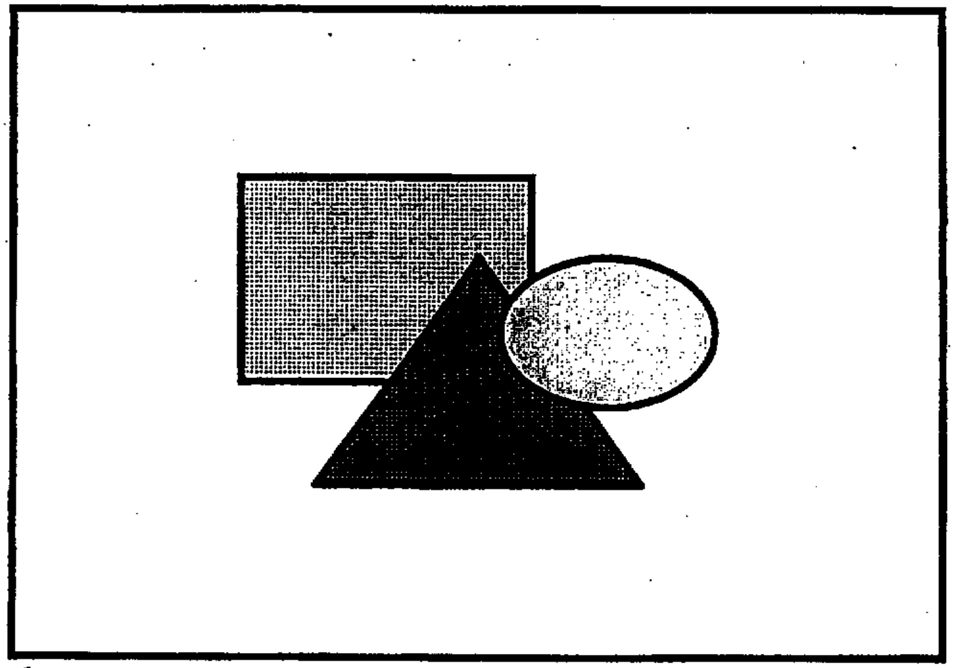
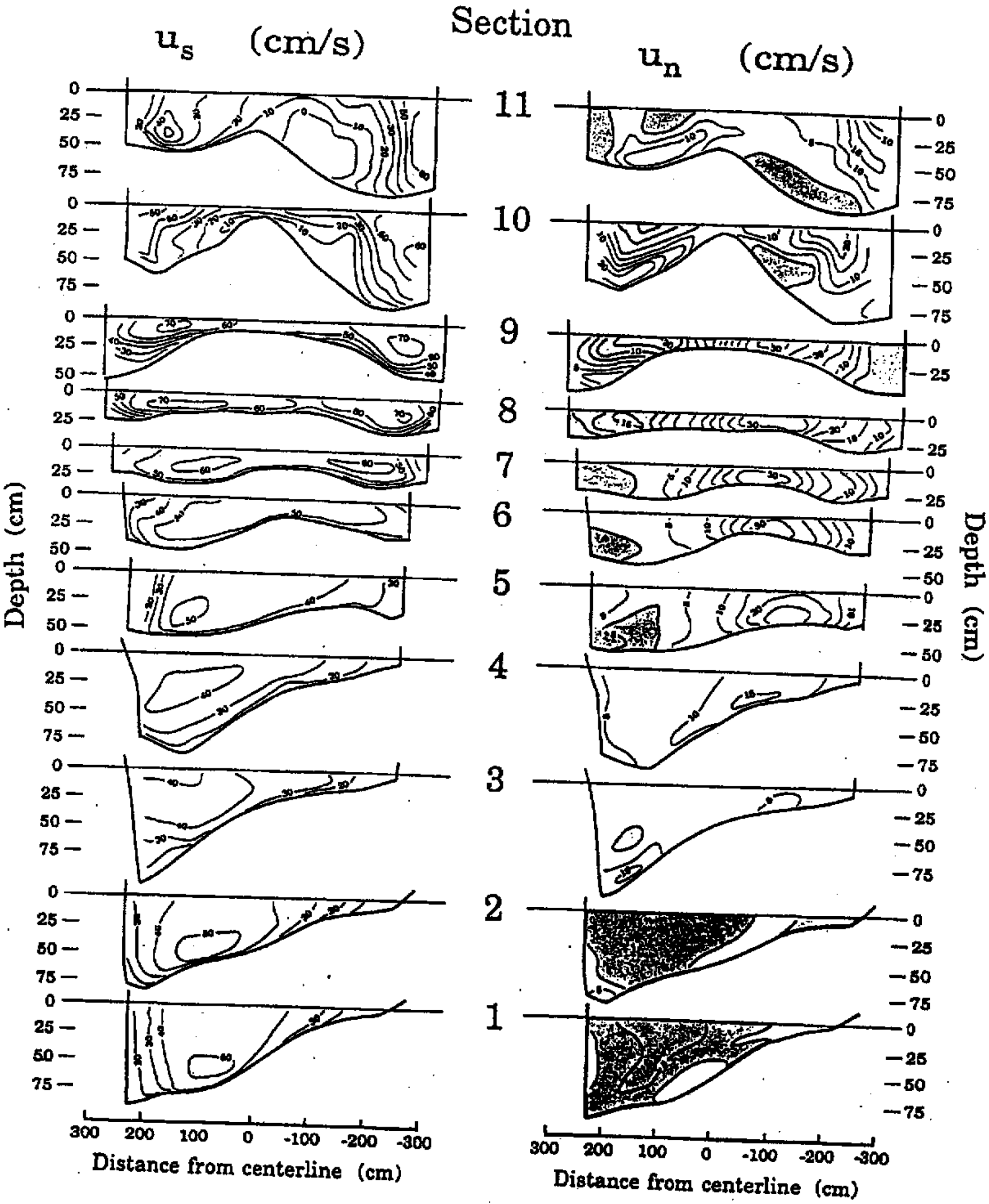


Figure 1


Section
u_s (cm/s)
u_n (cm/s)
11
10
9
8
7
6
5
4
3
2
1
Depth (cm)
Depth (cm)
0
25
50
75
300
200
100
0
-100
-200
-300
Distance from centerline (cm)
Distance from centerline (cm)

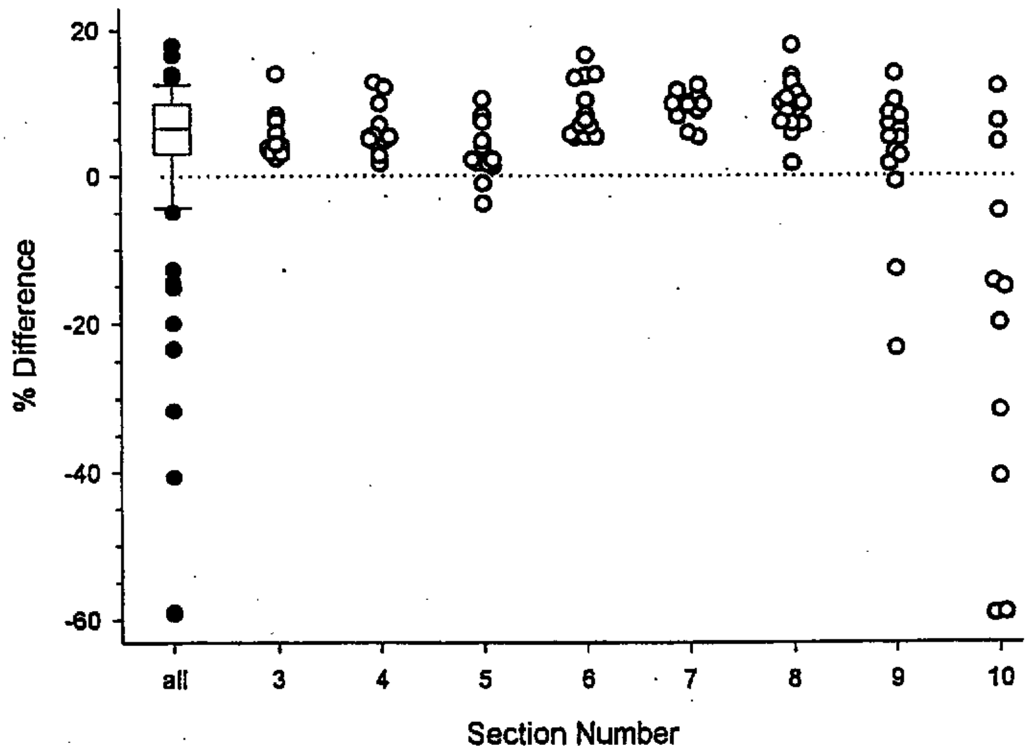
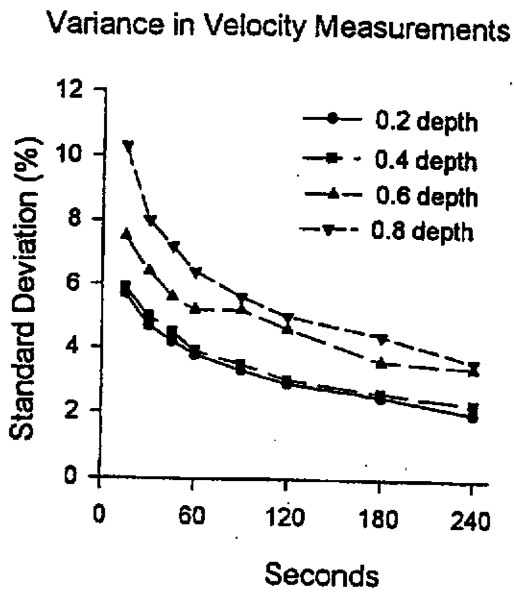


Figure 3


Variance in Velocity Measurements
0.2 depth
0.4 depth
0.6 depth
0.8 depth
Standard Deviation (%)
12
10
8
6
4
2
0
0
60
120
180
240
Seconds

Figue 4

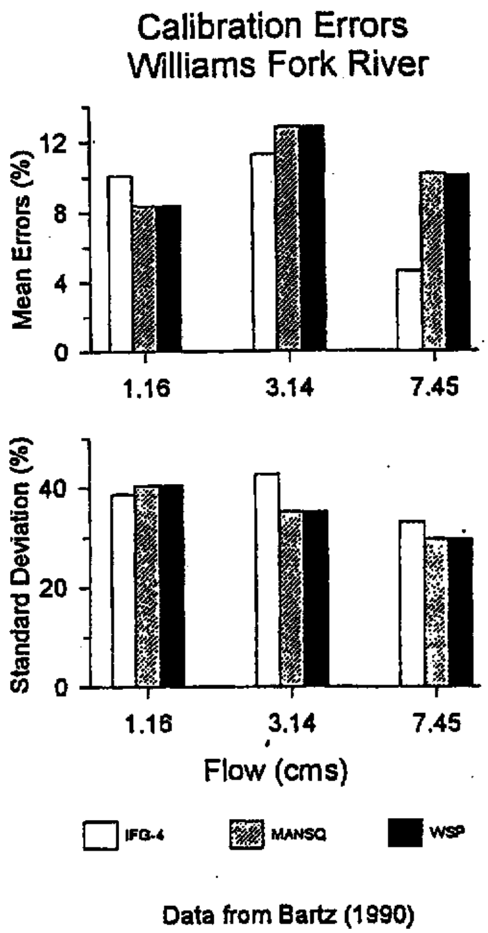

Calibration Errors
Williams Fork River
Mean Errors (%)
12
8
4
0
1.16
3.14
7.45
Standard Deviation (%)
40
20
0
1.16
3.14
7.45
Flow (cms)
IFG-4
MANSQ
WSP
Data from Bartz (1990)

Figure 5

Exhibit 2

Exhibit # 12

State Water Resources Control Board

Division of Water Rights
1001 I Street, 14th Floor • Sacramento, California 95814 • (916) 341-5300
Mailing Address: P.O. Box 2000 • Sacramento, California • 95812-2000
FAX (916) 341-5400 • Web Site Address: http://www.waterrights.ca.gov

Winston H. Hickox
Secretary for Environmental Protection

Gray Davis
Governor

W. H

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Web-site at http://www.swrcb.ca.gov.

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NAT'L MARINE FISHERIES SVC.
SANTA ROSA, CA

NOV 08 2002

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AR ORIGINAL ☐
DESK COPY ☐

Thomas and Mary Dimmick Elke
c/o Drew L. Aspegren
Napa Valley Vineyard Engineering, Inc.
176 Main Street, Suite B
St. Helena, CA 94574

Dear Mr. Aspegren:

APPLICATION 30718 and 31003—ELKE

The purpose of this letter is to discuss the status of Applications 30718 and 31003 for a water right permit and to describe activities that must be completed in order for the State Water Resources Control Board (SWRCB), Division of Water Rights (Division) to continue processing these applications. Currently, the Division is faced with a shortage of technical staff and a backlog of pending applications and change petitions. As a result, the Division has implemented a new policy. The applicant will now be responsible for completing most technical activities required for the Division to act on the application and issue a permit. This approach is similar to policies employed by most other government permitting agencies. A water right permit is a property right, similar to a building permit or an approved subdivision map. The water right permit attaches to the land and, in most cases, is of substantial value. Consequently, the cost of completing the major technical activities necessary to secure the permit should, appropriately, be borne by the person(s) realizing economic gain from the permit.

Background Information

On June 19, 1998, Water Right Application 30718 was submitted requesting a water right permit that would authorize storage of 30 acre-feet per annum (afa). Water would be stored in an existing onstream reservoir on Witherell Creek tributary to Anderson Creek thence the Navarro River. The proposed season of diversion is October 1 through May 31, and the purposes of use are irrigation and frost protection of 20 acres of vineyard. On January 21, 2000, application 31003 was submitted requesting direct diversion of 20 afa at a rate not to exceed 2 cfs from Witherell Creek between March 1 and May 31 for frost protection of the same place of use. The total combined amount under both applications shall not exceed 30 afa.[1,2]

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[1] Contact report dated June 2, 2000 between Laura Vasquez of the Division and Thomas Elke. In files 30718 and 31003, Division of Water Rights, State Water Resources Control Board.

[2] Notice of applications to appropriate water by permit dated June 30, 2000. In files 30718 and 31003, Division of Water Rights, State Water Resources Control Board.

On June 30, 2000, the Division distributed a Notice of Applications 30718 and 31003 to interested parties. Seven protests were filed against this project; National Marine Fisheries Service (NMFS), California Department of Fish and Game (DFG), California Sportfishing Protection Alliance, Navarro Watershed Protection Association, Friends of the Navarro Watershed, Daniel Myers, and James Minton. These protests were all accepted. In response to the protests, the Applicants agreed, in part, to reduce the season of diversion to December 15 through March 31 for Application 30718 and March 1 through March 31 for Application 31003, construct a bypass facility, and install appropriate gauging and/or metering devices.[3]

The protests were not resolved and therefore, pursuant to Water Code Sections 1345-1348, the SWRCB Division of Water Rights (Division) conducted a Field Investigation on October 26, 2000. During the field investigation, NMFS and DFG staff determined that the current reservoir is an onstream impoundment of a Class 1 fish bearing stream.[4]

Potential Cumulative Impacts on Endangered Fish

The Central California Coast coho salmon (*Oncorhynchus kisutch*) was federally listed by NMFS as threatened under the Endangered Species Act (ESA) (61 FR 56138, October 31, 1996). The Central California Coast steelhead (*O. mykiss*) was federally listed by NMFS as threatened under ESA (62 FR 43938, August 18, 1997). Division staff held a series of meetings with NMFS, DFG and other interested parties to develop a method to assess potential site-specific and cumulative impacts of new water projects on anadromous fishery resources in coastal watersheds. This assessment method is described in a document entitled *Guidelines for Maintaining Instream Flows to Protect Fisheries Resources Downstream of Water Diversions in Mid-California Coastal Streams [Draft]*, dated June 17, 2002, prepared by NMFS and DFG (copy enclosed). This document will hereinafter be referred to as the Guidelines. As described in the Guidelines, NMFS and DFG are concerned that the proposed projects in the Navarro River Watershed may have the potential to cause significant adverse impacts to anadromous fishery resources if the total <u>October 1 through March 31</u> diversion demand within the stream is greater than <u>five</u> percent of the average unimpaired <u>December 15 through March 31</u> seasonal runoff at any point downstream where fish are present. The specific locations of concern in the watershed are called the Points of Interest (POIs) and are selected by NMFS and DFG.

Request for Information

Before the Division can continue processing your application, you will need to make a specific showing that your project can be operated so as not to contribute to existing potential significant cumulative impacts on threatened coho salmon/steelhead in the Navarro River Watershed. This will require that you hire a qualified consultant to develop recommendations for specific project modifications or other actions (mitigation measures) that could be taken to prevent your project

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[3] Response to protests dated September 20, 2000 from Thomas Elke. In files 30718 and 31003, Division of Water Rights, State Water Resources Control Board.

[4] Memorandum from Laurie A. Hatton to Steven Herrera dated December 18, 2000. In files 30718 and 31003, Division of Water Rights, State Water Resources Control Board.

from contributing to these significant cumulative impacts. As part of this process you must determine whether the total diversion demand in this stream, including your proposed diversion, may cause a significant adverse impact to anadromous fishery resources, and you must prepare a Water Availability Analysis/Cumulative Flow Impairment Index Report (WAA/CFII Report). An example of how the WAA/CFII Report should be formatted is enclosed. Division staff will contact NMFS and DFG to determine the appropriate POIs for the WAA/CFII analysis. The NMFS and DFG should be contacted directly if the CFII at any POI is greater than five percent, since additional hydrologic or biological analysis may be required. Please consult the Guidelines for further information on when and how these further studies should be conducted.

You should be aware that the issuance of a water right permit is a discretionary action, as defined by the California Environmental Quality Act (CEQA). CEQA requires that the SWRCB, as Lead Agency, prepare the appropriate environmental document. As the Applicant, you are responsible for all costs related to the environmental evaluation and the preparation of the CEQA document.

In view of the above discussion, we request that you advise the Division whether you intend to continue the water right permit application process. Please submit your reply in writing within 30 days of the date of this letter. If you do not respond in writing within 30 days, we will assume that you no longer want to obtain a water right permit and the Division will proceed with the cancellation of your application, in accordance with section 1276 of the California Water Code.

If you want the Division to continue processing your application, you need to clearly demonstrate that you are taking significant steps to complete the water right process. Within 60 days of the date of this letter, you need to complete and sign a Memorandum of Understanding (MOU) with the SWRCB that clearly sets forth the roles of the (1) SWRCB, (2) you, the water right applicant, and (3) your consultant (See enclosed list of environmental and engineering consultants who are familiar with the preparation of CEQA documents and the water rights process). Upon receipt of a completed and signed MOU, we will return an executed copy to you. A copy of the MOU template is attached.

Within 60 days of the date of the executed MOU, your consultant must submit a preliminary work plan that includes a description of the tasks to be performed, including the scope of the WAA/CFII analysis to be performed; the specific environmental studies to be performed; a list of permits required to construct and implement your project; and a schedule for consultation with DFG, NMFS and any local, state or federal agency from whom a permit may be required. Based on this preliminary work plan, Division staff and your consultant will then set a schedule for preparation of a final work plan and completion of tasks. The final work plan shall include detailed descriptions of, and a schedule of completion for, any biological, endangered species and archeological survey reports requested by the SWRCB, and a WAA/CFII Report as described above. It is important that the WAA/CFII Report be completed prior to starting the CEQA process, as the results could determine the scope and content of the CEQA document.

Failure to submit the above requested information by the completion date may result in cancellation of your application and possible enforcement action by the Division.

For Further Information
If you have questions regarding the Guidelines please contact:

NMFS:	Dr. Willam Hearn	Phone: (707) 575-6062 E-Mail: William.Hearn@NOAA.gov
	Dr. Stacy Li	Phone: (707) 575-6082 E-Mail: Stacy.Li@NOAA.gov
DFG:	Ms. Linda Hanson	Phone: (707) 944-5562 E-Mail: Lhanson@dfg.ca.gov

Mailing addresses for the above contact persons are given below.

If you have any questions or would like to discuss the requirements described in this letter, please contact Laurie A. Hatton in the Environmental Section at (916) 341-5336, or Julé Rizzardo in the Applications Section at (916) 341-5339.

Sincerely,

David R. Beringer
for Harry M. Schueller
Chief Deputy Director

Enclosures (4)

cc: Thomas and Mary Dimmick Elke
P.O. Box 6237
Napa, Ca 94581

Dr. William Hearn
National Marine Fisheries Service
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404-6528

Dr. Stacy Li
National Marine Fisheries Service
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404-6528

(Continued next page.)

cc: (Continuation page.)

Ms. Linda Hanson
Department of Fish and Game, Region 3
P.O. Box 47
Yountville, CA 94599

Mr. Robert W. Floerke, Regional Manager
Department of Fish and Game, Region 3
P.O. Box 47
Yountville, CA 94599

Mr. Larry Week, Chief
Native Anadromous Fish and Watershed Branch
Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Ms. Nancee Murray, Staff Counsel
Department of Fish and Game
Office of the General Counsel
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Exhibit 8

Exhibit # 13

State of California

Memorandum

To: Mr. Edward C. Anton, Chief
Division of Water Rights
State Water Resources Control Board
Post Office Box 2000
Sacramento, CA 95812
Fax: (916) 341-5400

Date: April 25, 2003

Attention Ms. Kathryn Gaffney

From: Robert W. Floerke, Regional Manager *COPY - Original signed by Jim Swanson for*
Department of Fish and Game - Central Coast Region, Post Office Box 47, Yountville, California 94599

Subject: Protest of Water Application (WA) 31133 of Cakebread Properties, LLP for Diversions from Anderson Creek, Tributary to the Navarro River, Thence the Pacific Ocean in Mendocino County

The Department of Fish and Game's (DFG) interest in this application is based on its status as a responsible and trustee agency for fish and wildlife resources in California. DFG's right to protest is based on State Water Code Section 1330 and other associated provisions of law.

Basis of Protest

DFG is protesting this application because it will result in reduced stream flow during critical periods, thus likely diminishing aquatic and riparian resources in Anderson Creek, the Navarro River, and its tributaries. These streams support populations of steelhead trout (*Oncorhynchus mykiss*), coho salmon (*Oncorhynchus kisutch*), and other fish and wildlife resources. Due to dramatic declines of populations in their southern range, steelhead and coho salmon of the Navarro River basin are listed by the National Marine Fisheries Service (NOAA Fisheries) as "threatened" under the Federal Endangered Species Act (FESA). In addition, DFG has listed coho as a "candidate/recovery"[1] species. The Navarro River and its tributaries also support other designated sensitive species such as Navarro roach (*Lavinia symmetricus navarroensis*) and foothill yellow-legged frogs (*Rana boylii*). DFG is concerned that the proposed project may result in

[1] The Fish and Game Commission accepted coho salmon north of San Francisco Bay as a candidate species and subsequently determined that listing is warranted. However, pursuant to a State law providing for recovery planning, the Commission has delayed the formal "listing" until a recovery plan is prepared. Until that time, the provisions of Title 14, Section 749.1 remain in effect as they currently exist or as they are amended. However, if the Commission approves a recovery plan for coho, the provisions regulating take of the species are likely to change.

direct and cumulative adverse impacts to these valuable resources. Specifically, this diversion and the other diversions in the watershed have the potential to reduce the instream flows that are needed to provide fish passage and to maintain riparian and fishery rearing habitat within Anderson Creek and the Navarro River.

In addition, changes in land use due to construction or habitat conversion for this project may cause negative effects on terrestrial species. The application indicates that the reservoir was built in the spring of 2001 and that the vineyards have also now been planted.

Project Description

Under WA 31133, the applicant proposes to collect 49 acre-feet per annum (afa) of water to storage. The water will be diverted from Anderson Creek using an offset well at the rate of 2.9 cubic-feet per second (cfs). This water will be stored in an existing 49 acre-foot (af) offstream reservoir that is currently unpermitted and unauthorized. The proposed use for the stored water is irrigation, heat control, and frost protection of 47 acres of existing vineyard, fire protection, and recreation. The proposed season of diversion is December 15 through March 31.

DFG requests clarification of the nature of any additional sources of water required for this project. The water duty for 47 acres of vineyard irrigation, frost protection, and heat control will likely exceed the amount of stored water available from a 49 acre-foot reservoir, especially one with proposed incidental summer uses of fishing, swimming, and fire protection. Any additional water diverted outside the proposed diversion season will have additional impacts that need to be addressed during the California Environmental Quality Act (CEQA) review for this project.

Based on the information provided in the application, there are no other existing water rights being claimed for use on this 47 acres of vineyard. The application does list groundwater as an alternative source of water, but does not provide information on whether that source has been developed. In light of the sensitivity of this watershed with regard to Federal and State listed species, DFG requests clarification of the water source currently being utilized to support the vineyard and the source of the water, if any, currently being stored in the existing 49 af reservoir. If diverted water is being stored and/or used without a basis of right, DFG requests that the SWRCB rigorously pursue the actions available to it under the State Water Code to stop any unpermitted diversions until their impacts can be adequately assessed and appropriately mitigated under CEQA. Allowing continuing diversions may artificially inflate the environmental baseline during CEQA review and thus give a false picture as to the true measure of resource impacts.

Protest Dismissal Terms

Protest dismissal terms, if adopted as enforceable conditions of the water rights permit, are intended to mitigate adverse impacts to fisheries and wildlife resources. Based on the information provided by the applicant, site-specific studies for the purpose of determining appropriate flow-related terms and conditions are needed. The study plan should include, at a minimum, the following:

1. A hydrologic study to determine if the production of the watershed is sufficient to provide the water requested without having significant adverse impacts to aquatic and riparian resources of the subject stream or downstream reaches. The study shall identify all other basis of water rights in watersheds potentially affected by the proposed diversions.

2. A specific proposal to provide minimum bypass flows for maintenance of aquatic habitat, fish, and wildlife. The starting point for determining the minimum bypass flow shall be the estimated long-term unimpaired February medial flow at the points of diversion. This proposal should also specifically address bypass flows released while the reservoirs are filling during the onset of rains each season, as well as reservoir levels remaining at the end of the irrigation season.

3. An assessment of the impacts of the proposed diversions on channel forming flows with a specific proposal to provide periodic channel maintenance and flushing flows that are representative of the natural hydrograph.

4. A plan to monitor compliance, the effectiveness of the stipulated flows, and procedures for making subsequent modifications, if necessary.

In addition to the flow-related assessment discussed above, surveys for the presence of listed plant and animal species must be conducted on the entire place of diversion (including downstream reaches affected by the diversions), place of storage, and place of use. When the results of the above-indicated studies are provided to DFG, appropriate mitigation measures and protest dismissal terms shall be determined. Depending on the outcome of these studies, dismissal terms for these diversions may include, but are not limited to:

1. Permittee shall not use more water under basis of riparian right on the place of use than permittee would have used absent the appropriation under permit.

2. Under the exercise of all bases of rights, the season of diversion shall be limited to December 15 to March 31 each year.

3. Under the exercise of all bases of rights, from April 1 to December 14, all natural flow shall be bypassed.

4. Under the exercise of all bases of rights, the diversions shall be limited to 49 afa.

5. A measure of flow shall be bypassed around the point of diversion during the allowable diversion season that will be of sufficient quantity and quality to allow upstream and downstream fish passage and maintain in good condition any aquatic resources that would exist in downstream reaches under unimpaired flows. Determination of the bypass flow can be based on site-specific biological investigations conducted in consultation with DFG and NOAA Fisheries personnel. In the absence of site-specific data, the bypass shall not be less than the estimated long-term unimpaired February median flow at the point of diversion.

6. The bypass shall be a passive system that is designed to only divert flow when the terms of the SWRCB permit will be met. Outside the diversion season and at low flows, water will automatically bypass the point of diversion.

7. DFG is opposed to any project that impedes either upstream or downstream passage of fisheries resources. Any device or contrivance which prevents, impedes, or tends to prevent or impede the passage of fish up or downstream shall not be accepted as a means to divert or store water.

8. The cumulative maximum instantaneous rate of withdrawal shall not exceed a flow rate equivalent to 15 percent of the estimated "winter 20 percent exceedence flow." The "winter 20 percent exceedence flow" is the 20 percent exceedence value of the stream's daily average flow duration curve for the period December 15 to March 31. Cumulative withdrawal rate refers to the effects of this and all other permitted or licensed projects as well as diversion under riparian rights.

9. Any water intended for recreation or fire protection must be designated as a non-consumptive use.

10. Under the exercise of any basis of right, there shall be no direct diversion for irrigation or for frost or heat control.

11. The applicant shall develop and submit for DFG approval, a mitigation plan aimed at replacing lost plant, fish, and/or wildlife resources including, but not limited to, species or habitats listed in the California Natural Diversity Database. This plan shall include a survey which quantifies losses of resources that have or will occur as a result of this project. Plans shall specify measures taken to offset impacts to resources and outline specific mitigation and monitoring programs.

12. If warranted, an erosion control plan shall be developed. This plan shall outline measures aimed at alleviating sediment delivery into the Navarro River basin. This plan shall include:

    a. Time restriction for grading operations or other project-related activities to reduce the potential for erosion and sediment delivery to Anderson Creek.

    b. Buffer zones shall be established along any riparian corridor of the affected project site. Discing or removal of existing riparian vegetation or other disruptive work shall not occur wi thin said buffer zone.

    c. Erosion control for all exposed areas susceptible to erosion including seeding, mulching, tree planting, slope contouring, and other erosion protection measures shall be included in this plan.

13. If unforeseen problems arise which are causing significant adverse impacts to fish and/or wildlife resources or as further data is accumulated for analysis, the applicant may be required to remediate the situation to the satisfaction of DFG.

14. Permittee must agree to allow access for DFG personnel to monitor compliance.

All or some of these terms may be subject to modification or cancellation should facts warranting such action come to light at a later date.

NOTICE TO APPLICANT: The applicant should be advised that a Streambed Alteration Agreement (SAA) pursuant to Fish and Game Code sections 1601-03 may be required prior to any work, including water diversion, within the stream zone. This agreement process will be administered through the Central Coast Region Office in Yountville and can be initiated by contacting the Streambed Alteration Section at (707) 944-5520. Work cannot be initiated until an SAA is executed.

If you have any questions regarding our comments, please contact Ms. Linda Hanson, Environmental Scientist, at (707) 944-5562; or Mr. Carl Wilcox, Habitat Conservation Manager, at (707) 944-5525; or by writing to the DFG at the above address.

cc: Cakebread Properties, LLP
c/o Wagner & Bonsignore
Consulting Engineers
444 North Third Street
Sacramento, CA 95814

Mr. William Hearn
Mr. Stacy Li
National Marine Fisheries Service
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404

e9: Department of Fish and Game
H. Branch (Legal)
C. Vouchilas (SVCSR)
L. Hanson, J. Emig (CCR)

LH/pm

Exhibit 4

Exhibit # 14

Small Domestic Use Registrations
1990-2004
Humboldt County

Application ID	Applicant	Date Filed
D029728R	Wilder	4/26/1990
D029729R	Wilder	4/26/1990
D029730R	Wilder	4/26/1990
D029741R	Allen	5/9/1990
D029833R	Paoli	10/3/1990
D030091R	Hulbard	3/25/1992
D030235R	Noel	3/17/1993
D030315R	Olson	12/9/1993
D030316R	Fitch	12/9/1993
D030317R	Floyd	12/9/1993
D030318R	Quittenton	12/9/1993
D030319R	Jacobsen	12/9/1993
D030320R	Lemieux	12/9/1993
D030321R	Odegard	12/9/1993
D030414R	Anderson	12/8/1994
D030417R	Nichols	12/14/1994
D030499R	Campbell	12/12/1995
D030571R	Brooks	9/12/1996
D030572R	Shawver	9/12/1996
D030576R	Canzoneri	9/19/1996
D030598R	Ogden	3/11/1997
D030604R	Jennings	4/4/1997
D030624R	Canclini	6/3/1997
D030640R	Roeflofs	8/21/1997
D030651R	Archer	10/10/1997
D030775R	Youngreen	9/28/1998
D030817R	Wolf	12/7/1998
D030845R	Campbell	3/17/1999
D030911R	Faulkner	6/22/1999
D030916R	Caraway	7/1/1999
D031128R	Wilson	1/16/2001
D031440R	Hinz	9/8/2003
D031441R	Hinz	8/19/2003

Small Domestic Use Registrations
1990-2004
Marin County

Application ID	Applicant	Date Filed
D030071R	Tacherra	3/3/1992
D030152R	LV Ranch	7/2/1992

Small Domestic Use Registrations
1990-2004
Mendocino County

Application ID	Applicant	Date Filed
D029713R	The Lone Rock Partemship	4/9/90
D030064R	Richter	2/26/92
D030157R	Smith	7/8/92
D030167R	Hott	7/29/92
D030183R	Gersley	10/7/92
D030185R	Keim	10/15/92
D030291R	Swallow	10/14/93
D030346R	Dress	4/7/94
D030377R	McFarland Living Trust	7/11/94
D030394R	Graham	9/7/94
D030395R	Winding	9/7/94
D030427R	Pepperwood	1/26/95
D030428R	Golden	1/27/95
D030586R	Cooke	12/24/96
D030636R	Galey	8/1/97
D030660R	Covell	11/5/97
D030668R	Spivey	12/22/97
D030689R	Carsey	3/24/98
D030704R	Peter and Collette Rothschild Trust	5/20/98
D030705R	Hackett	5/22/98
D030709R	Ronald and Gail Gester Trust	6/2/98
D030713R	Smith	6/16/98
D030714R	Busse	6/16/98
D030719R	Red Cap	6/23/98
D030723R	Kasper	7/1/98
D030742R	Love	8/6/98
D030754R	Martz	8/31/98
D030767R	Basehore	9/18/98
D030768R	Walker	9/18/98
D030773R	Hallomas Inc.	9/25/98
D030774R	Nunes	9/28/98
D030778R	Gundling	9/30/98
D030784R	Kaplan	10/9/98
D030785R	Peterman	10/9/98
D030786R	Evenson	10/9/98
D030793R	Green	10/9/98
D030795R	Copper Queen Ranch	10/15/98
D030811R	Don Pedro Ranch Corporation	11/18/98
D030819R	Tebbutt	12/7/98
D030821R	Scheidegger	12/8/98
D030822R	Medaris	12/9/98
D030841R	Squire	2/18/99
D030843R	Williams	3/17/99
D030847R	Wuerfel	3/17/99
D030850R	Colton	3/26/99
D030862R	Clark	4/13/99
D030863R	Schaeffer	4/13/99
D030865R	Browne	4/13/99
D030883R	Ornbaun	4/27/99
D030887R	Rudovsky	5/13/99
D030888R	Rancho Navarro Association	5/13/99

Small Domestic Use Registrations
1990-2004
Mendocino County

D030889R	Bradford	5/13/99
D030894R	Whittaker Family Trust	5/13/99
D030899R	Pratt	6/22/99
D030900R	Venturi	6/22/99
D030902R	Russell	6/22/99
D030903R	Imhoff	6/22/99
D030905R	Kary B. Mullis Trust	6/22/99
D030906R	Harpe	6/22/99
D030907R	Dusenberry	6/22/99
D030908R	Kobler	6/22/99
D030909R	Shanley	6/22/99
D030917R	Pinoli	7/1/99
D030918R	Pinoli	7/1/99
D030921R	Hammond	7/1/99
D030937R	Mendocino Redwood Company	9/17/99
D030938R	Segar	9/17/99
D030939R	Baker	9/17/99
D030940R	Nelson	9/17/99
D030943R	Hanelt	9/17/99
D030953R	Mendocino Lake Clubhouse	10/14/99
D030957R	Alexander	10/14/99
D030968R	Kleve C Johnson DMD & Nancy G Johnson Revoc Intervivos Trust	10/14/99
D030969R	Riddell	10/14/99
D030985R	Murphey	11/22/99
D031000R	Frederick Martin & Francis Sylvia Martin Revocable Trust	1/21/00
D031010R	Hubbert	1/21/00
D031035R	Estes	3/21/00
D031062R	Romani	6/12/00
D031082R	Abbey Foundation for the Arts	7/25/00
D031083R	Hurt	7/25/00
D031098R	Vanslett	8/30/00
D031146R	Barron	2/1/01
D031172R	Weir	3/30/01
D031211R	Weir	7/18/01
D031221R	Carley	8/23/01
D031225R	Ostler	9/13/01
D031266R	Deutschman	1/11/02
D031301R	Yggdrasil Land Foundation	2/27/02
D031321R	Marcus	5/15/02
D031327R	Walworth	5/29/02
D031330R	Eubanks	6/3/02
D031338R	Steele	6/26/02
D031356R	Klaas	9/9/02
D031376R	Riordan	12/16/02
D031380R	Henwood	12/26/02
D031410R	Marrington	4/4/03
D031411R	Widler	4/7/03
D031472R	Mergener	12/17/2003
D031473R	Injayan	12/17/2003

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Application ID	Applicant	Date Filed
D029713R	The Lone Rock Parternship	4/9/90
D030064R	Richter	2/26/92
D030157R	Smith	7/8/92
D030167R	Hott	7/29/92
D030183R	Gersley	10/7/92
D030185R	Keim	10/15/92
D030291R	Swallow	10/14/93
D030346R	Dress	4/7/94
D030377R	McFarland Living Trust	7/11/94
D030394R	Graham	9/7/94
D030395R	Winding	9/7/94
D030427R	Pepperwood	1/26/95
D030428R	Golden	1/27/95
D030586R	Cooke	12/24/96
D030636R	Galey	8/1/97
D030660R	Covell	11/5/97
D030668R	Spivey	12/22/97
D030689R	Carsey	3/24/98
D030704R	Peter and Collette Rothschild Trust	5/20/98
D030705R	Hackett	5/22/98
D030709R	Ronald and Gail Gester Trust	6/2/98
D030713R	Smith	6/16/98
D030714R	Busse	6/16/98
D030719R	Red Cap	6/23/98
D030723R	Kasper	7/1/98
D030742R	Love	8/6/98
D030754R	Martz	8/31/98
D030767R	Basehore	9/18/98
D030768R	Walker	9/18/98
D030773R	Hallomas Inc.	9/25/98
D030774R	Nunes	9/28/98
D030778R	Gundling	9/30/98
D030784R	Kaplan	10/9/98
D030785R	Peterman	10/9/98
D030786R	Evenson	10/9/98
D030793R	Green	10/9/98
D030795R	Copper Queen Ranch	10/15/98
D030811R	Don Pedro Ranch Corporation	11/18/98
D030819R	Tebbutt	12/7/98
D030821R	Scheidegger	12/8/98
D030822R	Medaris	12/9/98
D030841R	Squire	2/18/99
D030843R	Williams	3/17/99
D030847R	Wuerfel	3/17/99
D030850R	Colton	3/26/99
D030862R	Clark	4/13/99
D030863R	Schaeffer	4/13/99
D030865R	Browne	4/13/99
D030883R	Ornbaun	4/27/99
D030887R	Rudovsky	5/13/99
D030888R	Rancho Navarro Association	5/13/99

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D030889R	Bradford	5/13/99
D030894R	Whittaker Family Trust	5/13/99
D030899R	Pratt	6/22/99
D030900R	Venturi	6/22/99
D030902R	Russell	6/22/99
D030903R	Imhoff	6/22/99
D030905R	Kary B. Mullis Trust	6/22/99
D030906R	Harpe	6/22/99
D030907R	Dusenberry	6/22/99
D030908R	Kobler	6/22/99
D030909R	Shanley	6/22/99
D030917R	Pinoli	7/1/99
D030918R	Pinoli	7/1/99
D030921R	Hammond	7/1/99
D030937R	Mendocino Redwood Company	9/17/99
D030938R	Segar	9/17/99
D030939R	Baker	9/17/99
D030940R	Nelson	9/17/99
D030943R	Hanelt	9/17/99
D030953R	Mendocino Lake Clubhouse	10/14/99
D030957R	Alexander	10/14/99
D030968R	Kleve C Johnson DMD & Nancy G Johnson Revoc Intervivos Trust	10/14/99
D030969R	Riddell	10/14/99
D030985R	Murphey	11/22/99
D031000R	Frederick Martin & Francis Sylvia Martin Revocable Trust	1/21/00
D031010R	Hubbert	1/21/00
D031035R	Estes	3/21/00
D031062R	Romani	6/12/00
D031082R	Abbey Foundation for the Arts	7/25/00
D031083R	Hurt	7/25/00
D031098R	Vanslett	8/30/00
D031146R	Barron	2/1/01
D031172R	Weir	3/30/01
D031211R	Weir	7/18/01
D031221R	Carley	8/23/01
D031225R	Ostler	9/13/01
D031266R	Deutschman	1/11/02
D031301R	Yggdrasil Land Foundation	2/27/02
D031321R	Marcus	5/15/02
D031327R	Walworth	5/29/02
D031330R	Eubanks	6/3/02
D031338R	Steele	6/26/02
D031356R	Klaas	9/9/02
D031376R	Riordan	12/16/02
D031380R	Henwood	12/26/02
D031410R	Marrington	4/4/03
D031411R	Widler	4/7/03
D031472R	Mergener	12/17/2003
D031473R	Injayan	12/17/2003

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Application ID	Applicant	Date Filed
D029653R	Marum	2/2/1990
D029793R	Holland	8/8/1990
D029834R	Clark	10/4/1990
D030020R	Taplin	10/22/1990
D030030R	Camp	11/4/1991
D030127R	Clos Pegase Winery	5/14/1992
D030158R	Erasmy	7/13/1992
D030307R	Lynch	11/23/1993
D030347R	Coffman	4/8/1994
D030371R	Pine Ridge Winery	6/10/1994
D030434R	Univeristy of California Natural Reserve System	3/13/1995
D030435R	Buchwald-Baerwald	3/14/1995
D030461R	Kuleto	7/13/1995
D030481R	Lamoreaux	9/12/1995
D030488R	Hazlet	10/3/1995
D030559R	Long Meadow Ranch Partners	8/22/1996
D030582R	Read	12/10/1996
D030599R	Kuleto	3/19/1997
D030628R	Cox	7/8/1997
D030665R	Burton	12/5/1997
D030669R	Dickson	12/22/1997
D030671R	Bartolucci	1/16/1998
D030733R	Rose	7/22/1998
D020764R	Borneman	9/14/1998
D030766R	Ridley	9/18/1998
D030777R	Sculatti	9/29/1998
D030809R	Lee	11/9/1998
D030864R	Huntington	4/13/1999
D030919R	Nelson	7/1/1999
D030944R	Carpenter	9/17/1999
D031009R	Van Dewark	1/21/2000
D031011R	Rhead	1/21/2000
D031012R	Schultz	1/21/2000
D031016R	Hudson	2/1/2000
D031024R	Holquist	2/29/2000
D031032R	Jones	3/21/2000
D031041R	Gospodnetich	4/13/2000
D031130R	Brooks	1/16/2001
D031188R	Provost	5/24/2001
D031214R	Peebles	7/20/2001
D031354R	Miller	7/20/2001
D031357R	Brodman	9/5/2002
D031382R	Nemerever	1/9/2003

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Sonoma County

Application ID	Applicant	Date Filed
D029650R	Bowles	1/31/1990
D029749R	Hood	5/23/1990
D029791R	Judd	8/8/1990
D029831R	Gourley	9/24/1990
D029862R	Polesky-Lentz Partnership	11/16/1990
D030000R	Wilson	8/28/1991
D030003R	Sogin	9/4/1991
D030095R	Manning	4/7/1992
D030211R	Stoumen	1/20/1993
D030220R	Herden	2/4/1993
D030221R	Johnson	2/4/1993
D030256R	Nardone	5/12/1993
D030286R	Collins	9/28/1993
D030297R	Schwartz	10/28/1993
D030353R	Heath	4/15/1993
D030423R	Friedrichsen	1/5/1995
D030433R	Noton	3/8/1995
D030460R	Zweig	7/10/1995
D030556R	Powers	7/17/1996
D030601R	The Bishops Ranch	4/4/1997
D030712R	Gillett	6/8/1998
D030727R	Damiani	7/13/1998
D030731R	Neerhout	7/20/1998
D030732R	McDermott	7/20/1998
D030741R	Murray	8/5/1998
D030743R	Mitchell	8/6/1998
D030755R	LeStrange	8/31/1998
D030758R	Gilg	9/4/1998
D030759R	Andreoli	9/4/1998
D030760R	Hour	9/14/1998
D030765R	Lindsley	9/15/1998
D030820R	Hussey	12/7/1998
D030823R	Duerloo	12/10/1998
D030867R	Painter	4/13/1999
D030881R	John Y James and Thais Garnett James Revocable Trust	4/27/1999
D030890R	Curtis	5/13/1999
D030891R	Bulger	5/13/1999
D030898R	LaFranchi Trust	6/22/1999
D030904R	Califronia Academy of Sciences	6/22/1999
D030923R	Kresch	7/28/1999
D030924R	Ferguson	7/29/1999
D030995R	Johnson	1/21/2000
D031005R	Sloan	1/21/2000
D031111R	Ramsey	9/21/2000
D031142R	Kahn	1/30/2001
D031143R	Allied Doemcq Wines USA	1/2/2001
D031145R	Kahn	12/21/2000
D031151R	Wilson	2/22/2001
D031168R	Gladstein	3/21/2001
D031173R	Prieto	3/30/2001

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D031267R	Werbe	1/11/2002
D031316R	Brothers	4/22/2002
D031318R	Newman	5/2/2002
D031326R	Lannin	5/29/2002
D031331R	Terribilini	6/3/2002
D031332R	Palefsky	6/6/2002
D031333R	Owen	6/6/2002
D031334R	Fosberg	6/13/2002
D031375R	Ostler	12/11/2002
D031390R	McMicking	1/28/2003
D031427R	McMicking	5/20/2003
D031451R	Fosberg	10/8/2003
D031458R	Tellefsen	10/28/2003

Exhibit ~~5~~

Exhibit #15

Livestock Stock Pond Registrations
1990-2004
Humboldt County

Application ID	Applicant	Date Filed
S013509	Stover Ranch	6/26/1990
S013510	Stover Ranch	6/26/1990
S013511	Stover Ranch	6/26/1990
S013512	Stover Ranch	6/26/1990
S013513	Stover Ranch	6/26/1990
S013514	Stover Ranch	6/26/1990
S013515	Stover Ranch	6/26/1990
S013516	Stover Ranch	6/26/1990
S013517	Stover Ranch	6/26/1990
S013518	Stover Ranch	6/26/1990
S013519	Stover Ranch	6/26/1990
S013520	Stover Ranch	6/26/1990
S013521	Stover Ranch	6/26/1990
S013522	Stover Ranch	6/26/1990
S013523	Stover Ranch	6/26/1990
S013524	Stover Ranch	6/26/1990
S013525	Stover Ranch	6/26/1990
S013526	Stover Ranch	6/26/1990
S013558	US Bureau of Land Management	3/13/1991
S013726	Viera	8/7/1991
S013727	Gray	8/12/1991
S013728	Jewett	8/19/1991
S013744	Davis	10/15/1991
S013756	Goodner	11/4/1991
S013826	Davis	9/1/1992
S013920	Odegard	3/25/1992
S014036	Filmer	7/1/1993
S014167	Brown	10/7/1993
S014314	Ruth	12/21/1994
S014391	Tubb	5/18/1995
S014446	Stevens	7/24/1995
S014447	Shawver	7/24/1995
S014763	Schamberg	1/6/1997
S014860	Frost	1/29/1998
S014962	Coates	5/12/1998
S014965	Nelson	6/9/1998
S015054	Parker	9/29/2000
S015083	Kitna	2/25/1999
S015099	Morais	7/19/1999
S015186	Lane	6/16/2001
S015215	Lattanza	2/27/2001
S015230	J W Fisher Logging	8/31/2000
S015292	Bazemore	7/23/2001
S015368	Sun Valley Floral Farms	4/2/2000
S015405	Christman	11/6/2001
S015410	Goff	4/28/2003

Livestock Stock Pond Registrations
1990-2004
Marin County

Application ID	Applicant	Date Filed
S013506	Lucas Valley Ranch	9/21/1990
S013720	Borello	7/22/1991
S013879	Cerini	11/30/1992
S014038	Marin Municipal Water District	7/6/1993
S014039	Marin Municipal Water District	7/6/1993
S014040	Marin Municipal Water District	7/6/1993
S014759	Martinelli	2/4/1997
S014760	Martinelli	2/4/1997
S014764	Martinelli	2/4/1997
S014981	Dierks	7/7/1998

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1990-2004
Mendocino County

Application ID	Applicant	Date Filed
S013384	Modugno	3/26/90
S013696	Valentine	6/14/91
S013701	Bair	6/13/91
S013710	Dileto et al	7/1/91
S013711	Dileto et al	7/1/91
S013718	Villarreal	7/19/91
S013719	Lovera	7/18/91
S013722	Sosa	7/18/91
S013746	Stoker	10/15/91
S013747	Sweetwater Ranch/Four Winds Farm	10/15/91
S013771	Bates & Schmitt	1/8/92
S013776	Bello	1/13/92
S013841	McFarland	9/18/92
S013939	Bennett	7/17/92
S013940	Bennett	7/17/92
S013947	Hansen	11/6/92
S013977	Solomon & Tournoour Vineyards	1/28/93
S013984	Crawford	3/8/93
S013985	Crawford	3/8/93
S014016	H&W Vineyards	6/22/93
S014129	Rosetti Brothers	10/25/93
S014150	Brady	1/10/94
S014182	Reid	6/10/94
S014234	Van Zandt	10/17/94
S014244	Crawford	7/7/94
S014292	Brucker	12/12/94
S014293	Pepperwood	12/12/94
S014313	Potter Valley Irrigation District	1/31/95
S014322	Prati	2/7/95
S014373	Grasso	4/10/95
S014374	Grasso	4/10/95
S014385	Parducci Wine Estates	4/21/95
S014395	Pronsolino	6/16/95
S014448	Thormahlen	7/28/95
S014469	Copperrider	8/21/95
S014470	Copperrider	8/21/95
S014554	Brunicardi	2/28/96
S014569	Caughey	4/21/96
S014589	De Tevis	6/28/96
S014732	Mendocino Redwood Company	5/24/96
S014749	Bartolomei	4/24/97
S014861	Frey Vineyard	1/29/98
S014862	Frey Vineyard	1/29/98
S014863	Frey Vineyard	1/29/98
S014864	Frey Vineyard	1/29/98
S014865	Frey Vineyard	1/29/98
S014866	Frey Vineyard	1/29/98
S014948	Pronsolino	3/27/98
S014949	Pronsolino	3/27/98
S014955	Redwood Empire Council	4/13/98
S014958	Nunes	4/29/98

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S014959	Nunes	4/29/98
S014985	Covell	8/21/97
S014996	Moreno & Company	8/12/98
S015014	Hallomas Inc	10/13/98
S015021	Demuth	10/13/98
S015034	Dusenberry	6/22/99
S015041	Rosetti	2/10/99
S015043	Rosetti	2/10/99
S015047	Rosetti	2/10/99
S015075	Van Bueren	1/5/00
S015076	Van Bueren	1/5/00
S015096	Meyer	5/15/98
S015097	Marks	12/7/98
S015098	Mathias	2/1/99
S015102	Martin	12/20/99
S015103	McGuiness	12/22/99
S015110	Niesen	10/26/00
S015116	Wasson	4/13/01
S015123	Panofsky	3/6/01
S015127	Whittaker	5/4/99
S015130	Wuerfel	12/4/98
S015131	Munoz	6/14/01
S015132	Seekins	3/6/00
S015147	Dominguez	10/3/01
S015149	Soper Company	2/13/01
S015183	Wentzel	1/16/02
S015184	Ashurst	1/16/02
S015199	Thomas	10/21/01
S015200	Thomas	10/21/01
S015201	Thomas	10/21/01
S015202	Thomas	10/21/01
S015203	Thomas	10/21/01
S015204	Thomas	10/21/01
S015205	Thomas	10/21/01
S015206	Thomas	10/21/01
S015207	Golden	10/21/01
S015208	Thomas	10/21/01
S015209	Gannon	10/21/01
S015210	Thomas	10/21/01
S015212	Oswald	7/22/99
S015213	Oswald	7/22/99
S015216	Thornhill Vineyard Properties	6/29/01
S015217	Thornhill Vineyard Properties	6/29/01
S015218	Thornhill Vineyard Properties	6/29/01
S015219	Nevin	8/2/01
S015228	Rogina Water Company	4/22/02
S015233	Ornbaun	4/21/99
S015235	William Charles Trust	9/11/00
S015238	Oswald	6/4/01
S015244	Edwards	2/27/01
S015289	Bergner	4/9/01
S015290	Bergner	4/9/01

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S015291	Bergner	4/9/01
S015303	Barron	7/24/00
S015306	Anderson Vineyards	4/25/00
S015313	Fetzer Vineyards	11/8/02
S015314	Fetzer Vineyards	11/8/02
S015315	Fetzer Vineyards	11/8/02
S015316	Fetzer Vineyards	11/8/02
S015317	Fetzer Vineyards	11/8/02
S015318	Fetzer Vineyards	11/8/02
S015319	Lashinksi	11/12/02
S015320	Beckstoffer Russian River Vineyards	8/1/02
S015349	Balverne Vineyards	12/27/02
S015353	Booth	3/1/01
S015362	Beckstoffer Russian River Vineyards	3/10/03
S015365	Ruddick Ranch	9/28/01
S015371	Beckstoffer Russian River Vineyards	3/11/03
S015400	Fetzer Vineyards	1/29/03
S015401	Fetzer Vineyards	1/29/03
S015402	Fetzer Vineyards	1/29/03
S015403	Fetzer Vineyards	1/28/03
S015404	Fetzer Vineyards	1/28/03
S015414	Hendricks	1/17/03
S015433	Yggdrasil Land Foundation	6/20/03
S015434	Yggdrasil Land Foundation	6/20/03
S015477	Milovina Brothers	1/14/04
S015478	Milovina Brothers	1/14/04
S015479	Milovina Brothers	1/14/04
S015480	Milovina Brothers	1/14/04
S015483	Surprise Valley Ranch	1/20/04
S015484	Surprise Valley Ranch	1/20/04

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Application ID	Applicant	Date Filed
S013386	Abruzzini	4/18/1990
S013387	Abruzzini	4/18/1990
S013497	Corrigan	9/5/1990
S013536	Fifield	10/31/1990
S013739	Camp	10/1/1991
S013748	Scurry	10/22/1991
S013828	Alneida	9/1/1992
S013952	Learned	1/12/1993
S013953	Learned	1/12/1993
S013954	Learned	1/12/1993
S013955	Learned	1/12/1993
S013988	Hienzsch	3/24/1993
S013992	Kephart	4/19/1993
S013993	York Creek Vineyards	4/1/1993
S013994	York Creek Vineyards	4/1/1993
S013995	York Creek Vineyards	4/1/1993
S013996	York Creek Vineyards	4/1/1993
S014052	Charles F. Shaw Vineyards & Winery	7/13/1993
S014115	Young	9/23/1993
S014137	Burns	11/24/1993
S014138	Burns	11/24/1993
S014151	Dollar	2/11/1994
S014160	Bennett	3/8/1994
S014161	Bennett	3/8/1994
S014164	Parady	3/11/1994
S014176	Ho	4/25/1994
S014184	Wyllie	6/29/1994
S014203	Juliana Vineyards	8/8/1994
S014233	Moore	10/11/1994
S014241	MacVeagh	10/6/1994
S014242	Smith	10/27/1994
S014243	Hudak	10/28/1994
S014252	Balyeat	11/18/1994
S014290	Marty	11/30/1994
S014294	Baerwald	12/9/1994
S014295	Baerwald	12/9/1994
S014296	Buchwald-Baerwald	12/9/1994
S014297	Neyers	12/9/1994
S014312	Van den Bogaard	1/30/1995
S014389	Linstad	5/5/1995
S014514	Pacific Union College	11/21/1995
S014740	Alluvial Vineyard	1/29/1997
S014741	Madrigal	1/29/1997
S014836	Kornell Cellars	9/23/1997
S014013	Cutler	10/13/1998
S014025	Haberger	9/11/1998
S015040	Youngson	2/22/2000
S014051	Burns	5/17/2000
S014053	Passaro	4/11/2000
S015058	Provost	9/5/2000
S015077	Van Dewark	11/19/1999

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Napa County

S015078	Van Dewark	1/5/2000
S015088	Lewelling Family Trust	12/3/1999
S015119	Parker	1/24/2000
S015138	Holquist	9/29/1999
S015150	Carpenter	9/20/2002
S015231	Lynch Ranch	8/20/2001
S015232	Lynch Ranch	8/20/2001
S015248	City of Calistoga	5/8/2001
S015301	Bleechner	9/14/2000
S015308	Silverado Hills Vineyard	11/1/2002
S015356	Desimoni	1/29/2001
S015370	Scaggs	11/30/2000
S015387	Spring Mt. Vineyard	7/9/2001
S015388	Good Wine Company	7/9/2001
S015409	Swanson Vineyards	4/23/2003
S0158457	Beringer Blass Wine Estates	1/6/2004

Livestock Stock Pond Registrations
1990-2004
Sonoma County

Application ID	Applicant	Date Filed
S013469	Warner	5/17/1990
S013484	Kreiger	8/24/1990
S013555	Boring	1/28/1991
S013563	Boyce	4/10/1991
S013709	Cervantes	5/13/1991
S013724	Hafner Vineyard	7/26/1991
S013755	Steinway	10/15/1991
S013760	Skall	12/3/1991
S013792	Bastian	3/9/1992
S013793	Bastian	3/9/1992
S013811	Klos	4/17/1992
S013813	Folger	5/29/1992
S013814	Folger	5/29/1992
S013850	Williams	10/13/1992
S013877	Chateau St. Jean	11/18/1992
S013956	C W Stuber-Stroeh Engineering Group	1/12/1993
S013957	Learned	1/12/1993
S013958	Learned	1/12/1993
S013959	Learned	1/12/1993
S013960	Learned	1/12/1993
S013961	Learned	1/12/1993
S013962	Learned	1/12/1993
S013963	Learned	1/12/1993
S013964	Learned	1/12/1993
S013965	Learned	1/12/1993
S014005	Gallo Vineyards	5/11/1993
S014006	Berkeley-Albany YMCA	5/13/1993
S014057	Ferrari-Carano Vineyards & Winery	8/4/1993
S014058	Ferrari-Carano Vineyards & Winery	8/4/1993
S014059	Ferrari-Carano Vineyards & Winery	8/4/1993
S014060	Ferrari-Carano Vineyards & Winery	8/4/1993
S014061	Ferrari-Carano Vineyards & Winery	8/4/1993
S014062	Ferrari-Carano Vineyards & Winery	8/4/1993
S014063	Ferrari-Carano Vineyards & Winery	8/4/1993
S014064	Ferrari-Carano Vineyards & Winery	8/4/1993
S014065	Ferrari-Carano Vineyards & Winery	8/4/1993
S014066	Ferrari-Carano Vineyards & Winery	8/4/1993
S014070	Silverado Premium Properties	8/10/1993
S014071	Silverado Premium Properties	8/10/1993
S014072	Silverado Premium Properties	8/10/1993
S014073	Silverado Premium Properties	8/10/1993
S014074	Silverado Premium Properties	8/10/1993
S014075	Silverado Premium Properties	8/10/1993
S014076	Silverado Premium Properties	8/10/1993
S014077	Silverado Premium Properties	8/10/1993
S014078	Silverado Premium Properties	8/10/1993
S014079	Silverado Premium Properties	8/10/1993
S014080	Silverado Premium Properties	8/10/1993
S014081	Silverado Premium Properties	8/10/1993
S014082	Silverado Premium Properties	8/10/1993
S014083	Ledbetter Farms	8/10/1993

Livestock Stock Pond Registrations
1990-2004
Sonoma County

S014084	Ledbetter Farms	8/10/1993
S014085	Ledbetter Farms	8/10/1993
S014086	Silverado Premium Properties	8/10/1993
S014087	Silverado Premium Properties	8/10/1993
S014088	Clos Du Bois Wines	8/10/1993
S014089	Silverado Premium Properties	8/10/1993
S014090	River Bend Vineyards	8/10/1993
S014091	River Bend Vineyards	8/10/1993
S014092	River Bend Vineyards	8/10/1993
S014093	Airport Business Center	8/10/1993
S014094	Klein Foods	8/10/1993
S014095	Klein Foods	8/10/1993
S014096	UCC Vineyards Group	8/10/1993
S014097	UCC Vineyards Group	8/10/1993
S014200	Rickards	8/5/1994
S014202	Austin	6/23/1994
S014205	Evans	7/22/1994
S014230	Miller	10/4/1994
S014231	Miller	10/4/1994
S014237	City of Cloverdale	10/17/1994
S014299	Flowers	1/5/1995
S014378	Bou	2/7/1995
S014392	Wasson Vineyards	5/23/1995
S014393	Wasson Vineyards	5/23/1995
S014420	Costello	7/14/1995
S014479	Nixon	9/11/1995
S014532	Pompei	1/10/1996
S014572	Whitman	5/9/1996
S014587	Case	4/19/1997
S014748	Folger	9/22/1997
S014773	Staub	3/28/1997
S014795	Bleifuss	4/7/1997
S014796	Bleifuss	4/7/1997
S014847	Rush	11/10/1997
S014851	Horowitz	12/1/1997
S014857	Loarie	1/12/1998
S014910	Beringer Wine Estates Company	2/3/1998
S014911	Olson	2/9/1998
S014922	Olson	2/9/1998
S014923	Ferrari-Carano Vineyards & Winery	3/19/1998
S014924	Ferrari-Carano Vineyards & Winery	3/19/1998
S014925	Ferrari-Carano Vineyards & Winery	3/19/1998
S014926	Ferrari-Carano Vineyards & Winery	3/19/1998
S014927	Ferrari-Carano Vineyards & Winery	3/19/1998
S014928	Ferrari-Carano Vineyards & Winery	3/19/1998
S014929	Ferrari-Carano Vineyards & Winery	3/19/1998
S014930	Ferrari-Carano Vineyards & Winery	3/19/1998
S014931	Ferrari-Carano Vineyards & Winery	3/19/1998

Exhibit 6

Exhibit #16

Streambed Alteration Agreements
1993-2002
Mendocino County

APPLICATION ID	STREAM	APPLICANT	DATE ISSUED
0004-93	BRUSH CREEK TRIB	AT&T	03-Feb-93
0006-93	MCDOWELL CREEK	LAKEPORT, CITY	05-Jan-93
0006-94	LITTLE VALLEY CREEK	KAIJANKOSKI, ANDREW	11-Feb-94
0009-93	ACKERMAN CREEK	LOUISIANA PACIFIC	25-Jan-93
0012-93	NOYO RIVER	DOUGLAS, PAUL	08-Jan-93
0014-94	TAYLOR CREEK	C E M R	10-Jan-94
0020-93	RUSSIAN RIVER	KOHN PROPERTIES	11-Jan-93
0038-94	BIG RIVER LITTLE NF	BRODERICK, PETER	19-Jan-94
0040-93	RUSSIAN RIVER	WHITE, AL	25-Jan-93
0046-93	FORSYTHE CREEK	TODD, TIM	11-Feb-93
0051-93	SPRINGS CREEK TRIB	BEWLEY, STUART	02-Feb-93
0053-93	RUSSIAN RIVER EF	SCOTT, JIM	28-Jan-93
0063-93	CRAWFORD CREEK	PARDUCCI, W H	11-Feb-93
0074-93	ROBINSON CREEK	COOK, WALDO	07-Mar-93
0074-94	GIBSON CREEK	MAYFIELD, RICK	01-Feb-94
0077-94	POINT ARENA CREEK	POINT ARENA CITY	24-Jan-94
0089-93	TEN MILE CREEK	SLUIS, STAN	22-Mar-93
0091-93	MICHAELS CREEK	CALIF CONSERVATION CREWS	17-Feb-93
0092-93	LOW GAP CREEK	CALIF CONSERVATION CREWS	17-Feb-93
0092-94	DAUGHERTY CREEK & TRIBS	FRECHOU, BOB	10-Feb-94
0093-93	BEAR CREEK	CALIF CONSERVATION CREWS	17-Feb-93
0094-93	GARCIA RIVER	FREDRICKS, RICHARD	15-Mar-93
0097-94	GUALALA RIVER LITTLE NF	FORBES, RANDALL	10-Feb-94
0103-93	LITTLE GARCIA CREEK	HOWELL, MIKE	19-Feb-93
0103-94	NAVARRO RIVER	LOUISIANA PACIFIC	28-Mar-94
0105-93	DOTY CREEK	GUALALA RIVER SH REST GP	21-Feb-93
0114-94	RUSSIAN RIVER WB	TODD, KEN	24-Feb-94
0124-93	GUALALA RIVER	HOVLAND, PATRICK	31-Mar-93
0125-93	ROCKPILE CREEK	HOVLAND, PATRICK	31-Mar-93
0138-94	RATTLESNAKE CREEK	HOLM, HOMER	25-Apr-94
0139-94	ROBINSON CK/DRY CK/GUALALA LNF	KELLY, SCOTT	06-Apr-95
0140-94	GARCIA RIVER	FREDRICKS, RICHARD	25-May-94
0151-94	GARCIA RIVER	HIATT, WAYNE	25-Apr-94
0158-93	BIG RIVER	LARKIN, DAVID	18-Mar-93
0160-94	WAGES CREEK	MOORE, DEWEY	19-Mar-94
0164-93	TEN MILE RIVER LNF UNN TRIB	ORME, MICHAEL	06-Mar-93
0166-94	RUSSIAN RIVER EB	LAMALFA, RICHARD	20-Mar-94
0172-94	BIG RIVER & TRIBS	FRYKMAN, DAVID	01-Apr-94
0174-93	RUSSIAN RIVER	BELLOWS, FRED	08-Mar-93
0176-93	PARSONS CREEK	UNIV OF CALIF	10-Mar-93
0180-93	RUSSIAN RIVER	FORD, DAVID	07-Apr-93
0181-93	MCCLURE CREEK	BARTLOMEI, C T	11-Mar-93
0181-94	RUSSIAN RIVER	OWNSBEY, BILL	06-Apr-94
0182-93	RUSSIAN RIVER WB	THOMAS ORCHARDS	11-Mar-93
0183-93	RUSSIAN RIVER	THOMAS ORCHARDS	11-Mar-93
0184-93	FORSYTHE CREEK	KOHN PROPERTY	11-Mar-93
0185-93	RUSSIAN RIVER	PIPER, TOM	11-Mar-93
0196-93	BRUSH CREEK	CAUGHEY, LYNN	21-Apr-93
0200-93	RUSSIAN RIVER	RUDDICK, MATT	12-Mar-93
0205-94	UNNAMED STREAM	BERRY, BILL	25-Mar-94

Streambed Alteration Agreements
1993-2002
Mendocino County

0206-94	GRIST CREEK	ROUND VALLEY WATER DIST	25-Mar-94
0211-94	GUALALA RIVER NF	KELLY, SCOTT	25-Apr-94
0212-94	SHERWOOD CREEK/OUTLET CREEK	SEQUEIRA, CELESTE	08-Apr-94
0223-93	RUSSIAN RIVER	RUDDICK, CHRIS	13-Mar-93
0226-94	GARCIA RIVER	BEAN, RALPH	13-May-94
0227-94	NOYO RIVER NF	SCHANTZ, DAVID	07-Apr-94
0244-93	BIG RIVER	IVERSEN, RON	10-Apr-93
0246-93	UNKNOWN STREAM	BLENCOWE, CRAIG	15-Apr-93
0254-93	JOHN HIATT CREEK	MOORE, MARK	23-May-93
0255-93	COTTENEVA CREEK	MOORE, MARK	22-Apr-93
0255-94	NAVARRO RIVER	GOWAN, JIM	16-Mar-94
0256-94	GARCIA RIVER	STORNETTA, LARRY	02-Apr-94
0257-94	BRUSH CREEK	CAUGHEY, LYNN	08-Apr-94
0258-93	EEL RIVER	PETERS, ROBERT	28-Apr-93
0258-94	NAVARRO RIVER	GOWAN, DAVE	11-Apr-94
0259-94	NAVARRO RIVER	BATES, TIM	11-Apr-94
0260-94	RED MOUNTAIN CREEK	BOLDT, FARON WAYNE	24-Apr-94
0263-94	BIG RIVER SF	POOL, GRANVILLE	02-May-94
0265-93	NAVARRO RIVER	C E M R	31-Mar-93
0266-93	RUSSIAN RIVER EB	WELCH, MARK	07-Apr-93
0266-94	POINT ARENA CREEK	SOLDANI, JIM	03-Jun-94
0267-93	RUSSIAN RIVER WB	NEESE, BILL	22-Mar-93
0268-93	EEL RIVER MIDDLE FORK	ROWLAND, RICHARD	28-Apr-93
0281-94	GROSHONG GULCH	LEWICKI, FRANK	15-May-94
0282-93	TEN MILE RIVER LNF	ORME, MICHAEL	07-May-93
0282-94	BIG RIVER NF	MAXEY, DOUG	05-May-94
0283-94	SIGNAL CREEK	BURNS, JOHN JR	03-Jun-94
0284-93	ELK CREEK	TODD, BERT	08-May-93
0285-94	EEL RIVER SF	BERESFORD, RICHARD	21-Apr-94
0291-94	MULE CREEK	RIBAR, PETER	25-Apr-94
0298-94	SINGLEY CREEK	GOTT, K N	13-May-94
0299-94	TEN MILE RIVER	MALLORY, DOUGLAS	22-Apr-94
0300-93	RANCHERIA CREEK	HANELT, FREDA	30-Apr-93
0301-93	ANDERSON GULCH	WEBSTER, ROY	14-May-93
0302-93	RUSSIAN RIVER	DAUGHERTY, THOMAS	14-Apr-93
0303-93	HAYFORK CREEK	SCHANTZ, DAVID	08-May-93
0303-93	OLDS CREEK	SCHANTZ, DAVID	08-May-93
0304-93	EEL RIVER	SULLIVAN, FORREST	09-Apr-93
0304-94	RAILROAD GULCH	BISHOP, BRIAN	31-May-94
0308-93	RUSSIAN RIVER	NELSON, GREGORY	25-Apr-93
0311-93	UNKNOWN STREAM	MUNOZ, RICHARD	19-Jun-93
0319-93	RAMON CREEK NF	FRYKMAN, DAVID	05-May-93
0333-93	GARCIA RIVER	BRADY, HUGH	29-Apr-93
0337-94	FALL CREEK	MAXEY, DOUG	24-Jun-94
0338-93	FORSYTHE CREEK	MENDOCINO COUNTY WATER AG	10-May-93
0341-93	ROBINSON CREEK	GULBRANSEN, VIRGINIA	25-May-93
0343-93	ACKERMAN CREEK	RUDDICK, MATT	21-Apr-93
0346-94	NAVARRO RIVER	BROWN, MARK	18-Apr-94
0347-94	SALMON CREEK	MALLORY, DOUGLAS	09-May-94
0348-93	DEHAVEN CREEK	MALLOY, DOUG	19-Apr-93

Streambed Alteration Agreements
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Mendocino County

0348-93	REDWOOD CREEK	MALLOY, DOUG	19-Apr-93
0349-93	EEL RIVER	ZOBEL, HARRY	20-Apr-93
0351-94	WAGES CREEK NF	MALLORY, DOULGAS	16-May-94
0352-94	EEL RIVER MIDDLE FORK	ROWLAND, RICHARD	02-Jun-94
0353-94	NAVARRO RIVER	BLATTNER, ERNEST	02-Jun-94
0359-93	RUSSIAN RIVER	BRADFORD, ROBERT	01-May-93
0360-93	BEAR TRAP CREEK	HINCKLEY, JONATHAN	04-May-93
0363-93	NAVARRO RIVER	BLATTNER, ERNEST	21-May-93
0364-93	FOX GULCH	OVERFIELD, ALLEN	19-May-93
0372-93	UNKNOWN STREAM	VANDERHORST, STEVEN	05-May-93
0373-93	BLACKSMITH CREEK	FLEMING, MARK	06-May-93
0379-94	GARCIA RIVER	DRUMRIGHT, INGRID	26-May-94
0380-93	EEL RIVER SF	POOL, GRANVILLE	21-May-93
0385-94	GARCIA RIVER	STORNETTA, HENRY	26-May-94
0387-94	COLD CREEK	BAUER, DON	22-Jun-94
0390-93	MILL CREEK	HOWELL, MIKE	14-May-93
0390-93	BEAR PEN CREEK	HOWELL, MIKE	14-May-93
0390-93	GARCIA RIVER	HOWELL, MIKE	14-May-93
0390-94	BRUSH CREEK	BIAGGI, MIKE	09-May-94
0391-93	RUSSIAN RIVER	THOMAS, STEPHEN	11-May-93
0391-94	GARCIA RIVER	STORNETTA, WALT	03-May-94
0392-93	RANCHERIA CREEK	SNYDER, STEVEN	14-May-93
0394-93	MILL CREEK NF	BALLARD, ROBERT	17-May-93
0401-94	NOYO RIVER	ANDERSEN, CHARLES	13-May-94
0406-94	GARCIA RIVER	HAY, RICHARD	25-May-94
0407-94	GARCIA RIVER NF	HAY, WILLIAM	25-May-94
0408-94	GARCIA RIVER	HAY, WILLIAM	25-May-94
0411-93	BIG RIVER	FISCHER, NIEL	12-May-93
0411-93	JOHNSON CREEK	FISCHER, NIEL	12-May-93
0413-94	GUALALA RIVER	BOWER, JOHN	20-May-94
0416-93	UNKNOWN STREAM	CHECKAL, GREG	04-Jun-93
0421-94	FELIZ CREEK	MENDOCINO ENGINEERING	02-Jun-94
0428-94	DARK GULCH CREEK	C E M R	17-May-94
0434-94	WAGES CREEK	BETSWORTH, GERG	06-Jun-94
0440-94	UNKNOWN STREAM	VANDERHORST, STEVEN	22-May-94
0443-93	TEN MILE CREEK SF	OVERFIELD, ALLEN	19-May-93
0446-94	ALDER CREEK	MOYLES, FRANK	27-Jun-94
0449-94	EEL RIVER	PETERS, ROBERT	02-Jun-94
0455-93	RUSSIAN RIVER EB	SONOMA COUNTY WATER AG	20-May-93
0459-93	TOMKI CREEK	SORACE, TONY	09-Jun-93
0459-94	ALDER CREEK	STORNETTA, ASE	27-Jun-94
0461-94	GRIST/MILL CREEK	POLSLEY, RAYMOND	02-Jun-94
0462-94	MILL CREEK	ANDERSON, ERNIE	28-May-94
0463-94	MILL CREEK TRIB	RIDEOUT, AL	28-May-94
0466-93	HENSLEY CREEK	MARQUARDT, DONALD	03-Jun-93
0476-94	HULLS CREEK/WHO WHO CREEK	FLEMING, MARK	22-Jun-94
0477-94	NAVARRO RIVER	MORIN, TIMOTHY	22-Jun-94
0481-93	MILLS CREEK	L D GIACOMINI INC	29-Jun-93
0483-94	EEL RIVER SB SF	MUNOZ, RICHARD	14-Jun-94
0484-94	RATTLESNAKE CREEK/EEL RIVER	BAILEY, AGNES	14-Jun-94

Streambed Alteration Agreements
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0485-93	FERGUSON CREEK	CROWLEY, JOHN	09-Jul-93
0488-94	UNKNOWN STREAM	OHLSON, RON	24-Jun-94
0489-93	BUSH CREEK	MARCH, CHUCK	19-May-93
0491-94	NO NAME CRK TRIB NAVARRO RIVER	POOL, GRANVILLE	11-Jul-94
0492-94	NO NAME CRK TRIB HAEHL CREEK	POOL, GRANVILLE	08-Jun-94
0495-94	MILL CREEK	MAILLIARD, LARRY	15-Jun-94
0500-93	SHORT CREK	BAUER, DON	01-Jun-93
0503-93	RANCHERIA CREEK	GALBREATH, FRED	15-May-93
0504-93	MILL CREEK	THOMAS, STEVE	17-May-93
0505-93	RUSSIAN RIVER	REDDING, DAVID	25-May-93
0515-94	NOYO RIVER	STONE, WILLIAM	15-Jun-94
0517-94	DAVIS CREEK	LOGAN, GORDON	21-Aug-94
0518-93	GUALALA RIVER LITTLE NF	KELLY, SCOTT	28-May-93
0520-93	TEN MILE RIVER CLARK FORK	MELO, JERE	01-Jun-93
0520-94	BRUSH CREEK	FISCHER, NIEL	18-Jul-94
0526-94	TEN MILE RIVER MF & TRIBS	MALLORY, DOUGLAS	13-Jun-94
0532-93	RUSSIAN RIVER	WHITE, BRIAN JR	28-May-93
0533-94	RUSSELLBROOK CREEK	C E M R	15-Jun-94
0538-93	INDIAN CREEK & TRIBS	RIBAR, PETER	12-Jun-93
0539-94	ELK CREEK	BEAN, RALPH	22-Jun-94
0540-94	WAGES CREEK	BARBER, TERRI	16-Jun-94
0542-93	NAVARRO RIVER	WYANT, FRANK	05-May-93
0543-93	ANDERSON CREEK	ROBERTS, BRIAN	17-May-93
0544-93	IRISH CREEK	ACHER, CHARLES	23-Apr-93
0547-93	RATTLESNAKE CREEK	BAILEY, AGNES	12-Jun-93
0549-94	ALBION RIVER	CARP, WILLIAM	30-Jun-94
0559-94	ANDERSON CREEK	ROBERTS, BRIAN	01-Jun-94
0564-93	SODA CREEK	LOUISIANA PACIFIC	29-Jun-93
0565-93	RUSSIAN RIVER	PARDUCCI, W	25-Jun-93
0570-94	ROBINSON CREEK	SPANGLER, ELY	07-Jul-94
0571-94	ROBINSON CREEK	SHOCKEY, KENNETH	07-Jul-94
0572-93	BILLINGS CREEK	PORTER, DON	25-Jun-93
0572-94	DRY CREEK	MILLER, PATRICIA	07-Jul-94
0573-94	DRY CREEK	CLARK, MARK	06-Jul-94
0580-94	OUTLET CREEK	MCCRALEY, ROBERT	15-Jul-94
0583-93	LONG VALLEY CREEK	MOORE, MARK	28-Jul-93
0584-93	CAVE CREEK	MCBRIDE, GORDON	12-Jun-93
0585-94	DUTCH HENRY CREEK	HUMPHREY, JAMES	27-Jun-94
0586-94	HOLLOW TREE CREEK	HUMPHREY, JAMES	27-Jun-94
0587-94	DAUGHERTY CREEK	HUMPHREY, JAMES	27-Jun-94
0588-94	SODA CREEK	HUMPHREY, JAMES	27-Jun-94
0589-94	TURNER CREEK	HUMPHREY, JAMES	27-Jun-94
0597-93	MILL CREEK	DAVIS, JEFF	15-Jun-93
0603-94	BIG GULCH	BOWER, JOHN	11-Jul-94
0605-93	BAECHTEL CREEK	REID, GARY	15-Jun-93
0606-94	GARCIA RIVER	BELL, CRAIG	11-Jul-94
0608-94	ELK CREEK SODA FORK	MORIN, TIM	15-Aug-94
0609-93	EEL RIVER SF	KIRK, CHARLIE	15-Jun-93
0610-94	DENMARK CREEK	SPEARS, ROBERT	09-Aug-94
0616-94	RUSSIAN RIVER EB	MCFADDEN, EUGENE J.M.	06-Jul-94

Streambed Alteration Agreements
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0620-93	RUSSIAN RIVER	WILLIAMS, BRUCE	18-Jun-93
0620-93	DOOLEY CREEK	WILLIAMS, BRUCE	18-Jun-93
0622-94	DUNN CREEK	GOTT, K N	11-Jul-94
0624-94	DERBY CREEK	MOHR, ALAN	29-Jul-94
0631-93	GRIST CREEK	POLSLEY, RAYMOND	14-Jul-93
0631-93	MILL CREEK	POLSLEY, RAYMOND	14-Jul-93
0632-93	BLUE WATER CREEK TRIB	VAN HOUSEN, CRAIG	08-Jul-93
0635-93	RANCHERIA CREEK	GLOECKNER, CHARLES	06-Jul-93
0644-93	CLEARBROOK CREEK	BISHOP, BRIAN	02-Jul-93
0644-93	KAISEN GULCH	BISHOP, BRIAN	02-Jul-93
0645-93	ELK CREEK	GIACOMINI, L D	21-Aug-93
0647-93	TEN MILE RIVER NF	ORME, MICHAEL	20-Jul-93
0648-94	NAVARRO RIVER TRIB	CAHN, DEBORAH	16-Aug-94
0651-93	LAKE CLEONE TRIB	CALLOWAY, ROGER	29-Jun-93
0655-94	BROADDUS CREEK TRIBS	KENT, NICHOLAS	27-Jul-94
0656-93	ELK CREEK	C E M R	25-Jun-93
0658-93	BLUE WATER HOLE CREEK	NEW GROWTH FORESTRY	07-Jul-93
0659-93	BARNWELL CREEK	NEW GROWTH FORESTRY	12-Jul-93
0660-93	BEAR CREEK	NEW GROWTH FORESTRY	03-Jun-94
0660-94	BRUSH CREEK & TRIBS	VANDERHORST, STEVEN	29-Aug-94
0661-93	INMAN CREEK	NEW GROWTH FORESTRY	03-Jun-94
0661-94	UNKNOWN STREAM	MUNOZ, RICHARD	15-Aug-94
0667-93	MORRISON CREEK	SAGEHORN, FRED & SONS INC	03-Jul-93
0668-93	RANCHERIA CREEK	COPPER QUEEN RANCH	03-Jul-93
0669-93	TEN MILE CREEK SF	WATKINS, ROBERT	04-Aug-93
0680-93	MULE CREEK SF	LIGMAN, JOE	20-Jul-93
0681-93	PALMER CREEK	PORTER, DON	15-Jul-93
0686-93	NAVARRO RIVER	HARMON, DEBORAH	22-Jul-93
0692-94	ALDER CREEK	PIPER, JEAN	19-Mar-95
0695-94	STREETER CREEK	ENBERG, KEVIN	02-Aug-94
0697-93	ALBION RIVER SF	BISHOP, BRIAN	13-Apr-94
0705-93	ROBINSON CREEK	HOSIER, MARGARET	06-Aug-93
0706-94	SOUTH TURNER CREEK	NEWTON, PETER	12-Aug-94
0709-94	SALMON CREEK	SMYTHE, TOM	18-Aug-94
0710-93	SHORT CREEK	FLEMING, MARK	08-Sep-93
0711-93	WILLIAMS CREEK	FLEMING, MARK	08-Sep-93
0712-93	HULLS CREEK	FLEMING, MARK	08-Sep-93
0720-93	WILSON CREEK	O'FERRALL, ROY	19-Jul-93
0722-94	BIG RIVER	C E M R	08-Aug-94
0725-93	RUSSIAN RIVER TRIB	WILSEY, WAYNE	25-Jul-93
0729-94	GRIST CREEK	PHILLIPS, EDWIN	29-Aug-94
0730-93	SALMON CREEK TRIB	LARKIN, DAVID	02-Aug-93
0731-93	BIG RIVER LAGUNA	ORME, MICHAEL	17-Jul-93
0737-93	RATTLESNAKE CREEK TRIB	INGRAM, DORIS	22-Jul-93
0740-94	HAEHL CREEK	MAYFIELD, TED	19-Sep-94
0745-93	EEL RIVER SF	PATRICK, MICHAEL	20-Jul-93
0745-94	FOSTER CREEK	HARWOOD, CALVEN	15-Aug-94
0748-93	TURNER CREEK	NIXSON, DAVE	16-Jul-93
0750-94	ANDERSON CREEK	GATLIN, DALE	05-Sep-94
0753-93	EEL RIVER SF	MC CRALEY, ROBERT	19-Jul-93
0753-94	ROCKPILE CREEK	HOVLAND, PATRICK	22-Aug-94
0754-93	OUTLET CREEK	MCCRALEY, ROBERT	20-Jul-93

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0755-93	SLAUGHTERHOUSE CREEK	RAY, TOM	20-Jul-93
0762-94	RUSSIAN RIVER	MC LELLAND, DOUGLAS	26-Aug-94
0769-93	GUALALA RIVER	BOWER, JOHN	19-Jul-93
0775-93	FLUME GULCH CREEK	C E M R	22-Jul-93
0775-94	KASS CREEK	GEORGIA PACIFIC CORP	18-Aug-94
0784-93	ALLEN CREEK	GALLIANI, ALICIA	13-Jun-93
0786-93	GALLOWAY CREEK	LORENZINI, KEVIN	16-May-94
0786-94	ROCKPILE CREEK	KENT, NICHOLAS	07-Sep-94
0787-94	ROBINSON CREEK	REEVES, ARLENE/MIKE	09-Sep-94
0789-94	BAECHTEL CREEK	FORD, JOHN E	07-Sep-94
0795-93	EEL RIVER & TRIBS	CLARK, JIM	11-Aug-93
0796-94	RUSSIAN RIVER	SCHLIENGER, MAX	29-Aug-94
0799-93	UNKNOWN STREAM	SMYTHE, THOMAS	04-Aug-93
0803-93	GREENWOOD CREEK	LOUISIANA PACIFIC	21-Aug-93
0814-94	CAHTO CREEK	WEBBER, WILBERT	23-Aug-94
0819-93	ALBION RIVER	SHANDEL, WILLIAM	24-Jul-93
0820-93	COLEMAN CREEK	NICOLAS, ROBERT	31-Jul-93
0820-94	HAEHL CREEK EB	HAYDEN, ROBERT	25-Aug-94
0821-93	EEL RIVER SF	FISH AND GAME DEPT	04-Aug-93
0824-94	BAECHTEL CREEK	FISH & GAME	29-Aug-94
0825-94	MILL CREEK	FISH & GAME	29-Aug-94
0832-93	COLD CREEK	LAWSON, RICHARD	27-Aug-93
0834-94	STRING CREEK MIDDLE FORK	GRAHAM, STEPHEN	06-Oct-94
0839-93	GARCIA RIVER SF	SHIVELY, RUSS	26-Aug-93
0849-94	BIG GULCH TRIB	NELSEN, PATRICIA	29-Sep-94
0851-93	ROBINSON CREEK TRIB	SHELL, DAVID	06-Jul-93
0855-94	WOODMAN CREEK	HARWOOD, CALVIN	27-Sep-94
0856-93	UNNAMED SWALE	SWALLOW, JAMES	19-Aug-93
0862-93	GRIST CREEK	PHILLIPS, EDWIN	01-Sep-93
0862-93	SHORT CREEK	PHILLIPS, EDWIN	01-Sep-93
0865-94	EEL RIVER SF	SNYDER, FRED	15-Sep-94
0866-94	EEL RIVER SF	SNYDER, FRED	15-Sep-94
0869-94	UNKNOWN STREAM	KOERNER, HARRY	15-Sep-94
0873-93	LITTLE BEAR HAVEN CREEK	MALLORY, DOUGLAS	13-Aug-93
0875-93	FELIZ CREEK	LUCCHETTI, ANTHONY	15-Aug-93
0877-94	TEN MILE RIVER	MALLORY, DOUG	07-Sep-94
0878-94	MARSH CREEK TRIB	MARTIN, CHARLES	09-Sep-94
0880-94	NAVARRO RIVER	BATES, TIM	03-Sep-94
0881-94	ANDERSON CREEK	WASSON, PHIL	03-Sep-94
0883-93	UNKNOWN STREAM	BLENCOWE, CRAIG	09-Sep-93
0883-94	DOOLEY CREEK	REED, WILLIAM	04-Sep-94
0884-93	RUSSIAN RIVER	REEDER, ROBERT	27-Aug-93
0892-93	TOWN CREEK	ANDERSON, ART	20-Aug-93
0894-93	EEL RIVER TRIB	MIHELCIC, PETE	23-Aug-93
0895-93	HAM CANYON CREEK	HINCKLEY, JONATHAN	08-Sep-93
0899-94	LITTLE RIVER	PASQUINELLI, RENE	15-Sep-94
0900-94	SALT HOLLOW CREEK TRIB	LOLONIS, ULYSSES	16-Sep-94
0905-94	GASKER SLOUGH	MOORE, MARK	24-Oct-94
0909-93	RUSSIAN RIVER WF	BURSTAD, IVAN	27-Aug-93
0912-93	ROBINSON CREEK	MOHR, ALLAN	31-Aug-93
0916-94	COLD CREEK TRIB	PARKER, ROBERT	13-Oct-94
0920-94	ALBION RIVER SF	C E M R	21-Sep-94

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0921-93	ALBION RIVER	BISHOP, BRIAN	25-Aug-93
0932-94	MCDOWELL CREEK/DOOLEY CREEK	STEPHEN, TONY	23-Sep-94
0933-93	GARCIA RIVER	FREDRICKS, RICHARD	17-Sep-93
0934-93	GARCIA RIVER	FREDRICKS, RICHARD	17-Sep-93
0935-93	GARCIA RIVER	FREDRICKS, RICHARD	17-Sep-93
0936-94	BUSH CREEK	HOLT, SAXON	26-Oct-94
0938-93	LEWIS CREEK	C E M R	25-Aug-93
0941-93	GARCIA RIVER NF	BURNS, JOHN	17-Sep-93
0942-93	GUALALA RIVER NF	HOVLAND, PATRICK	17-Sep-93
0943-93	VARIOUS STREAMS	CAMPBELL, C F	04-Apr-94
0944-94	USAL CREEK & TRIBS	MALLORY, DOUGLAS	27-Sep-94
0951-94	RANCHERIA CREEK	PRONSOLINO, GUIDO	27-Sep-94
0956-94	ALBION RIVER SF	BISHOP, BRIAN	04-Oct-94
0962-93	EEL RIVER	HIGHLAND, DAVE	31-Aug-93
0965-94	ELDRIDGE CREEK	BRUCKER, YARROW	12-Oct-94
0967-93	EEL RIVER	SULLIVAN, FORREST	08-Oct-93
0968-93	FORSYTHE CREEK	MOHR, ALLAN	31-Aug-93
0969-93	RUSSIAN RIVER	KRESS, REBECCA	27-Aug-93
0970-94	ROBINSON CREEK	MOHR, ALAN	03-Oct-94
0971-93	RUSSIAN RIVER	MENDO CO RUSSIAN RIVER	03-Sep-93
0971-94	BLOODY RUN CREEK	FISH AND GAME	04-Oct-94
0972-94	EEL RIVER	FISH AND GAME	04-Oct-94
0976-93	UNKNOWN STREAM	BUTLER, SCOTT	20-Sep-93
0976-94	BROADDUS CREEK	GRIBALDO, LOREN	12-Oct-94
0980-94	GIBSON CREEK/COLD CREEK	HARWOD, CALVIN	17-Nov-94
0984-93	NAVARRO RIVER TRIB	RAU & ASSOCIATES	02-Oct-93
0985-94	TRIPLETT GULCH	MOHR, ALAN	13-Oct-94
0988-93	ABALOBADIAH CREEK	MOORE, MARK	15-Sep-93
0991-93	BLUE WATERHOLE CREEK	SHEEHAN, HARRY	14-Oct-93
0992-93	GUALALA RIVER NF	SHEEHAN, HARRY	14-Oct-93
0997-93	NAVARRO RIVER	URDAHL, GARY	29-Sep-93
0998-93	DUTCH HENRY CREEK	LOUISIANA PACIFIC	20-Sep-93
1002-94	RANCHERIA CREEK	HINCKLEY, JONATHAN	11-Oct-94
1003-93	RANCHERIA CREEK	HANES, JOHN	20-Sep-93
1006-94	EEL RIVER SF	DUMARS, PETER	25-Oct-94
1008-94	HALE CREEK & TRIBS	CANTRELL, LAREN	13-Oct-94
1012-94	TOWN CREEK	ROUND VALLEY WATER	17-Oct-94
1013-94	BLACK BUTTE RIVER MF & TRIBS	POOL, GRANVILLE	17-Oct-94
1021-93	JACKASS CREEK	INTER/TRIBAL SINKYONE WLD	22-Sep-93
1022-93	STANLEY CREEK	CALIF CONSERVATION CORP	13-Sep-93
1025-94	ROBINSON CREEK	SHEEHAN, HARRY	01-Nov-94
1028-93	PLEASANT VALLEY CREEK	BISHOP, BRIAN	27-Sep-93
1032-93	ALBION RIVER	RAU & ASSOCIATES	19-Jul-95
1039-93	RUSSIAN RIVER WF	JOHNSON ORCHARDS INC	23-Sep-93
1040-94	BIG RIVER LITTLE NF	FORESTRY DEPT	28-Oct-94
1041-93	RUSSIAN RIVER	POOL, GRANVILLE	23-Sep-93
1042-93	ALDER CREEK	FREDRICKS, RICHARD	29-Sep-93
1043-93	GIBSON CREEK	BOLTON, ISABELLE	05-Oct-93
1043-94	YORK CREEK	COX, JACK	31-Oct-94
1047-93	WILLITS CREEK	FISHING FOUNDATION OF CA	13-Jun-94

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1048-93	BAECHTEL CREEK	FISHING FOUNDATION OF CA	20-Sep-93
1057-93	OUTLET CK, MILL CK, DAVIS CK	AYRE-JONES, BARBARA	20-Sep-93
1057-94	GARCIA RIVER	STORNETTA, WALT	10-Oct-94
1058-94	VIRGIN CREEK	SHANDEL, JOHN	03-Nov-94
1064-93	ORRS CREEK	KENNEDY, RICK	01-Oct-93
1071-93	RUSSIAN RIVER TRIB	FAIRBAIRN, WES	29-Sep-93
1072-93	CRAWFORD, DOOLAN, AUSTIN CKS	MCCARN, BILL	29-Sep-93
1075-93	RUSSIAN GULCH CREEK	BRAUDRICK, PETER	22-Sep-93
1075-94	BIG RIVER	MOORE, MARK	16-Nov-94
1082-93	BIG RIVER SF	POOL, GRANVILLE	29-Sep-93
1085-93	NAVARRO RIVER NF	PARDINI, TONY	23-Sep-93
1092-93	LONG VALLEY CREEK	HARMON, DEBORAH	23-Dec-93
1093-94	ALDER CREEK	FREDRICKS, RICHARD	17-Oct-94
1099-93	RYAN CREEK	KREMSER, WAYNE	14-Oct-93
1104-93	SMITH CREEK	THOMPSON, BUD	29-Sep-93
1105-93	LITTLE RIVER	SNYDER, ROBERT	29-Sep-93
1105-94	JUAN CREEK	C E M R	06-Dec-94
1106-94	BAECHTEL CREEK	LOGAN, GORDON	10-Jan-95
1110-93	ANDERSON CREEK	TEBBUTT, CHRISTOPHER	05-Oct-93
1122-93	ANDERSON GULCH	BISHOP, BRIAN	12-Oct-93
1124-94	MCGARVEY/BOTTOM CK/NAVARRO NF	WOOD, KEN	01-May-95
1127-93	BEAR HAVEN CREEK SF	MALLORY, DOUG	04-Oct-93
1128-94	TOWN CREEK	COVELO COMMUNITIES SERV	16-Dec-94
1132-93	DOOLEY CREEK	FERRANTI, DONALD	18-Oct-93
1135-93	UNKNOWN STREAM	KIRTLAN, ROBERT	20-Oct-93
1148-93	FELIZ CREEK	LINVILLE, TROY	15-Oct-93
1159-93	YEW CREEK	MATTOLE SALMON GROUP	04-Nov-93
1162-93	FORSYTHE CREEK	HANSON, ERNEST	14-Oct-93
1184-93	ROBINSON CREEK	MOHR, ALLAN	22-Oct-93
1194-93	RUSSIAN RIVER	FETZER VINEYARDS	26-Oct-93
1209-93	ANDERSON CREEK	HIATT, CHARLES	01-Nov-93
1214-93	BUCK ROCK CREEK	MITZEL, MIKE	18-Nov-93
1229-93	SHORT CREEK	BROWN, STAN	29-Oct-93
1230-93	TOWN CREEK	EDWARDS, GLEN	29-Oct-93
1233-93	NAVARRO RIVER	CALTRANS	22-Dec-93
1234-93	BURRIGHT CREEK TRIB EB	STRICKLER, BRUCE	05-Nov-93
1236-93	TEN MILE CREEK UNNAMED TRIB	BEWLEY, STUART	20-Jun-97
1237-93	MUD SPRINGS CREEK UNNAMED TRIB	BEWLEY, STUART	20-Jun-97
1245-93	NAVARRO RIVER & BIG RIVER	CHECKAL, GREG	25-Jan-94
1246-93	NAVARRO RIVER TRIB	POOLE, GRANVILLE	11-Nov-93
1261-93	NAVARRO RIVER SB NF UNNAM TRIB	GIMBLETT, JAMES	13-Nov-92
1267-93	RUSSIAN RIVER TRIB TO EB	KIMMEL, LILLIAN	18-Nov-93
1274-93	RUSSIAN RIVER	KENNEDY, RICK	11-Jan-94
1289-93	GARCIA RIVER	KENDALL, VERNON	17-Nov-93
1290-93	HAPPY VALLEY CREEK	SHANDEL, JOHN	17-Nov-93
1321-93	GARCIA RIVER TRIB	SHEEHAN, HARRY	10-Jan-94

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1333-93	MEYER GULCH	HERR, EUGENIA	21-Jan-94
1334-93	GARCIA RIVER	HAY, WILLIAM/BEDROCK	13-Dec-93
1339-93	HUCKLEBERRY CREEK	FISH & GAME DEPT	21-Dec-93
1340-93	COTTONEVA CREEK SF	FISH & GAME DEPT	31-Dec-93
1346-93	DOOLAN CREEK	AKERSTROM, GARY	22-Dec-93
0006-95	CASPER CREEK TRIB	DECKER, WALT	05-Jan-95
0019-95	PUDDING CREEK	CALIFORNIA WESTERNN RR	20-Jan-95
0044-95	HENSLEY CREEK	VOGT, BOB	03-Feb-95
0090-95	NAVARRO RIVER	MOORE, MARK	15-Feb-95
0095-95	RUSSIAN RIVER	THOMAS, JOHN	23-Feb-95
0096-95	RUSSIAN RIVER WB	THOMAS, JOHN	23-Feb-95
0112-95	DOOLEY CREEK	ROSETTI BROS	27-Feb-95
0118-95	RUSSIAN RIVER WB	TODD, KEN	01-Mar-95
0127-95	BEAR CREEK	SHEEHAN, HARRY	18-Apr-95
0133-95	ELK CREEK	GIACOMINI L.D. INC	03-Apr-95
0143-95	HOWARD CREEK	EDGERLY, FRANK	14-Mar-95
0146-95	EEL RIVER MF	ROWLAND, RICHARD	15-Mar-95
0154-95	SHORT CREEK	BAUER, DON	13-Mar-95
0164-95	ANDERSON CREEK	CHARLES, WILLIAM	03-Apr-95
0179-95	WAGES CREEK	WAGES CREEK PROPERTY	15-Mar-95
0188-95	RATTLESNAKE CK/EEL RIVER	MACDONALD, ROGER	02-Apr-95
0192-95	NAVARRO RIVER/S.F. ALBION	STEINBUCK, ADAM	20-Apr-95
0197-95	NOYO RIVER	ANDERSEN, CHARLES	02-Jun-95
0205-95	RUSSIAN RIVER	MENDOCINO VINEYARD CO	13-Apr-95
0206-95	RUSSIAN RIVER	MENDOCINIO VINEYARDS CO	13-Apr-95
0210-95	JUAN CREEK	CALTRANS	27-Mar-95
0232-95	UNKNOWN STREAM	LYDA, GREG	23-May-95
0233-95	NOYO RIVER TRIB	MALLORY, DOUG	03-Apr-95
0234-95	ANDERSON CREEK	WASSON, PHIL	03-Apr-95
0236-95	TOMKI CREEK	LAWLER, STEPHEN	07-Apr-95
0240-95	ALDER CREEK	FRASER, DONALD	19-Jun-95
0241-95	RUSSIAN RIVER E.B.	WELCH, MARK	13-Apr-95
0242-95	RUSSIAN RIVER	JAHNKE, GORDON	08-May-95
0258-95	RUSSIAN RIVER	FORD, MELVIN	12-Apr-95
0261-95	BIG SALMON CREEK	MALLORY, DOUG	23-May-95
0275-95	MILL CREEK	SUSAN, LEE	15-May-95
0299-95	RYAN CREEK	WHITE, ROBERT	19-Apr-95
0301-95	MILL CREEK (AKA WILLITS CK)	LOGAN, GORDON	13-Jun-95
0317-95	RUSSIAN RIVER EB	SONOMA COUNTY WATER	21-Apr-95
0319-95	MCDOWELL CREEK	MOORE, MARK	27-Apr-95
0327-95	EEL RIVER SF	ALLOR, ED	27-May-95
0330-95	TEN MILE CREEK	SLUIS, STAN	04-May-95
0351-95	TEN MILE RIVER	MALLORY, DOUG	28-Apr-95
0352-95	SLAUGHTERHOUSE CREEK	MALLORY, DOUG	28-Apr-95
0353-95	HUCKLEBERRY CREEK	FLOSI, GARY	28-Apr-95
0363-95	GREENWOOD CREEK	SCHULTZ, TOM	19-Jun-95
0373-95	LITTLE RIVER	BRAUDRICK, PETER	05-May-95
0387-95	NAVARRO RIVER	BLATTNER, ERNEST	06-Jun-95
0399-95	UNKNOWN STREAM	CLARK, JIM	09-Jun-95
0407-95	ROBINSON CREEK	WILSON, J W	05-Jun-95
0421-95	GARCIA RIVER	HAY, WILLIAM	07-Jun-95
0432-95	GUALALA RIVER	POOL, GRANVILLE	16-Jun-95

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0443-95	RANCHERIA CREEK	HANES, JOHN	12-Jun-95
0448-95	BROADDUS CREEK	HARRISON, FAYE	24-May-95
0457-95	UNKNOWN STREAM	HASCHAK, ART	24-May-94
0467-95	FELIZ CREEK	DE VINCENZI, JOHN	23-May-95
0469-95	MILL/WALKER/VALENTINE/RICE CKS	KENT, NICHOLAS	07-Jun-95
0474-95	INDIAN CREEK	LANGAGER, STEVE	20-Jun-95
0492-95	OUTLET CREEK	MCLELLAND, DOUGLAS	01-Jun-95
0498-95	EEL RIVER SO FORK	MALLORY, DOUG	30-May-95
0499-95	TEN MILE CK/ABALOBADIAH CK	MALLORY, DOUG	30-May-95
0503-95	STANSBURY CREEK	NEW GROWTH FORESTRY	01-Jun-95
0518-95	MILL,WILLITS,HALE,BAECHTEL CKS	HAYDEN, BOB	19-Jun-95
0526-95	ANDERSON CREEK	WASSON, PHIL	26-Jun-95
0527-95	NOYO RIVER NF	SCHANTZ, DAVID	07-Jul-95
0528-95	MORRISON CREEK	POOL, GRANVILLE	20-Jun-95
0532-95	WILLIAMS CREEK	BONELLI, DAVID	05-Jun-95
0544-95	FOSTER CREEK	CLARK, JIM	09-Jun-95
0551-95	HALE CREEK	CAVANAUGH, RODERICK	15-Jun-95
0552-95	GIBSON CREEK	JOSEPH, RENEE	10-Jul-95
0553-95	EEL RIVER MIDDLE FORK	CAMPBELL, JACK	16-Jul-95
0555-95	GRIST CREEK/MILL CREEK	POLSLEY, RAYMOND	07-Jul-95
0559-95	EEL RIVER SO FK	PATRICK, MICHAEL	24-Jun-95
0562-95	RANCHERIA CREEK	PRONSOLINO, GUIDO	26-Jul-95
0578-95	TEN MILE RIVER SF	WATKINS, ROBERT	07-Jul-95
0581-95	WOODMAN CREEK	HELM, HOMER	24-Jun-95
0611-95	JAMES CREEK NF	SLACK, HAL/ROBT BYERS	10-Jul-95
0614-95	HENSLEY CREEK	KRAMER, IRVING	20-Jul-95
0615-95	UNKNOWN STREAM	DENOEU, JACQUES	30-Jun-95
0625-95	CUMMINSKY CREEK/RUSSIAN RIVER	ROSATI, MARIO	12-Jul-95
0628-95	GARCIA RIVER SF	BELL, CRAIG	07-Jul-95
0629-95	SIGNAL CREEK	BELL, CRAIG	07-Jul-95
0630-95	INMAN CREEK	BELL, CRAIG	07-Jul-95
0631-95	GARCIA RIVER NF	BELL, CRAIG	07-Jul-95
0633-95	BROADDUS/BAECHTEL/HAEHL CREEKS	LOGAN, GORDON	05-Jul-95
0634-95	BROADDUS CREEK	LOGAN, GORDO	05-Jul-95
0641-95	OLSON GULCH CREEK	MONSCHKE, JACK	17-Jul-95
0647-95	EEL RIVER SF/WHITCOMB GULCH	LINKHART, DAVID	25-Jun-95
0680-95	MILL CREEK	EVANS-FREKE, STEVEN	01-Jul-95
0682-95	SHORT CREEK	POOL, GRANVILLE	26-Jul-95
0683-95	TOWN CREEK	POOL, GRANVILLE	26-Jul-95
0684-95	SHORT CREEK	POOL, GRANVILLE	26-Jul-95
0685-95	TEN MILE RIVER TRIB	HESS, ALAN	01-Aug-95
0686-95	EEL RIVER/INDIAN CREEK	HESS, ALAN	17-Jul-95
0688-95	RUSSIAN RIVER	MCLELLAND, DOUGLAS	20-Jul-95
0691-95	DAUGHERTY CREEK	FLOSI, GARY	05-Jul-95
0692-95	NAVARRO RIVER SB NF	FLOSI, GARY	05-Jul-95
0693-95	HOLLOW TREE CREEK	FLOSI, GARY	05-Jul-95

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0702-95	EEL RIVER/VAN ARSDALE FISH LAD	LEO, DON	07-Jul-95
0717-95	GIBSON CREEK/ORR CREEK	KENNEDY, RICH	21-Aug-95
0719-95	REDWOOD CREEK	C E M R	12-Jul-95
0720-95	GARCIA RIVER & TRIBS	BURNS, JOHN	14-Aug-95
0722-95	STRING CREEK	CLARK, JIM	14-Jul-95
0724-95	RANCHERIA CREEK	HOWELL, MICHAEL	17-Jul-95
0733-95	BARNWELL CREEK	NEW GROWTH FORESTRY	18-Jul-95
0734-95	BROADDUS CREEK	NEW GROWTH FORESTRY	18-Jul-95
0735-95	JACK OF HEARTS CREEK	NEW GROWTH FORESTRY	18-Jul-95
0739-95	EEL RIVER SF	SNYDER, FRED	25-Jul-95
0740-95	MILL CREEK	MAILLIARD, LARRY	03-Aug-95
0741-95	YALE CREEK/RANCHERIA CREEK	HIATT, CHARLIE	01-Sep-95
0742-95	EEL RIVER	PETERS, ROBERT	27-Jul-95
0752-95	JUMPOFF CREEK	AALFS, CHARLES	27-Jul-95
0754-95	BRUSH CREEK	HINCKLEY, JONATHAN	19-Jul-95
0756-95	BRUSH CREEK	HAYES, PAUL	05-Jul-95
0777-95	CASPAR CREEK	GREEN, JON	25-Jul-95
0787-95	BLUE WATERHOLE CREEK	NEW GROWTH FORESTRY	28-Jul-95
0790-95	MILL CREEK	SCHANTZ, DAVID	04-Aug-95
0791-95	MC COY CREEK	LANCASTER, DOYLE	21-Aug-95
0800-95	SHORT CREEK	CAMPBELL, JACK	27-Jul-95
0801-95	MURPHY CREEK	BAUER, DON	27-Jul-95
0808-95	UNKNOWN STREAM	DENEAU, JACQUES	17-Aug-95
0809-95	STRING CK, DIGGER CK, TOMKI CK	AALFS, CHARLES	27-May-96
0816-95	BAECHTEL CREEK	TWEDDELL, APRIL	04-Aug-95
0821-95	TEN MILE CREEK	ENGBER, EVAN	31-Jul-95
0824-95	DOOLEY CREEK	REED, WILLIAM	09-Jul-95
0828-95	EEL RIVER	MIHELCIC, PETE	16-Aug-95
0832-95	DRY CREEK TRIB	LAWSON, ROBERT	01-Sep-95
0850-95	MARTIN CK, NF BIG RIVER	BURNS, JOHN	16-Aug-95
0855-95	PARSONS CREEK	COLE, JOSEPHINE	05-Sep-95
0859-95	ELK PRARIE CREEK	WARNER, GREGG	01-Sep-95
0860-95	DRY CREEK (UPPER)	WARNER, GREGG	01-Sep-95
0861-95	MCGANN'S CREEK	WARNER, GREGG	01-Sep-95
0862-95	DRY CREEK (LOWER)	WARNER, GREGG	01-Sep-95
0871-95	RUSSIAN RIVER & CRAWFORD CREEK	CHAVORR, WALT	14-Aug-95
0883-95	UNKNOWN STREAM	LANGAGER, STEVE	17-Sep-95
0889-95	ALDER CREEK	HAY, BILL	05-Jul-95
0896-95	RUSSELL BROOK CREEK	C E M R	10-Aug-95
0900-95	DRY CREEK	LYDA, GREG	15-Sep-95
0917-95	LITTLE VALLEY CREEK	KAIJANKOSKI, RUTH	11-Sep-95
0935-95	DOOLEY CREEK	JONES, KENNETH	05-Sep-95
0936-95	RUSSIAN RIVER	JONES, KENNETH	05-Sep-95
0942-95	JUG HANDLE CREEK TRIB	HOBLIN, WILLIMG	29-Aug-95
0946-95	NAVARRO RIVER NB NF & TRIBS	FLOSI, GARY	17-Aug-95
0981-95	SHORT CREEK	PHILLIPS, EDWIN	26-Sep-95
0992-95	ALBION RIVER TRIB	MAHONEY, DARCIE	26-Sep-95

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1993-2002
Mendocino County

0997-95	DUTCH CHARLIE CREEK	HESS, ALAN	25-Aug-95
1008-95	ROBINSON CREEK	NEW GROWTH FORESTRY	25-Aug-95
1010-95	CHARLIE CREEK	IVERSON LOGGING	25-Aug-95
1012-95	MCCLURE CREEK	BARTOLOMEI, RAY	15-Sep-95
1015-95	DOUGHERTY CREEK	LOUISIANA PACIFIC	25-Aug-95
1016-95	BAECHTER/MILL/DAVIS/OUTLET CKS	SHEA, MONROE	29-Aug-95
1018-95	TOWN CREEK	WILSON, CHRIS	01-Sep-95
1031-95	EEL RIVER	MC LELLAND, DOUGLAS	07-Sep-95
1040-95	EEL RIVER SF	CARVER, GEORGE	11-Sep-95
1042-95	RUSSIAN RIVER/PIETA CREEK	COX, JACK	21-Sep-95
1048-95	DONNELLEY CREEK	TITUS, DEAN	08-Aug-95
1066-95	TEN MILE RIVER NF	MALLORY, DOUG	06-Sep-95
1067-95	TEN MILE RIVER	MALLORY, DOUG	06-Sep-95
1074-95	ANDERSON CREEK	ROSSI, EMIL	19-Sep-95
1078-95	HENSLEY CREEK	MC GEHEE, RON	04-Oct-95
1080-95	DOYLE CREEK UNNAMED TRIB	PEMBER, LYLES	20-Sep-95
1104-95	ROBINSON CREEK	MOHR, ALAN	02-Aug-95
1115-95	WILLIAMS CREEK UNNAMED TRIB	RODERICK, WALTER	11-Sep-95
1121-95	COLD CREEK	GUNTLY, CHARLES	23-Sep-95
1137-95	TEN MILE CREEK TRIB	BAILEY, WILLIAM	14-Sep-95
1141-95	MC NASTY CREEK	POOL, GRANVILLE	14-Sep-95
1149-95	RUSSIAN RIVER	BRADFORD, ROBERT	03-Oct-95
1160-95	SKUNK CREEK DRAINAGE	SHELL, DAVID	15-Sep-95
1164-95	UNKNOWN STREAM	DELL'AQUILA, CARL	13-Oct-95
1178-95	UNKNOWN STREAM	BRUDER, J M	22-Sep-95
1188-95	NOYO RIVER	BENNEDETTI, BRUNO	20-Sep-95
1212-95	RUSSIAN RIVER	BORECKY, GEORGE	06-Oct-95
1228-95	BOB'S CREEK	LAWSON, ROBERT	02-Oct-95
1232-95	GALLOWAY CREEK	MOHR, ALAN	05-Oct-95
1237-95	RUSSIAN RIVER WB	HORN, JOE	07-Oct-95
1243-95	MILL CREEK	COHEN, BURT	02-Oct-95
1250-95	DRY CREEK UNNAMED TRIBS	CLARK, JIM	09-Oct-95
1263-95	BALD HILL CREEK	LINKHART, DAVE	29-Sep-95
1268-95	MC WINNIE CREEK	RASCHE, GARY	23-Sep-95
1269-95	ORR CREEK	POOL, MAURINE	02-Oct-95
1270-95	RUSSIAN RIVER	RUSSIAN RIVER FLOOD	02-Oct-95
1275-95	EEL RIVER UNNAMED TRIBS	HASCHAK, ART	04-Oct-95
1344-95	TEN MILE RIVER SF	PERRY, DON	24-Oct-95
1352-95	JOHNSON CREEK	QUEIROLO, LUCIANO/SILVIO	15-Oct-95
1355-95	GARCIA RIVER	STORNETTA, LARRY	26-Oct-95
1356-95	DOOLIN CREEK	DETURBILLA, JIM	19-Oct-95
1358-95	GARCIA RIVER	BELL, CRAIG/STORNETTA H	25-Oct-95
1359-95	GARCIA RIVER	BELL, CRAIG/KENDALL VERN	25-Oct-95
1412-95	BEAR HAVEN CREEK	SUTPHIN, JOE	26-Oct-95
1413-95	GREENWOOD CREEK	ACKER, CHARLIE	03-Oct-95
1414-95	ANDERSON CREEK	TITUS, DEAN	21-Oct-95
1441-95	GIBSON CREEK	MAYFIELD, RICK	03-Nov-95
1463-95	MORRISON CREEK	SAGEHORN, FRED & SON INC	09-Nov-95
1473-95	TOWN CREEK	ROUND VALLEY WATER DIST	14-Nov-95
1494-95	SODA CREEK	MOHR, ALAN	28-Nov-95

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1993-2002
Mendocino County

1515-95	INDIAN CREEK WB	TITUS, DEAN	28-Nov-95
1523-95	ORR CREEK	CARPENTER, ROBERT	30-Nov-95
1558-95	CAVE CREEK	THYGESEN, DENNIS	03-Jan-96
1577-95	OWL CREEK	BOWLES, STEVE	03-Nov-95
1585-95	DOTY CREEK	GUALALA RIVER RESTORATION	27-Dec-95
0008-96	TEN MILE RIVER LITTLE NF	LINKHART, DAVID	30-Jan-96
0012-96	WILDCAT CREEK	STORNETTA, WALTER	30-Jan-96
0041-96	ANDIRON CREEK	SHANDEL, JOHN	23-Jan-96
0042-96	SORTORI CREEK	SHANDEL, JOHN	23-Jan-96
0043-96	TAYLOR CREEK	SHANDEL, JOHN	23-Jan-96
0048-96	ROBINSON CREEK	COOK, WALDO	29-Jan-96
0054-96	ELK,ALDER,INDIAN,ANDERSON CKS	ASH, TIM	20-Feb-96
0062-96	BIG RIVER SF	WILLIAMS, JAMES L	20-Feb-96
0086-96	EEL RIVER SF	BURGESS, LYLE	14-Mar-96
0092-96	DOOLEY CREEK	MOORE, MARK	12-Mar-96
0143-96	GUALALA RIVER LITTLE N.F.	KELLY, SCOTT	26-Mar-96
0151-96	MCNAB CREEK	BARRETT, THOMAS	12-Apr-96
0159-96	RUSSIAN RIVER	BELLOWS, FRED	19-Jun-96
0160-96	UNKNOWN STREAM	HASCHAK, ART	12-Apr-96
0161-96	EEL RIVER SF	MCCAULEY, DOUG	12-Apr-96
0162-96	RUSSIAN RIVER EB	LAMALFA, RICHARD	05-Apr-96
0170-96	GARCIA RIVER & TRIBS	BURNS, JOHN	10-Apr-96
0176-96	BROADDUS CREEK	ASH, TIM	09-Apr-96
0177-96	RUSSIAN RIVER	ASH, TIM	09-Apr-96
0181-96	EEL RIVER MF	ROWLAND, KEITH	18-Apr-96
0184-96	BRUSH CREEK AND SF BRUSH CREEK	LYDA, GREG	20-Apr-96
0185-96	EEL RIVER TRIB	CHINMAYA MISSION (WEST)	28-Mar-96
0157-96	RUSSIAN RIVER	BELLOWS, FRED	14-Mar-96
0190-96	RANCHERIA CREEK MEN	ORNBAUN, DUANE	25-Apr-96
0201-96	RUSSIAN RIVER UNNAMED TRIB	KENNEDY, RICH	24-Apr-96
0206-96	RUSSELL BROOK	C E M R	28-Mar-96
0207-96	YALE CREEK	HIATT, CHARLIE	25-Apr-96
0212-96	UNNAMED STREAM	PETERSON, JEFF	29-Mar-96
0213-96	TEN MILE RIVER UNN TRIB SF	PETERSON, JEFF	29-Mar-96
0214-96	MARTIN CREEK/ANDERSON GULCH	PETERSON, JEFF	29-Mar-96
0215-96	NOYO RIVER LITTLE NF	PETERSON, JEFF	29-Mar-96
0216-96	HAZEL CREEK NF	PETERSON, JEFF	29-Mar-96
0217-96	PUDDING CREEK	PETERSON, JEFF	29-Mar-96
0222-96	BEAR GULCH/NOYO RIVER NF OF SF	MALLORY, DOUGLAS	20-Feb-96
0235-96	BUNKER GULCH CK/HARE CREEK	PHILBRICK, JERRY	20-Apr-96
0259-96	NAVARRO RIVER	SHIVELY, RUSSELL	03-May-96
0260-96	ELK CREEK	SHIVELY, RUSSELL	03-May-96
0266-96	ALLEN CK/GARCIA RIVER TRIBS	GALLIANI, STEVE	03-May-96
0280-96	RANCHERIA CREEK	PRONSOLINO, GUIDO	26-Apr-96
0297-96	GARCIA RIVER	HAY, WILLIAM JR	26-Apr-96

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1993-2002
Mendocino County

0299-96	BIG RIVER UNNAMED TRIB	PETERSON, JEFF	20-Apr-96
0300-96	GARCIA RIVER UNNAMED TRIB	PETERSON, JEFF	20-Apr-96
0301-96	TWO LOG CK/BIG RI/PETERSON GUL	PETERSON, JEFF	24-Apr-96
0302-96	REDWOOD CREEK CENTER FORK	PETERSON, JEFF	24-Apr-96
0303-96	CHURCHMAN CREEK	PETERSON, JEFF	20-Apr-96
0304-96	TEN MILE RIVER MIDDLE FORK	PETERSON, JEFF	24-Apr-96
0305-96	SMITH CREEK	PETERSON, JEFF	24-Apr-96
0306-96	TEN MILE RIVER	PETERSON, JEFF	24-Apr-96
0314-96	RUSSIAN RIVER UNNAMED TRIB	KENNEDY, RICK	22-May-96
0327-96	RANCHERIA CREEK	HANES, JOHN	25-Apr-96
0329-96	MICHAELS CREEK	FLOSI, GARY	01-May-96
0330-96	DOUGHERTY CREEK	FLOSI, GARY	01-May-96
0331-96	BOND CREEK	FLOSI, GARY	07-May-96
0332-96	MILL CREEK	COLBERG, SARITA	22-May-96
0335-96	NAVARRO RIVER	PEDERSEN, CRAIG	22-May-96
0361-96	NAVARRO RIVER	BLATTNER, ERNEST	25-May-96
0364-96	RUSSIAN RIVER	FORD, MELVIN	25-May-96
0375-96	NOYO RIVER NF	DECKER, WALT	10-May-96
0394-96	MURPHY CREEK/HULLS CREEK	BRINKERHOFF, RON	06-Jun-96
0398-96	SALMON CREEK	PETERSON, JEFF	11-Jun-96
0399-96	TEN MILE RIVER NF	PETERSON, JEFF	11-Jun-96
0400-96	JESSE GULCH/GARCIA RIVER NF	PETERSON, JEFF	11-Jun-96
0401-96	KASS CREEK	PETERSON, JEFF	14-Jun-96
0402-96	TEN MILE RIVER UNNAMED TRIB	PETERSON, JEFF	11-Jun-96
0405-96	ANDERSON CREEK	WASSON, PHIL	27-Jun-96
0409-96	BIG RIVER	FRYKMAN, DAVID	05-Jun-96
0415-96	RUSSIAN RIVER	ASHURST, TOM	16-May-96
0433-96	HOLLOW TREE CREEK	WILLIAMSON, MICHAEL	11-Jun-96
0437-96	RUSSIAN RIVER	MCLELLAND, DOUG	11-Jun-96
0440-96	COOK CREEK	WOOD, KEN	05-Jun-96
0445-96	RUSSIAN RIVER EB	MOORE, MARK	11-Jun-96
0448-96	UNKNOWN STREAM	SCHANTZ, DAVID	19-Jun-96
0452-96	UNKNOWN STREAM	MON PERE, TOM	30-Aug-96
0458-96	TEN MILE RIVER NF	CEMR	28-May-96
0461-96	FELIZ CREEK	DE VINCENZI, JOHN	24-Jun-96
0468-96	SHORT CREEK	PARKER, ROBERT	27-Jun-96
0473-96	MULE CREEK	STEINBUCK, ADAM	19-Jun-96
0474-96	ALBION RIVER	STENBUCK, ADAM	19-Jun-96
0482-96	HAYWORTH CREEK	HORNER, STEVE	06-Jun-96
0508-96	NOYO RIVER	BAKER, JEAN	11-Jun-96
0517-96	EEL RIVER MAIN STEM	MCLELLAND, DOUGLAS	05-Jul-96
0518-96	EEL RIVER MIDDLE FORK	MCLELLAND, DOUGLAS	06-Jul-96
0519-96	OUTLET CREEK	MCLELLAND, DOUGLAS	05-Jul-96
0549-96	MILL CREEK	MAILLIARD, LARRY	05-Jul-96
0550-96	ALBION RIVER	BLENCOWE, CRAIG	05-Jul-96
0552-96	TOMKI CREEK	PETERS, ROBERT	09-Jul-96

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0575-96	METTIC CREEK	C E M R	18-Jun-96
0576-96	SHERWOOD CREEK	STEVENS, JOHN	22-Jun-96
0581-96	LITTLE RIVER	HIROSE, DOROTHY	05-Jul-96
0584-96	TEN MILE RIVER/GULCH 24 & 25	MALLORY, DOUGLAS	27-Jun-96
0592-96	UNKNOWN STREAM	NASH, ELEANOR	14-Jul-96
0593-96	OUTLET CREEK UNNAMED TRIBS	SUSAN, LEE	05-Jul-96
0594-96	BIG RIVER NORTH FORK	FRYKMAN, DAVID	05-Jul-96
0612-96	ALBION RIVER	CARP, WILLIAM/SETO, SUM	26-Jul-96
0619-96	BIG RIVER LITTLE N.F.	EDGE, STACY/CDF	01-Nov-95
0621-96	MCNAB CREEK	FETZER, JOHN	06-Jul-96
0640-96	RUSSIAN RIVER	SCHLIENGER, MAX	06-Jul-96
0645-96	GUALALA RIVER	KELLY, SCOTT	06-Jul-96
0650-96	DOOLEY CREEK	REED, WILLIAM	11-Jul-96
0659-96	GULCH C/TRIB NOYO RIVER	VIOLETT, PAUL	12-Aug-96
0667-96	HAEHL CREEK	MORAN, LARRY	07-Aug-96
0688-96	CHERRY CREEK	STRAIT, DANIEL	16-Aug-96
0695-96	UNKNOWN STREAM	SMITH, STEPHEN	27-Jul-96
0697-96	SLAUGHTERHOUSE CREEK	STEINBUCK, ADAM	09-Aug-96
0724-96	INDIAN CK WB	C E M R	27-Jul-96
0734-96	PARLIN CREEK	BAXTER, WILLIAM	31-Jul-96
0737-96	HORSE CREEK	LITTLE, JAMES	12-Aug-96
0750-96	RUSSIAN RIVER	LOUDON, JEFFREY	09-Sep-96
0762-96	TEN MILE CREEK	SLUIS, STAN	07-Sep-96
0768-96	ANDERSON CREEK	YORK, ALLEN	07-Aug-96
0774-96	WILLIAMS CREEK	BONELLI, DAVID	21-Aug-96
0775-96	TOMKI CREEK	HAWLEY, RICK	21-Aug-96
0778-96	RANCHERIA CREEK TRIB	HIATT, CHARLES	12-Aug-96
0779-96	MILL CREEK TRIB	HIATT, CHARLES	31-Aug-96
0796-96	EEL RIVER AND TRIBS	NICOLL, SCOTT	12-Aug-96
0810-96	DUNN CREEK	SWEELEY, JOHN	28-Aug-96
0813-96	STRING CREEK	ENGBER, KEVIN	01-Sep-96
0819-96	CEDAR CREEK	MOORE, MARK	30-Aug-96
0821-96	DOOLEY CREEK	BRANHAM, JOHN	29-Aug-96
0823-96	FELIZ CREEK	ASHURST, TOM	29-Aug-96
0826-96	TEN MILE CREEK	ENGBER, EVAN	01-Sep-96
0830-96	RANCHERIA CREEK	MATHIAS, J ROBERT	29-Aug-96
0851-96	ANDERSON CREEK	BERGNER, GEORGE	20-Sep-96
0863-96	GATES CREEK	FLOSI, GARY	23-Aug-96
0864-96	NAVARRO RIVER LITTLE NF	FLOSI, GARY	23-Aug-96
0870-96	WAGES CK, N. OF WESTPORT	MC KINLEY, ED	12-Sep-96
0883-96	GRIST CREEK	BERRIEN, CURTIS	07-Sep-96
0886-96	WAGES CREEK	BAY LOU CORP	13-Sep-96
0891-96	COMMINSKY CREEK UNNAMED TRIB	NAYES, WILLIAM	09-Sep-96
0898-96	ROBINSON CREEK	NEW GROWTH FORESTRY	13-Sep-96
0903-96	FELIZ CREEK	LUCCHETTI, ANTHONY	03-Oct-96
0915-96	NORTH FORK NOYO	MALLORY, DOUGLAS	16-Sep-96
0916-96	PUDDING CREEK	MALLORY, DOUGLAS	16-Sep-96
0917-96	GIBSON CREEK AND ORR CREEK	KENNEDY, RICK	01-Oct-96

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0920-96	JUMPOFF CREEK TRIB EEL RIVER	BALDO, CHRISTOPHER	16-Sep-96
0927-96	ROBISON CREEK	TITUS, DEAN	20-Sep-96
0928-96	DONNELLY CREEK/ANDERSON CREEK	TITUS, DEAN	20-Sep-96
0932-96	GRIST AND MILL CREEK	POLSLEY, RAYMOND	02-Oct-96
0935-96	BIG RIVER SOUTH FORK	WILLIAMS, JAMES LESLIE	02-Oct-96
0931-96	GRUBB CREEK	MILLER, TERRY	23-Sep-96
0948-96	LITTLE RIVER	BRAUDRICK, PETER	07-Oct-96
0949-96	BROADDUS CREEK	MORAN, LARRY	07-Oct-96
0950-96	FORSYTHE CREEK	ALBRIGHT-FOORD INV	19-Sep-96
0965-96	RUSSIAN RIVER	BRAMHAM, JOHN C JR	19-Sep-96
0968-96	GREENWOOD CREEK	ACKER, CHARLES	07-Oct-96
0969-96	GUALALA NORTH FORK	KELLY, SCOTT	07-Oct-96
0970-96	MC DOWELL/DOOLEY	BRUTOCA, LEN JR	17-Oct-96
0983-96	GUALALA RIVER	BROWN, DAN	21-Sep-96
0984-96	RUSSIAN RIVER WEST FORK	GRIDER VINEYARDS	21-Sep-96
0985-96	REDWOOD CREEK	WESTERN TIMBER SERVICES	20-Sep-96
0986-96	BAECHTEL CREEK	FORD, JOHN	22-Sep-96
0988-96	EEL RIVER	SNYDER, ROBERT	18-Sep-96
1002-96	ROBISON CREEK	LYON, CURTIS	17-Oct-96
1010-96	PACIFIC OCEAN UNNAMED TRIB	HESS, PETE	30-Sep-96
1017-96	BAECHTEL/OUTLET/MILL CREEKS	MAC DONNELL, JASON	23-Sep-96
1018-96	BRANDON GULCH	YEE, FAYE	27-Sep-96
1019-96	NOYO RIVER N.F. OF THE S.F.	YEE, FAYE	27-Sep-96
1021-96	MC GANN CREEK	GUALALA RIVER STEELHEAD	25-Sep-96
1024-96	DOOLEY CREEK	ENGBER, EVAN	05-Oct-96
1034-96	VALLEJO GULCH	SALMON RESTORATION ASSN	27-Sep-96
1036-96	BIG RIVER NORTH FORK	SALMON TROLLERS MARKETING	27-Sep-96
1040-96	GARCIA RIVER	STORNETTA, LARRY	03-Oct-96
1047-96	PARKINSON GULCH TRIB	MOTE, TIM	02-Oct-96
1059-96	MILL CREEK	BAYLIE, LEROY	27-Sep-96
1079-96	ACKERMAN CREEK	KUNZLER, KEN	16-Oct-96
1086-96	RUSSIAN RIVER WEST FORK	JOHNSON, WILLIAM	05-Nov-96
1093-96	HOWELL CREEK	STEINMANN, CARL	08-Nov-96
1094-96	BIG RIVER	CLARK, JIM	17-Oct-96
1121-96	ALBION RIVER	STEINBUCK, ADAM	13-Nov-96
1134-96	TOM BELL CREEK	CEMR	16-Oct-96
1135-96	UNKNOWN	FETZER, DANIEL	02-Nov-96
1149-96	ANDERSON CREEK	HOPKINS, WALTER	05-Nov-96
1150-96	ROSS CREEK	FREDRICKS, RICHARD	04-Nov-96
1151-96	MOTE CREEK	FREDRICKS, RICHARD	04-Nov-96
1153-96	BROADDUS CREEK	MIHELCIC, PETE	05-Nov-96
1179-96	TEN MILE CREEK TRIBUTARY	ROSE, RON	25-Oct-96
1189-96	GETCHELL GULCH CREEK	WARNER, GREGG	05-Nov-96
1192-96	RUSSIAN RIVER UNNAMED TRIB	FORD, KEN	31-Oct-96
1198-96	PARLIN CREEK	FISH AND GAME	01-Nov-96
1201-96	MILL CREEK	BUICH, ROBERT	02-Nov-96
1232-96	TOWN CREEK	FISHER, JAMES	20-Feb-97

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1245-96	DOOLAN CREEK TRIB	MOUNTANOS, MARK	12-Dec-96
1271-96	RANCHERIC CREEK	ASH, TIM	18-Dec-96
0001-97	OUTLET CREEK	ROEDIGER, GENE	16-Jan-97
0041-97	MILL CREEK	BERRY, ED	18-Aug-97
0042-97	DEHAVEN CREEK UNKNOWN MARSH	HALE, JOAQUIN	27-Jan-97
0059-97	BIG RIVER	CROWELL, ANTHONY	05-Feb-97
0077-97	MC NAB CREEK	BARRETT, THOMAS A	12-Feb-97
0078-97	BIG RIVER	CHODER, BRUCE	14-Feb-97
0090-97	EEL RIVER SOUTH FORK	MALLORY, DOUGLAS	07-Mar-97
0100-97	RANCHERIA CREEK	HANELT, PETER G	15-Jun-97
0103-97	LITTLE JUAN CREEK	STEINBUCK, ADAM	07-Mar-97
0102-97	HOLLOW TREE CK UNNAMED TRIB	STEINBUCK, ADAM	07-Mar-97
0105-97	ANDERSON CREEK	ROSSI, EMIL	28-Mar-97
0115-97	NAVARRO RIVER NORTH FORK	BOY SCOUTS OF AMERICA	21-Feb-97
0127-97	FORSYTHE CREEK	TODD, KEN	20-Feb-97
0140-97	PUDDING CREEK	CALTRANS	01-Jul-97
0151-97	V-DITCH	FABIAN, MARK	25-Mar-97
0155-97	HOLLOW TREE CREEK TRIBUTARY	KENNEDY, CLIFTON E.	07-Mar-97
0161-97	BIG RIVER	MC MILLAN, JOHN PAUL	31-May-97
0162-97	RUSSIAN RIVER WEST BRANCH	TODD, KEN	06-Mar-97
0168-97	SHORT CREEK	RICE, JOE C.	15-Apr-97
0217-97	METTIC CREEK	CEMR	17-Mar-97
0218-97	RAMON CREEK	CEMR	17-Mar-97
0219-97	RUSSELBROOK CREEK	CEMR	17-Mar-97
0222-97	GARCIA RIVER	STORNETTA, LARRY	10-Apr-97
0246-97	DOOLEY CREEK	HIALT RANCH	24-Mar-97
0259-97	EEL RIVER SOUTH FORK	HINCKLEY, JONATHAN B	17-Apr-97
0260-97	REDWOOD CREEK	HINCKLEY, JONATHAN	16-Apr-97
0261-97	DAVIS CREEK	MC LELLAND, DOUG	07-Apr-97
0264-97	RUSSIAN RIVER	WHITE, AL	01-Apr-97
0271-97	TEN MILE CREEK	WEAVER, VICTOR C	21-Apr-97
0272-97	MIDDLE FORK EEL RIVER	ROWLAND, KEITH	17-May-97
0273-97	EEL RIVER TRIB	SCHIEFFER, CLARA	17-Apr-97
0287-97	EEL RIVER SOUTH FORK	MC CAULEY, DOUGLAS	28-Apr-97
0291-97	ROSS CREEK	GOTT, KENNETH N	02-May-97
0292-97	GARCIA RIVER UNNAMED TRIBS	GOTT, KENNETH N	01-May-97
0296-97	GARCIA NORTH FORK UNNAMED TRIB	BURNS, JOHN H JR	02-May-97
0309-97	VARIOUS	WOOD, KEN	07-May-97
0311-97	BUCKHORN CREEK	STRAESSLE, ALEX	05-May-97
0321-97	NAVARRO RIVER	PEDERSEN, CRAIG	05-May-97
0326-97	EEL RIVER SOUTH FORK	CHRISTIANSEN, STEPHEN	27-Apr-97
0341-97	DAVIS CREEK	VANDERHORST, STEVEN A	17-Apr-97
0369-97	GARCIA RIVER	STORNETTA, WALTER R	18-Apr-97
0372-97	VICHY/LTL GRIZZLY/SULPHUR CR	ASHOFF, GILBERT	19-May-97
0373-97	NAVARRO RIVER	GOWAN, JIM	14-Apr-97

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Mendocino County

0699-97	UNNAMED STREAM	ELSBREE, ANDREW	03-Jul-97
0700-97	SPANISH CANYON CREEK	NOYD, FRANK	16-Jul-97
0701-97	MARTIN CK,JAMES CK/NE BIG RIVE	BURNS, JOHN H JR	01-Jul-97
0715-97	NAVARRO RIVER UNNAMED TRIB	HESS, MARK S.	28-Jul-97
0733-97	GARCIA CREEK	KENDALL, VERNON	14-Jul-97
0751-97	TROUT CREEK TRIBUTARIES	ELSBREE, ANDREW	27-Aug-97
0753-97	DOUGHERTY CREEK	CALIFORNIA CONSERVATION	16-Jun-97
0754-97	MCCARVEY CREEK	CALIFORNIA CONSERVATION	26-Jun-97
0756-97	TEN MILE RIVER	MALLORY, DOUGLAS	02-Jul-97
0766-97	HATHAWAY CREEK	STORNETTA, LARRY	03-Jul-97
0767-97	CAVE CREEK	RICHARD, ROBERT M.	11-Jul-97
0779-97	BEAR PEN CYN/BURGER CRK UNNAME	SANDELIN, THOMAS (TOM)	11-Jul-97
0781-97	RUSSIAN RIVER	WHITE, BRIAN & HELEN	06-Aug-97
0784-97	EEL RIVER	MIHELCIC, PETE	20-Jul-97
0786-97	GARCIA RIVER TRIBUTARY	GAYTER, CHRIS	18-Jul-97
0789-97	DOOLAN & GIBSON CREEKS	JOHNSON, WILLIAM	11-Jul-97
0790-97	UNKNOWN	HISE, THOMAS	10-Jul-97
0800-97	FELIZ CREEK	RICHARDSON, TED	22-Aug-97
0802-97	UNKNOWN STREAM, MENDOCINO CO	SWEGLE, JEAN	06-Aug-97
0821-97	RANCHERIA CREEK	MATHIAS, ROBERT	11-Jul-97
0822-97	BURNS CREEK	FARRELL, DAVID	02-Aug-97
0824-97	BRUSH CREEK	STORNETTA, WALT	09-Jul-97
0835-97	MARTIN CREEK	FARRELL, DAVID E.	02-Aug-97
0870-97	ANDERSON CREEK	WALLACE, DAVE	09-Jul-97
0873-97	RUSSIAN RIVER	CROWFOOT, JANE	22-Jul-97
0879-97	EEL RIVER MIDDLE FORK	MCLELLAND, DOUG	21-Aug-97
0892-97	COLD CREEK	GUNTLY, JIM	01-Aug-97
0921-97	LITTLE RIVER	BRAUDRICK, PETER	31-Jul-97
0948-97	SALT HOLLOW UNNAMED TRIB	AKETSTROM, GARY	01-Aug-97
0965-97	JACK OF HEARTS CREEK	BRODESSER, MARK W.	22-Aug-97
0975-97	COLD CREEK TRIBUTARY	LOUISIANA PACIFIC	15-Aug-97
0981-97	COTTENEVA CREEK UNNAMED TRIB	SOPER, JAMES	22-Aug-97
0991-97	HARE CREEK/CASPAR CREEK	MALLORY, DOUG	08-Aug-97
1006-97	NOYO RIVER UNNAMED TRIBUTARIES	BALASSI, DENNIS	19-Aug-97
1011-97	RUSSIAN RIVER	WEGNER, DONALD F	13-Aug-97
1013-97	ROBINSON CREEK	PARDINI, BOB	21-Aug-97
1014-97	RANCHERIA CREEK	BURGER, BOB	15-Aug-97
1017-97	RUSSIAN RIVER	FETZER VINEYARDS	12-Aug-97
1020-97	WAGES CREEK	MC KINLEY, ED	25-Aug-97
1034-97	GARCIA RIVER TRIB	HOWELL, MICHAEL	05-Sep-97
1045-97	MILL CREEK	WATERS, WAYNE	24-Aug-97
1060-97	RUSSIAN RIVER	COX, JACK L	19-Sep-97
1062-97	RUSSIAN RIVER E. FK UNNAMED TB	PARKER, ROBERT V	30-Oct-97
1063-97	BURRIGHT CREEK	PARKER, ROBERT V	30-Oct-97
1064-97	RUSSIAN RIVER EAST FORK	PARKER, ROBERT V	30-Oct-97

Streambed Alteration Agreements
1993-2002
Mendocino County

1072-97	TEN MILE RIVER NORTH FORK	MALLORY, DOUG	18-Aug-97
1075-97	LAZY CREEK	CEMR	21-Aug-97
1095-97	GRIST & MILL CREEKS	POLSLEY, RAYMOND	18-Sep-97
1099-97	LITTLE NORTH FORK NAVARRO	CALIFORNIA CONSERV CORPS	07-Aug-97
1101-97	MARIPOSA CREEK	FREY, MATT	23-Aug-97
1110-97	WAGES CREEK	BARBER, TERRI	23-Aug-97
1118-97	CUMMINSKY CREEK & RUSSIAN RVR	ROSATI, MARIO	19-Sep-97
1129-97	WITHERAL CREEK	DENNISON, PETER	26-Aug-97
1163-97	RANCHERIA CREEK	PRONSOLINO, GUIDO A.	26-Sep-97
1171-97	OLSON GULCH CREEK	MONSCHKE, JACK	03-Oct-97
1197-97	ORRS CREEK	EIB, TERRY R.	19-Sep-97
1199-97	MILL CREEK	GRIEVE, RICHARD	09-Aug-97
1201-97	GARCIA RIVER	BOWLES, STEVE	11-Aug-97
1205-97	ALBION RIVER	CEMR	05-Sep-97
1206-97	STREETER CREEK	ENGBER, EVAN	04-Sep-97
1213-97	PETERSON CREEK	WHITELY, LANCE	16-Sep-97
1214-97	STALEY CREEK UNNAMED TRIB	VANDERHORST, STEVEN	18-Sep-97
1218-97	SCOTTS CREEK SOUTH FORK	BUREAU OF LAND MANAGEMENT	08-Sep-97
1228-97	RUSSIAN RIVER, EAST BRANCH	ANDERSON, RON	25-Sep-97
1229-97	SULPHUR CREEK	RAU, GEORGE C	25-Sep-97
1235-97	FELIZ CREEK	ASHURST, TOM	08-Sep-97
1234-97	GARCIA RIVER	DOBBINS, PETER	05-Sep-97
1232-97	BRANDON GULCH & N.FK OF S.FK	ANDERSON, MIKE	16-Sep-97
1287-97	EEL RIVER SOUTH FORK	BURGESS, LYLE	18-Sep-97
1300-97	RANCHERIA CREEK	BURGER, R. K.	22-Sep-97
1301-97	ANDERSON CREEK	MCCLURE, PAT	21-Sep-97
1340-97	MILL CREEK	GEIGER, BERNARD R	28-Sep-97
1321-97	RUSSIAN RIVER	FLIGHT RAIL CORP	15-Sep-97
1322-97	RUSSIAN RIVER WEST BRANCH	NORTHWESTERN PACIFIC RAIL	15-Sep-97
1347-97	EEL RIVER	SIMPSON, GREG	16-Sep-97
1349-97	ANDERSON CREEK	TEBBUTT, CHRIS	14-Sep-97
1350-97	ANDERSON CREEK	HIATT, WAYNE	03-Sep-97
1372-97	EEL RVR MIDDLE FK UNNAMED TRIB	GRIDER, DOUG	21-Aug-97
1373-97	EEL RVR MIDDLE FK UNNAMED TRIB	MOORE, RICHARD	09-Sep-97
1379-97	HAEHL CREEK	ADVANCED MANUFACTURING	18-Sep-97
1382-97	ROCK TREE CREEK	HEBARD, RAY	19-Sep-97
1391-97	ANDERSON CREEK	TITUS, DEAN	30-Sep-97
1394-97	MILL CREEK	LINDSEY, JIM	10-Oct-97
1396-97	HENSLEY CREEK	WELCH, MARK	22-Sep-97
1403-97	RANCHERIA CREEK	WANZER, DOUG	06-Oct-97
1406-97	ROBINSON CREEK	HATCH, STEPHEN G.	20-Sep-97
1407-97	NAVARRO RIVER UNNAMED TRIBUTAR	SEMR	24-Sep-97
1413-97	WAGES CREEK	BARBER, TERI	27-Oct-97

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1993-2002
Mendocino County

0403-98	RUSSIAN RIVER EAST BRANCH	MC FADDEN, EUGENE	07-May-98
0406-98	MILL CREEK	PARKER, R. V.	01-Jun-98
0032-98	DOOLEY CREEK	SYKES, HEIDI	01-Jul-98
0082-98	CASPER CREEK SOUTH FORK	BAXTER, WILLIAM TODD	19-Mar-98
0087-98	GARCIA RIVER & NO. FK & TRIBS.	MAXEY, DOUG	20-May-98
0599-98	DRY CREEK UNNAMED TRIB	HANSEN, STEVE	03-Aug-98
0798-98	HARE CREEK & WALTON GULCH TRIB	DUDLEY, JIM	27-Jul-98
0825-98	SPANISH CANYON CREEK	NOYD, FRANK	21-Aug-98
0826-98	GARCIA RIVER	STORNETTA, LARRY	21-Aug-98
0845-98	HOWARD CREEK	GRIGG, CHARLES & SALLY	13-Oct-98
0615-98	GARCIA RIVER	ENGBER, EVAN	22-Jul-98
0619-98	ROSEMAN CREEK TRIBUTARY	SHELLHORN, LANI	27-Jun-98
0626-98	HOWARD CRK/LAKE CLEON	MCKINNEY, JOHN	04-Dec-98
0631-98	SHORT CREEK	FISHER, JAMES	05-Aug-98
0632-98	STRING CREEK	LAWRASON, JESSE	02-Jul-98
0633-98	COTTANEVA CREEK UNNAMED TRIB	MEESE, DALE E.	01-Jun-98
0660-98	RUSSIAN RIVER	CROWFOOT, JANE	01-Jul-98
0661-98	RUSSIAN RIVER	LIGHTY, RUDY	22-Jul-98
0667-98	BEAR CREEK & TRIBS	HOVLAND, PATRICK	07-Aug-98
0676-98	MCDOWELL CREEK	MCDOWELL VALLEY VINEYARDS	02-Jul-98
0680-98	ALBION RIVER SO FORK	SWEELEY, JOHN P	23-Jul-98
0860-98	WAGES CREEK	BARBER, TERRI JOE	31-Jul-98
0872-98	NAVARRO RIVER SO BRANCH NO. FK	CCC	03-Aug-98
0876-98	WITHERELL CREEK	PARKER, R. V.	11-Sep-98
0893-98	HOWARD CREEK	PARKER, R. V.	11-Sep-98
0896-98	MOAT CREEK UNKNOWN TRIB	WATERS CONSTRUCTION INC	14-Aug-98
0914-98	ELK CREEK	CCC	07-Aug-98
0915-98	COOK CREEK	CCC	07-Aug-98
0920-98	FELIZ CREEK	DEVINCENZI, JOHN	30-Aug-98
0963-98	CONKLIN CREEK	WATERS CONSTRUCTION INC	25-Aug-98
0967-98	TEN MILE CREEK	BARSOTTI, SUSIE	13-Aug-98
0078-98	STRING CREEK	BERKOWITZ, RON	17-Feb-98
0079-98	SHORT CREEK	GEIGER, ERIK	11-Mar-98
0101-98	DAVIS CREEK UNNAMED TRIBUTARY	CA DEPT. OF FORESTRY	24-Feb-98
0115-98	ALBION RIVER	WOESSNER, JON	15-Apr-98
0141-98	ROCKPILE CREEK	RAMALEY, JOHN	31-Mar-98
0152-98	MCNAB CREEK	FETZER, JOHN	15-May-98
0156-98	ROCK CREEK	BURMESTER, DANIEL	01-Apr-98
0168-98	GARCIA RIVER	SHIVELY, RUSSELL S.	08-Oct-98
0169-98	ELK CREEK	SHIVELY, RUSSELL S.	20-Apr-98
0170-98	NAVARRO RIVER	SHIVELY, RUSSELL S.	20-Apr-98
0171-98	OUTLET CREEK	GREEN, JON	24-Jun-98
0975-98	ROBINSON CREEK UNNAMED TRIB	NUNES, GLAYDES C.	29-Aug-98
0979-98	BLACK BUTTE RIVER	BLACK BUTTE COUNTRY STORE	18-Aug-98
1034-98	RUSSIAN RIVER	FORD, MELVIN W.	29-Sep-98

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1993-2002
Mendocino County

0335-99	NOYO RIVER	FRYKMAN, DAVID	15-Apr-99
0336-99	NOYO RIVER TRIBUTARIES	FRYKMAN, DAVID	15-Apr-99
0350-99	NOYO RIVER TRIBUTARY	RICHARDS, GARY	01-Apr-99
0351-99	DAVIS CREEK	MCLELLAND, DOUG	01-Apr-99
0359-99	RUSSIAN RIVER	JAHNKE, L GORDON	26-Apr-99
0362-99	TOMKI CREEK UNNAMED TRIBS	CHECKAL, GREG	12-May-99
0363-99	TENMILE RIVER UNKNOWN CULVERT	MOLNAR, MELINDA	28-Jun-99
0365-99	THOMAS CREEK TRIBUTARIES	RICE, JOE C.	07-Apr-99
0374-99	MCCLURE CREEK	BARTOLOMEI, H. T.	14-Apr-99
0376-99	FISH ROCK GULCH	STONEMAN, CHARLL K.	28-May-99
0394-99	RATTLESNAKE & EEL RVR SF	BAILEY, AGNES J.	15-Jun-99
0403-99	NOYO RIVER TRIB	PEIRCE, LELAND	16-Apr-99
0406-99	BIG RIVER TRIBUTARIES	REMPEL, ROBBIN W.	28-Apr-99
0421-99	BEAR CREEK UNNAMED/NAVARRO NF	BRINKERHOFF, RON	10-Jul-99
0430-99	PETERSON CREEK	BROWN, STEVENSON	22-Apr-99
0432-99	INDIAN CREEK	SOLINSKY, WILLIAM D	27-Sep-99
0474-99	GRIST CREEK	FETZER, ROBERT L.	15-Jun-99
0479-99	WOLF CREEK	ROSALES, HAWK	30-Apr-99
0480-99	TEN MILE CREEK	ENGBER, EVAN	29-Apr-99
0484-99	MCDOWELL CREEK	HANSEN, STEVEN	25-May-00
0582-99	NAVARRO RIVER TRIBS	MENDOCINO REDWOOD COMPANY	04-Aug-99
0613-99	RUSSIAN RIVER CANAL EAST FORK	MCFADDEN, EUGENE F. M.	31-Aug-99
0621-99	CAMP 29 GULCH	MALLORY, DOUGLAS C.	22-Jun-99
0638-99	MILL CREEK/SHORT&GRIST CREEKS	MENDOCINO CO. TRANSPORT	22-Jun-99
0649-99	FLYNN CREEK	CCC	14-Jun-99
0650-99	ALBION RIVER SOUTH FORK	CCC	14-Jun-99
0651-99	COOK CREEK	CCC	14-Jun-99
0652-99	HOLLOW TREE CREEK	CCC	14-Jun-99
0653-99	BOND CREEK	CCC	14-Jun-99
0654-99	DAUGHERTY CREEK	CCC	14-Jun-99
0655-99	GATES CREEK	CCC	14-Jun-99
0656-99	NAVARRO RIVER SB NF	CCC	14-Jun-99
0657-99	MCCARVEY CREEK	CCC	14-Jun-99
0658-99	BOTTOM CREEK	CCC	14-Jun-99
0660-99	KAWI CREEK	SHERWOOD VALLEY RANCHERIA	15-Jun-99
0665-99	RUSSIAN RIVER	REDWOOD VALLEY C O WATER	20-Sep-99
0666-99	UNKNOWN	NELSON & SONS, INC	18-Jun-99
0699-99	ROCKTREE/TOMKI/BAKER 40 CRKS	MCKINSTRY, STEVE	03-Aug-99
0700-99	ALBION RIVER UNNAMED	PHILBRICK LOGGING INC.	13-Jul-99
0710-99	NOYO RIVER SO FORK	BURNS, JOHN H. JR	19-Jul-99
0715-99	REDWOOD CREEK	CCC	22-Jun-99
0716-99	HUCKLEBERRY CREEK	CCC	22-Jun-99
0722-99	CUMMINSKEY CREEK	NAYES, BILL	12-Jan-00
0723-99	WILLIAMS CREEK	SMYTHE, THOMAS E.	19-Jul-99
0770-99	RATTLESNAKE CREEK	LIVSEY, CHARLES	05-Oct-99
0771-99	NAVARRO RIVER	MENDOCINO REDWOOD COMPANY	13-Aug-99

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Mendocino County

R3-2000-0349	EEL RIVER MIDDLE FORK	PARNUM PAVING, INC.	11-Sep-00
R3-2000-0350	EEL RIVER MIDDLE FORK	PARNUM PAVING, INC.	11-Sep-00
R3-2000-0351	RUSSIAN RIVER	PARNUM PAVING, INC.	11-Sep-00
R3-2000-0285	RAMON & METTICK CREEK	SCRIVEN, JOSEPH	25-Aug-00
R3-2000-0364	RUSSIAN RIVER	HILDRETH, MIKE	02-Apr-01
R3-2000-0365	RUSSIAN RIVER	HILDRETH, MIKE	02-Apr-01
R3-2000-0366	FELIZ CREEK	RICHARDSON, DIANE	30-May-02
R3-2000-0383	ELK CREEK	ANDERSON,JOHN	01-Sep-00
R3-2000-0385	NAVARRO RIVER	WOESSNER, JON	03-Jul-00
R3-2000-0370	WAGES CREEK TRIBUTARY	MALLORY, DOUGLAS	29-Aug-00
R3-2000-0407	GARCIA RIVER	ENGBER, EVAN	29-Aug-00
R3-2000-0422	DRY CREEK	BARR, KEVIN & LINDA	04-Oct-00
R3-2000-0423	DRY CREEK	BARR, KEVIN & LINDA	01-Sep-00
R3-2000-0128	NAVARRO RIVER	HALLER, MELODY OR PAUL	30-Aug-00
R3-2000-0139	COLD CREEK	EMBREE, LISA	21-Jun-00
R3-2000-0145	ACKERMANN CREEK UNNAMED TRIB	FIDLER, MICHAEL	06-Apr-00
R3-2000-0146	RUSSIAN RIVER	FIDLER, MICHAEL	27-Sep-00
R3-2000-0187	RANCHERIA CREEK	RICE, RONALD	06-Apr-00
R3-2000-0188	RUSSIAN RIVER	BURKE, KIERAN	17-Aug-00
R3-2000-0231	JOHN SMITH CREEK TRIBUTARY	BORRAS, THEMBI	15-May-00
R3-2000-0444	HOLLOW TREE & VARIOUS CREEKS	MEESE, DALE	01-Sep-00
R3-2000-0447	GARCIA RIVER	STORNETTA, LARRY,JUDITH	20-Sep-00
R3-2000-0452	REDWOOD CREEK	RIBAR, PETER	01-Sep-00
R3-2000-0454	ORRS CREEK	SCRIVEN, JOSEPH	02-Aug-00
R3-2000-0455	COLD CREEK TRIBUTARY	JOE CINEK CONSULTING FORE	29-Aug-00
R3-2000-0456	PARDALOE CREEK	TOWN, CHRIS	30-Aug-00
R3-2000-0471	GARCIA RIVER	JACOBSZOON, RANDY	28-Jun-00
R3-2000-0475	HULLS VALLEY CREEK	SCRIVEN, JOSEPH	15-Sep-00
R3-2000-0479	HARE CREEK TRIBUTARY	HAYTER, CHRIS	29-Aug-00
R3-2000-0480	MCNAB CREEK TRIBUTARY	FETZER, JAMES	28-Aug-00
R3-2000-0507	RUSSIAN RIVER TRIBUATRIES	WALTER, RICH	08-Aug-00
R3-2000-0534	RUSSIAN RVR TRIB BORING S-120	WALTER, RICH	11-Aug-00
R3-2000-0535	RUSSIAN RVR TRIB BORING S-121	WALTER, RICH	11-Aug-00
R3-2000-0536	RUSSIAN RVR TRIB BORING S-126	WALTER, RICH	11-Aug-00
R3-2000-0537	RUSSIAN RVR TRIB BORING S-127	WALTER, RICH	11-Aug-00
R3-2000-0539	RUSSIAN RVR TRIB BORING S-164	WALTER, RICH	11-Aug-00
R3-2000-0540	RUSSIAN RVR TRIB BORING S-165	WALTER, RICH	11-Aug-00
R3-2000-0541	RUSSIAN RVR TRIB BORING S-166	WALTER, RICH	11-Aug-00
R3-2000-0542	DIRECTIONAL BORING B S-121	WALTER, RICH	11-Aug-00
R3-2000-0543	RUSSIAN RVR TRIB BORING S-173	WALTER, RICH	11-Aug-00

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Mendocino County

0403-98	RUSSIAN RIVER EAST BRANCH	MC FADDEN, EUGENE	07-May-98
0406-98	MILL CREEK	PARKER, R. V.	01-Jun-98
0032-98	DOOLEY CREEK	SYKES, HEIDI	01-Jul-98
0082-98	CASPER CREEK SOUTH FORK	BAXTER, WILLIAM TODD	19-Mar-98
0087-98	GARCIA RIVER & NO. FK & TRIBS.	MAXEY, DOUG	20-May-98
0599-98	DRY CREEK UNNAMED TRIB	HANSEN, STEVE	03-Aug-98
0798-98	HARE CREEK & WALTON GULCH TRIB	DUDLEY, JIM	27-Jul-98
0825-98	SPANISH CANYON CREEK	NOYD, FRANK	21-Aug-98
0826-98	GARCIA RIVER	STORNETTA, LARRY	21-Aug-98
0845-98	HOWARD CREEK	GRIGG, CHARLES & SALLY	13-Oct-98
0615-98	GARCIA RIVER	ENGBER, EVAN	22-Jul-98
0619-98	ROSEMAN CREEK TRIBUTARY	SHELLHORN, LANI	27-Jun-98
0626-98	HOWARD CRK/LAKE CLEON	MCKINNEY, JOHN	04-Dec-98
0631-98	SHORT CREEK	FISHER, JAMES	05-Aug-98
0632-98	STRING CREEK	LAWRASON, JESSE	02-Jul-98
0633-98	COTTANEVA CREEK UNNAMED TRIB	MEESE, DALE E.	01-Jun-98
0660-98	RUSSIAN RIVER	CROWFOOT, JANE	01-Jul-98
0661-98	RUSSIAN RIVER	LIGHTY, RUDY	22-Jul-98
0667-98	BEAR CREEK & TRIBS	HOVLAND, PATRICK	07-Aug-98
0676-98	MCDOWELL CREEK	MCDOWELL VALLEY VINEYARDS	02-Jul-98
0680-98	ALBION RIVER SO FORK	SWEELEY, JOHN P	23-Jul-98
0860-98	WAGES CREEK	BARBER, TERRI JOE	31-Jul-98
0872-98	NAVARRO RIVER SO BRANCH NO. FK	CCC	03-Aug-98
0876-98	WITHERELL CREEK	PARKER, R. V.	11-Sep-98
0893-98	HOWARD CREEK	PARKER, R. V.	11-Sep-98
0896-98	MOAT CREEK UNKNOWN TRIB	WATERS CONSTRUCTION INC	14-Aug-98
0914-98	ELK CREEK	CCC	07-Aug-98
0915-98	COOK CREEK	CCC	07-Aug-98
0920-98	FELIZ CREEK	DEVINCENZI, JOHN	30-Aug-98
0963-98	CONKLIN CREEK	WATERS CONSTRUCTION INC	25-Aug-98
0967-98	TEN MILE CREEK	BARSOTTI, SUSIE	13-Aug-98
0078-98	STRING CREEK	BERKOWITZ, RON	17-Feb-98
0079-98	SHORT CREEK	GEIGER, ERIK	11-Mar-98
0101-98	DAVIS CREEK UNNAMED TRIBUTARY	CA DEPT. OF FORESTRY	24-Feb-98
0115-98	ALBION RIVER	WOESSNER, JON	15-Apr-98
0141-98	ROCKPILE CREEK	RAMALEY, JOHN	31-Mar-98
0152-98	MCNAB CREEK	FETZER, JOHN	15-May-98
0156-98	ROCK CREEK	BURMESTER, DANIEL	01-Apr-98
0168-98	GARCIA RIVER	SHIVELY, RUSSELL S.	08-Oct-98
0169-98	ELK CREEK	SHIVELY, RUSSELL S.	20-Apr-98
0170-98	NAVARRO RIVER	SHIVELY, RUSSELL S.	20-Apr-98
0171-98	OUTLET CREEK	GREEN, JON	24-Jun-98
0975-98	ROBINSON CREEK UNNAMED TRIB	NUNES, GLAYDES C.	29-Aug-98
0979-98	BLACK BUTTE RIVER	BLACK BUTTE COUNTRY STORE	18-Aug-98
1034-98	RUSSIAN RIVER	FORD, MELVIN W.	29-Sep-98

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1993-2002
Mendocino County

1062-98	VARIOUS	PARKER, R. V.	31-Aug-98
1076-98	ROCKTREE CREEK	PUTNAM, TERRY	27-Aug-98
1086-98	RUSSIAN RIVER EAST BRANCH	MCFADDIN, DENNIS	28-Aug-98
0181-98	MILL CREEK UNNAMED TRIB	HURT, BRIAN	01-Apr-98
0197-98	RANCHERIA CREEK	HANELT, VALERIE	27-Mar-98
0198-98	SHIELDS CREEK	MENDOCINO COUNTY TRANSP.	01-May-98
0207-98	RUSSIAN RIVER UNNAMED STREAM	HANSEN, STEVE	01-Jun-98
0219-98	RUSSIAN RIVER	BRADFORD, PETER	26-Apr-98
0222-98	RANCHIERA CREEK	HANELT, PETER	21-Apr-98
0229-98	RUSSIAN RIVER	BELLOWS, FRED A.	30-Apr-98
0233-98	RUSSIAN RIVER WEST FORK	GOMES, STEVEN L.	15-May-98
1238-98	TEN MILE RIVER SOUTH FK	CEMR	17-Sep-98
1245-98	RUSSIAN GULCH CREEK	SHANNON, GARY	25-Sep-98
1261-98	RUSSIAN RIVER	HENWOOD, RICHARD	09-Oct-98
1279-98	RUSSIAN RIVER	ASHLEY, LENA	30-Sep-98
1284-98	MILL CREEK & MOORE CREEK	PETSCH, KAROL	30-Sep-98
1334-98A	CAMP CREEK	CEMR	25-Sep-98
1335-98	RUSSIAN RIVER EAST FORK	AIR, JACK	25-Sep-98
1343-98	TEN MILE RIVER/LITTLE VLY CRK	KRACKHER, GERALD	25-Sep-98
1348-98	TOWN CREEK	FISHER, JAMES	04-Oct-98
1349-98	FISH ROCK GLUCH	SYKES, HEIDI	13-Oct-98
1350-98	NORDEN GULCH	WOESSNER, JON	28-Oct-98
1351-98	ALLEN CREEK	BARBER, TERI JO	08-Oct-98
1352-98	RUSSIAN RIVER UNNAMED TRIB	HANSEN, STEVEN	10-Nov-98
1353-98	CAHTO CREEK	SILVA, JARED	28-Sep-98
1354-98	DOG TOWN CREEK	HANSEN, STEVE	01-Jan-00
0959-98	HOWARD CREEK	BARBER, TERI	12-Aug-98
0960-98	LITTLE RIVER	BARBER, TERI	12-Aug-98
1001-98	CAVE CREEK	TINDLE, RAY	19-Sep-98
1010-98	FELIZ CREEK	ASHURST, TOM	25-Aug-98
1043-98	MILL CREEK GARCIA DRAINAGE	GRASS, ALAN	28-Aug-98
1050-98	ORRS CREEK	EIB, TERRY R.	25-Sep-98
1136-98	ROBINSON CREEK	REDDING, DAVID	15-Sep-98
1140-98	WAGES CREEK	BARBER, TEN JO	15-Sep-98
1150-98	HENSLEY CREEK	FRANZ, RON	08-Sep-98
0011-98	DIGGER CREEK	PEIRCE, LELAND	06-Jan-98
0243-98	STREETER CREEK	REFORT, CLARK & DIANNE	02-Jun-98
0251-98	SODA CREEK	KENT, NICOLAS	27-Apr-98
0254-98	NAVARRO RIVER NORTH FORK	BOY SCOUTS OF AMERICA	07-Apr-98
0264-98	ROBINSON CREEK & TRIBUTARIES	HOVLUND, PATRICK	21-Apr-98
0293-98	RUSSIAN RIVER UNNAMED STREAM	MILOVINA, JAMES	06-Jun-98
0296-98	RUSSIAN RIVER UNNAMED CREEK	BERGERA, NICK	23-Apr-98
0340-98	RUSSIAN RIVER WEST BRANCH	BUTOW, DON	24-Apr-98

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0343-98	ALBION RIVER	WOESSNER, JON	09-Jun-98
0422-98	BRUSH CREEK/ALDER CREEK	SHIVELY, RUSSELL S	17-Jul-98
0423-98	EEL RIVER SF UNNAMED STREAM	SMYTHE, TOM	01-Jun-98
1408-98	FELIZ CREEK	BRUTOCAO, STEVE	07-Dec-98
1484-98	RUSSIAN RIVER WEST FORK	GOMES, STEVEN L	21-Oct-98
1504-98	MILL CREEK	MENDOCINO COUNTY ROAD DEP	19-Oct-98
1466-98	BIG ROCK CREEK	ENGBER, EVAN	13-Oct-98
0328-98	GREENWOOD CREEK	SHIVELY, RUSSELL S.	10-Jun-98
0334-98	ALDER CREEK	HAY, BILL	23-Apr-98
0440-98	ALBION RIVER UNNAMED TRIBUTARY	TOWN, CHRIS	26-May-98
0441-98	BROADDUS CREEK	TOWN, CHRIS	26-May-98
0442-98	BROADDUS CREEK	BOZZO, JAMES	15-Jun-98
0448-98	ALDER CREEK UNNAMED TRIB	MOTL, TIM	19-Aug-98
0449-98	MILL CREEK	FORBES, RANDALL	24-Jun-98
0470-98	GIBSON, ORR, & DOOLIN CREEKS	KENNEDY, RICK	30-Aug-98
0471-98	RANCHERIA CREEK	MATHIAS, BOB	23-May-98
0477-98	BIG RIVER	WEGER INTERESTS, LTD.	05-Jun-98
0478-98	RUSSIAN RIVER	LOVIN, SKIP	27-Jul-98
0488-98	MILL CREEK	JAMISON, ALLAN E	11-Jun-98
0494-98	LAZY CREEK	CEMR	15-Jun-98
0495-98	ELK CREEK	CEMR	15-Jun-98
0496-98	BIG RIVER SO FK TRIB	BRINKERHOFF, RON	02-Jun-98
0497-98	BIG RIVER SO FK TRIB	BRINKERHOFF, RON	02-Jun-98
0510-98	GARCIA RIVER	STORNETTA, LARRY	09-Jun-98
0511-98	SPANISH CREEK	CAUGHEY, LYNN	09-Jun-98
0512-98	CEMETARY CREEK	PARDINI, DON	15-Jun-98
0513-98	BIG RIVER	BRINKERHOFF, RON	04-Jun-98
0514-98	NOYO RIVER NORTH FORK	BRINKERHOFF, RON	04-Jun-98
0515-98	CASPAR CREEK NORTH & SOUTH FK	HENRY, NORM	11-Jul-98
1166-98	MILL CREEK	EPSTEIN, RON	07-Oct-98
1167-98	MORRISON CREEK	SKADE, HENRY	20-Oct-98
1168-98	DOOLEY CREEK	REED, WILLIAM T.	28-Oct-98
1186-98	ROBINSON CREEK	MOHR, ALAN	15-Sep-98
1187-98	MILL/BAECHTEL/OUTLET CREEKS	CALIFORNIA CONSERVATION C	25-Sep-98
1188-98	OUTLET CREEK	SLOTA, DENNIS	17-Sep-98
1191-98	SODA CREEK UNKNOWN TRIB	ASHLEY, LENA	20-Sep-98
1192-98	FORSYTHE CREEK UNKNOWN TRIB	ASHLEY, LENA	20-Sep-98
1252-98	SHORT CREEK	BROWN, STAN	11-Oct-98
1303-98	MILL CREEK UNNAMED TRIB	SICULAR, DANIEL	19-Aug-99
1562-98	SULPHUR CREEK	RAU, GEORGE/RAU & ASSOC	08-Dec-98
1563-98	ACKERMAN CREEK	MENDOCINO REDWOOD COMPANY	13-Apr-99
1564-98	NAVARRO RIVER NF UNNAMED TRIB	MENDOCINO REDWOOD COMPANY	13-Apr-99
1565-98	VARIOUS CREEKS	MENDOCINO REDWOOD COMPANY	13-Mar-99
1569-98	TOWN CREEK	WILSON, CHRIS	30-Oct-98
1617-98	ROCKTREE CREEK & TRIB	MADIGAN, KERRY	09-Nov-98

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Mendocino County

1618-98	BROADDUS CREEK	CA WESTERN RAILROAD	11-Nov-98
1628-98	KELLY GULCH	REMPEL, ROB	20-Nov-98
1217-98	STANDLEY CREEK	CEMR	16-Sep-98
1310-98	COLD CREEK	PETSCH, KAROL	24-Nov-98
1311-98	MILL CREEK	VANN, RONALD	11-Oct-98
1383-98	MC CARVEY CREEK	CCC	01-Oct-98
0358-98	EEL RIVER SOUTH FORK	STEPHENS, THOMAS N	28-May-98
0519-98	MURPHY CREEK	HOLMGREN, LARRY K.	26-Jun-98
0520-98	DOTY CREEK	DINGMAN, ROGER	14-Jun-98
0533-98	INDIAN CREEK	SOLINSKY, WILLIAM	25-Jun-98
0544-98	WAGES CREEK	STENSGARD, MARGARET	19-Jun-98
0545-98	EEL RIVER MIDDLE FORK	MCLELLAND, DOUG	15-Jul-98
0546-98	RUSSIAN RIVER	MCLELLAND, DOUG	26-Jun-98
0547-98	EEL RIVER MAIN	MCLELLAND, DOUG	06-Jul-98
0557-98	TEN MILE RIVER SF UNNAMED TRIB	MALLORY, DOUG	12-Jun-98
0563-98	WAGES CREEK	MCKINLEY, ED	24-Sep-98
0589-98	GARCIA RIVER/ALDER & BRUSH CRK	STORNETTA, WALT	18-Jun-98
0590-98	NOYO RIVER SOUTH FORK	MALLORY, DOUG	18-Jun-98
0591-98	BEAR HAVEN CREEK SO. FORK	MALLORY, DOUG	18-Jun-98
1230-98	ROCKPILE CREEK	RAMAKY, JOHN	14-Sep-98
1231-98	EEL RIVER NF TRIB	CINEK, JOE	03-Nov-98
1404-98	MALLO PASS	SHIVELY, RUSSELL S	28-Oct-98
1444-98	COTTONEVA SOUTH FORK	MEESE, DALE E	22-Oct-98
1530-98	EEL RIVER MAIN STEM	STEINER ENVIRON	23-Oct-98
1532-98	BIG ROCK CREEK	GEISLER, GENE	24-Oct-98
1536-98	RUSSIAN RIVER UNNAMED STREAM	KUWATCH, ED	03-Dec-98
1552-98	DOOLAN CREEK	WIPF, ERNEST	29-Oct-98
1554-98	SULFER CREEK	GRIFFIN, TOMMY GENE	23-Nov-98
1595-98	RUSSIAN RIVER EAST BRANCH	OVERFELDT, HANK	04-Nov-98
1604-98	RUSSIAN RIVER	SKADE, HANK	24-Nov-98
0734-98	EEL RIVER MIDDLE FK	EN TENA INC	15-Jul-98
0740-98	GUALALA, NORTH FORK	KELLY, SCOTT	10-Aug-98
0744-98	STREETES CREEK	ENGBER, EVAN	15-Jul-98
0745-98	LONG BRANCH	SMITH, LELAND J	16-Aug-98
0747-98	LONG VALLEY CREEK	MCCLELLAN, ARCHIE	29-Jul-98
0751-98	GRIST CREEK MILL CREEK	POLSLEY, RAYMOND	27-Jul-98
0760-98	GUALALA RIVER	BROWN, DANIEL E	22-Aug-98
0766-98	BRUSH CREEK/MILL CREEK	HICKLEY, JONATHAN	23-Jul-98
0767-98	MILL CREEK	HICKLEY, JONATHAN	23-Jul-98
0777-98	JACK OF HEARTS CREEK	LYDA, GREG	10-Aug-98
0784-98	HAYWORTH CREEK	FRYKMAN, DAVID	31-Jul-98
0795-98	CONN CREEK	CEMR	23-Jul-98
0796-98	MC CLURE CREEK	BARTOLOMEI, RAY	24-Jul-98
1657-98	GREENWOOD CREEK	YOUNGER, RANDY	17-Nov-98
1659-98	EEL RIVER SOUTH FORK	KRACHER, GERALD	19-Nov-98
1665-98	NOYO RIVER	TATMAN, KAREN	14-Jan-99
1668-98	RUSSIAN RIVER	DOLAN, PAUL E	09-Dec-98

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1676-98	RUSSIAN RIVER	DUTRA, FRANK	13-Jan-99
1684-98	MITCHELL CREEK	SHANDEL, NORM	12-Dec-98
1716-98	FELIZ CREEK	STEPHEN, TONY	23-Feb-99
1736-98	EEL RIVER/LK PILLSBURY--POTER	PG&E (POTTER VALLEY PROJE	22-Dec-98
0035-99	BIG RIVER	CAYLER, PAUL	09-Jan-99
0014-99	RUSSIAN RIVER WEST BRANCH	UKIAH ROD & GUN CLUB	10-Jan-99
0015-99	RUSSIAN RIVER	PIPER, TOM	13-Jan-99
0001-99	RUSSIAN RIVER	LA MALFA, RICHARD	03-Feb-99
0028-99	RUSSIAN RIVER	EMBRE, LISA	01-Feb-99
0066-99	RUSSIAN RIVER UNNAMED CREEK	PARKER, R. V.	22-Feb-99
0017-99	MILL CREEK	PARKER, R. V.	13-Jan-99
0062-99	RUSSIAN RIVER	SIMON, RICHARD	06-Oct-99
0080-99	JOHNS GULCH	MALLORY, DOUGLAS C	31-Mar-99
0189-99	SCHOOLHOUSE CREEK	LANCE, LAWRENCE & MARY	29-Apr-99
0190-99	RUSSIAN RIVER	THOMAS, JOHN	30-Apr-99
0191-99	RUSSIAN RIVER	THOMAS, JOHN	30-Apr-99
0192-99	RUSSIAN RIVER	THOMAS, JOHN	30-Apr-99
0225-99	RUSSIAN RIVER WEST FORK	JOHNSON, WILLIAM	18-Mar-99
0231-99	RUSSIAN RIVER	JOHNSON, WILLIAM	18-Mar-99
0263-99	ALBION RIVER	MACKAY, ROBERT F.	20-Apr-99
0264-99	RUSSIAN RIVER	BURKE, KIERAN C.	30-Apr-99
0265-99	RANCHERIA & YALE CREEKS	HIATT, CHARLES	13-Apr-99
0280-99	MILL CREEK	JOHNSON, WARREN A.	30-Jul-99
0281-99	DOOLEY CREEK	REED, WILLIAM T.	17-Apr-99
0297-99	RUSSIAN RIVER	JOHNSON, WILLIAM	20-May-99
0298-99	RUSSIAN RIVER WEST FORK	JOHNSON, WILLIAM	20-May-99
0299-99	RUSSIAN RIVER WEST FORK	JOHNSON, WILLIAM	20-May-99
0300-99	REDWOOD CREEK	MALLORY, DOUG	13-Apr-99
0301-99	BIG RIVER	MALLORY, DOUG	15-Apr-99
0302-99	PIERCY CREEK	MALLORY, DOUG	26-Apr-99
0303-99	CAMPBELL CREEK	MALLORY, DOUG	15-Apr-99
0304-99	INDIAN CREEK	MALLORY, DOUG	26-Apr-99
0305-99	TEN MILE LITTLE N. FK	MALLORY, DOUG	15-Apr-99
0306-99	EEL RIVER SOUTH FORK	MALLORY, DOUG	23-Apr-99
0316-99	NOYO RIVER/NEWMAN GULCH	MALLORY, DOUG	23-Apr-99
0176-99	EEL RIVER MIDDLE FORK	ROWLAND, KEITH A	20-Jul-99
0177-99	ROBINSON CREEK	KELLY, SCOTT	30-Mar-99
0178-99	ELK PRAIRIE CREEK	KELLY, SCOTT	30-Mar-99
0181-99	DOOLAN CREEK	WIPF, ERNEST	25-Mar-99
0183-99	INDIAN CREEK	HARTLIP, THOMPSON L.	23-Mar-99
0323-99	GARCIA RIVER	STORNETTA, LARRY	17-Jun-99
0324-99	RUSSIAN RIVER	NELSON, JIM D.	29-Apr-99
0330-99	ALBION RIVER	WOESSNER, JON	23-Apr-99
0331-99	ALBION RIVER	WOESSNER, JON	21-Apr-99
0332-99	TEN MILE RIVER CLARK FORK TRIB	MALLORY, DOUG	15-Apr-99
0333-99	TEN MILE RIVER CLARK FORK TRIB	MALLORY, DOUG	15-Apr-99
0334-99	NOYO RIVER	KRACHER, GERALD	23-Apr-99

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0335-99	NOYO RIVER	FRYKMAN, DAVID	15-Apr-99
0336-99	NOYO RIVER TRIBUTARIES	FRYKMAN, DAVID	15-Apr-99
0350-99	NOYO RIVER TRIBUTARY	RICHARDS, GARY	01-Apr-99
0351-99	DAVIS CREEK	MCLELLAND, DOUG	01-Apr-99
0359-99	RUSSIAN RIVER	JAHNKE, L GORDON	26-Apr-99
0362-99	TOMKI CREEK UNNAMED TRIBS	CHECKAL, GREG	12-May-99
0363-99	TENMILE RIVER UNKNOWN CULVERT	MOLNAR, MELINDA	28-Jun-99
0365-99	THOMAS CREEK TRIBUTARIES	RICE, JOE C.	07-Apr-99
0374-99	MCCLURE CREEK	BARTOLOMEI, H. T.	14-Apr-99
0376-99	FISH ROCK GULCH	STONEMAN, CHARLL K.	28-May-99
0394-99	RATTLESNAKE & EEL RVR SF	BAILEY, AGNES J.	15-Jun-99
0403-99	NOYO RIVER TRIB	PEIRCE, LELAND	16-Apr-99
0406-99	BIG RIVER TRIBUTARIES	REMPEL, ROBBIN W.	28-Apr-99
0421-99	BEAR CREEK UNNAMED/NAVARRO NF	BRINKERHOFF, RON	10-Jul-99
0430-99	PETERSON CREEK	BROWN, STEVENSON	22-Apr-99
0432-99	INDIAN CREEK	SOLINSKY, WILLIAM D	27-Sep-99
0474-99	GRIST CREEK	FETZER, ROBERT L.	15-Jun-99
0479-99	WOLF CREEK	ROSALES, HAWK	30-Apr-99
0480-99	TEN MILE CREEK	ENGBER, EVAN	29-Apr-99
0484-99	MCDOWELL CREEK	HANSEN, STEVEN	25-May-00
0582-99	NAVARRO RIVER TRIBS	MENDOCINO REDWOOD COMPANY	04-Aug-99
0613-99	RUSSIAN RIVER CANAL EAST FORK	MCFADDEN, EUGENE F. M.	31-Aug-99
0621-99	CAMP 29 GULCH	MALLORY, DOUGLAS C.	22-Jun-99
0638-99	MILL CREEK/SHORT&GRIST CREEKS	MENDOCINO CO. TRANSPORT	22-Jun-99
0649-99	FLYNN CREEK	CCC	14-Jun-99
0650-99	ALBION RIVER SOUTH FORK	CCC	14-Jun-99
0651-99	COOK CREEK	CCC	14-Jun-99
0652-99	HOLLOW TREE CREEK	CCC	14-Jun-99
0653-99	BOND CREEK	CCC	14-Jun-99
0654-99	DAUGHERTY CREEK	CCC	14-Jun-99
0655-99	GATES CREEK	CCC	14-Jun-99
0656-99	NAVARRO RIVER SB NF	CCC	14-Jun-99
0657-99	MCCARVEY CREEK	CCC	14-Jun-99
0658-99	BOTTOM CREEK	CCC	14-Jun-99
0660-99	KAWI CREEK	SHERWOOD VALLEY RANCHERIA	15-Jun-99
0665-99	RUSSIAN RIVER	REDWOOD VALLEY C O WATER	20-Sep-99
0666-99	UNKNOWN	NELSON & SONS, INC	18-Jun-99
0699-99	ROCKTREE/TOMKI/BAKER 40 CRKS	MCKINSTRY, STEVE	03-Aug-99
0700-99	ALBION RIVER UNNAMED	PHILBRICK LOGGING INC.	13-Jul-99
0710-99	NOYO RIVER SO FORK	BURNS, JOHN H. JR	19-Jul-99
0715-99	REDWOOD CREEK	CCC	22-Jun-99
0716-99	HUCKLEBERRY CREEK	CCC	22-Jun-99
0722-99	CUMMINSKEY CREEK	NAYES, BILL	12-Jan-00
0723-99	WILLIAMS CREEK	SMYTHE, THOMAS E.	19-Jul-99
0770-99	RATTLESNAKE CREEK	LIVSEY, CHARLES	05-Oct-99
0771-99	NAVARRO RIVER	MENDOCINO REDWOOD COMPANY	13-Aug-99

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0772-99	RUSSIAN RIVER UNNAMED TRIB	MENDOCINO CO TRANSPORTATI	09-Jul-99
0773-99	LONG OPENING CREEK/EEL RVR TRI	COOK, JONATHAN	29-Aug-00
0701-99	ALBION RIVER NORTH FORK	SURPRISE VALLEY RANCH	14-Sep-99
0800-99	CASPAR CREEK SO FORK	BAXTER, BILL	16-Jul-99
0802-99	NAVARRO RIVER	WHITE, ALFRED	27-Sep-00
0811-99	UNNAMED	DU VIGNEAUD, JEAN LOUIS	06-Oct-99
0812-99	SHORT CREEK	BAUER, DONALD	28-Sep-99
0813-99	RANCHERIA CREEK	MEYER FAMILY PORT	25-Sep-00
0814-99	RUSSIAN RIVER E FORK UNNAMED	RAU, GEORGE	10-Sep-99
0815-99	FELDMAN GULCH	MALLORY, DOUGLAS C	26-Jul-99
0825-99	RUSSIAN RIVER	ASH, TIM	10-Aug-99
0828-99	TEN MILE RIVER	HANSEN, STEVE	08-Sep-99
0841-99	RUSSIAN RIVER CANAL EF	MCFADDEN, EUGENE J. M.	19-Jul-99
0731-99	RUSSIAN RIVER TRIBUTARY	GORDON, DEVIN W.	
0732-99	NAVARRO RIVER UNNAMED TRIBS	CORSON, FRED P.	14-Sep-99
0751-99	PACIFIC OCEAN UNNAMED	BORRAS, THEMBI	04-Aug-99
0752-99	ANDERSON CREEK & TRIBUTARY	PRATHER, ALBERT	14-Sep-99
0829-99	GREENWOOD CREEK	ELK COUNTY WATER DIST	19-Oct-00
0838-99	STRING CREEK	FOREST, SOIL & WATER INC	23-Sep-99
0894-99	CASPER CREEK	CDF	20-Aug-99
0680-99	ACKERMAN/ORRS CREEK	CORSON, FRED P.	14-Sep-99
0975-99	BIG RIVER NORTH FORK	JACKSON DEMONSTRATION S.F	31-Aug-99
0976-99	CASPAR CREEK SOUTH FORK	JACKSON DEMONSTRATION S.F	25-Aug-99
0983-99	NAVARRO RIVER	WHITE, ALFRED	29-Oct-99
0984-99	DERBY CREEK	MAAHS, MICHAEL	26-Sep-99
0995-99	BEARPEN CREEK	E CENTER	23-Aug-99
1002-99	CAVE CREEK	DAWSON, IONE	28-Aug-00
1003-99	ANDERSON CRK TRIB	NUNES, GLADYS	26-Oct-99
1004-99	DOYLE CREEK	WOESSNER, JON	13-Oct-99
1005-99	FORSYTHE CREEK	OSTLER, JACK	19-Oct-99
1036-99	MILL CREEK	BUICH, BOB	25-Aug-00
1037-99	ROCKY CREEK	GIALDINI, ALLAN	05-Oct-99
1038-99	ANDERSON CREEK	BERGNER, GEORGE	11-Apr-00
1040-99	JUNGLE CREEK	BILBRO, CHRIS	12-Oct-99
1059-99	GRAVEYARD CREEK	WASSON-SMITH, JAN	20-Sep-99
1007-99	GUALALA RIVER	BROWN, DAN	14-Oct-99
1443-99	EEL RIVER S. F. TRIB	FULLER, DAVID	25-Jan-00
1024-99	RUSSIAN RIVER	DOLAN, PAUL	04-Oct-99
1026-99	MCNAB CREEK UNNAMED TRIB	CEAGO VINEGARDENS	12-Oct-99
1117-99	OUTLET CREEK & VARIOUS CRKS	CCC	10-Oct-99
1127-99	ASH CREEK	COPELAND, JOHN	28-Aug-00
1128-99	MILL CREEK, RED HILL GULCH	SICULAR, DAN	10-Nov-99
1130-99	GRIST CREEK	PHILLIPS, EDWIN	31-Oct-00
1131-99	CHERRY CREEK	PANZER, RODERIC	05-Oct-99
1132-99	BEAR HAVEN CREEK	MALLORY, DOUGLAS	22-Oct-99

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1133-99	MCCLURE CREEK	BARTOLOMEI, RAY	15-Jun-01
1169-99	RUSSIAN RIVER	FETZER, DANIEL	28-Aug-00
1170-99	BLUE ROCK CREEK	COOK, JOHN	26-Jul-00
1171-99	RUSSIAN RIVER WEST FORK	ENGBER, EVAN	23-Sep-99
1172-99	ROBINSON CREEK	ENGSTROM, NAOMI	20-Oct-99
1177-99	SCHOONER GULCH CREEK	THURMOND, BRYAN	23-May-00
1246-99	MILL CREEK	FISHER, JAMES	01-Sep-00
1262-99	FORSYTHE CREEK	HANSEN, STEVE	19-Jun-00
1277-99	RUSSIAN RIVER	FORD, MELVIN & DAVID	04-Oct-00
1301-99	SHORT CREEK	PROSCHOLD, TERRY	23-Aug-00
0895-99	HARE CREEK	CDF	20-Aug-99
0927-99	EEL RIVER MID FORK	KOCH, E.A.	14-Oct-99
0928-99	EEL RIVER SO FORK	KOCH, E.A.	14-Oct-99
0936-99	MILL CREEK	POLSLEY, RAYMOND	29-Sep-99
0940-99	WILLITS CREEK	WILLIAMS, PAUL	31-Aug-99
0958-99	BERRY CREEK UNNAMED STREAM	WILLIAMS, MIKE	16-Aug-00
1450-99	RUSSIAN RIVER (A)	JOHNSON, WILLIAM	30-Mar-01
1335-99	GARCIA RIVER & LEE CREEK	TUNHEIM, EDWARD	01-Sep-00
1336-99	DIGGER CREEK	GOTT, K.N.	30-May-00
1347-99	HARE CREEK TRIBUTARY	COX, LARRY	29-Nov-99
1100-99	ARENA CREEK	PATTEN, FRED	08-Jun-00
1108-99	ACKERMAN CREEK	MENDOCINO REDWOOD COMPANY	08-Oct-99
1325-99	FELIZ CREEK	MEHTONEN, PATRICK	10-Jul-01
1402-99	BEAR HAVEN CREEK	ORME, MICHAEL	26-Jul-00
1410-99	EEL RIVER MAIN FORK TRIBUTARY	LONGCRIER, JEFF	12-Jul-00
1419-99	JAMES CREEK	MATHERLY, MICHAEL	31-Aug-00
1463-99	RUSSIAN RIVER @ 1400 RUDDICK-C	FIDLER, MICHAEL	12-Apr-01
1437-99	ALBION CREEK	WOESSNER, JON	01-Sep-00
1438-99	TOMBELL CREEK	WOESSNER, JON	29-Aug-00
1385-99	HENSLEY CREEK TRIBUTARY	SMYTHE, THOMAS	21-Aug-00
1398-99	HAYWORTH CREEK NORTH FORK TRIB	FRYKMAN, DAVID	29-Aug-00
1466-99	RUSSIAN RIVER @ 1750 RUDDICK-C	FIDLER, MICHAEL	12-Apr-01
1469-99	NOYO RIVER	MALLORY, DOUGLAS	28-Jul-00
0459-99	EEL RIVER MIDDLE FORK	MCLELLAND, DOUG	15-Jul-99
0461-99	TEN MILE CREEK	SMYTHE, JOHN A.	15-Jun-99
0462-99	NAVARRO RIVER NORTH FORK	BROWN, SHARLEEN	19-Jul-99
0469-99	TEN MILE RIVER NORTH FORK	MALLORY, DOUG	29-Apr-99
0504-99	RANCHERIA CREEK	PRONSOLINO, GUIDO A.	03-Jun-99
0516-99	ACKERMAN CREEK	MENDOCINO REDWOOD COMPANY	24-Jun-99
0538-99	GARCIA RIVER	JACOBSZOON, RANDY	08-Jul-99
1454-99	FORSYTHE CREEK	COX, JACK	17-Jul-01
0549-99	DUTCH HENRY CREEK	BROOKTRAILS TOWNSHIP COMM	31-Aug-99
0561-99	RUSSIAN RIVER	MILLVIEW COUNTY WATER DIS	22-Jul-99
0565-99	BELL SPRINGS & JEWETT ROCK	MOTL, TIM	29-Jun-99
1464-99	RUSSIAN RIVER @ 1500 VICHY	FIDLER, MICHAEL	12-Apr-01

Streambed Alteration Agreements
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1465-99	RUSSIAN RIVER @ 550 REDEMEYER	FIDLER, MICHAEL	12-Apr-01
R3-2000-0075	NAVARRO RIVER UNNAMED TRIB	MADRIGAL, JESS	01-Mar-00
R3-2000-0031	PETERSON CREEK	BROWN, STEVENSON	15-Jun-00
R3-2000-0039	RAILROAD GULCH TRIBUTARY	METZ, TIMOTHY	30-Aug-00
R3-2000-0052	MOTE CREEK	MORRIS, RANDY	06-Apr-00
R3-2000-0053	ALBION RIVER TRIBUTARY	WOESSNER, JON	29-Aug-00
R3-2000-0065	ROBINSON CREEK	KELLY, SCOTT	01-Mar-00
R3-2000-0070	DRY CREEK	KELLY, SCOTT	01-Mar-00
R3-2000-0071	NORTH FORK #1	KELLY, SCOTT	01-Mar-00
R3-2000-0072	GUALALA RIVER NORTH FORK	KELLY, SCOTT	01-Mar-00
R3-2000-0073	GUALALA RIVER NORTH FORK #2	KELLY, SCOTT	07-Aug-00
R3-2000-0111	MINNIE CREEK	CHRIST, DARWIN	30-Aug-00
R3-2000-0112	TEN MILE RIVER	MORIN, TIM	29-Aug-00
R3-2000-0119	ALDER CREEK TRIBUTARY	SHIVELY, RUSS	29-Aug-00
R3-2000-0225	TEN MILE CREEK SOUTH FORK	MALLORY, DOUGLAS	01-Sep-00
R3-2000-0258	GUALALA RIVER NF TRIB	KELLY, SCOTT	09-May-00
R3-2000-0263	MILL CREEK	LUCCHETTI, WALTER	08-Sep-00
R3-2000-0264	ALBION RIVER TRIBUTARY	SWANSON, GARY	29-Aug-00
R3-2000-0269	BIG RIVER	MALLORY, DOUGLAS	01-Sep-00
R3-2000-0287	BRIDGE ATTACH (PA TO ROBBINS)	CATE, MISTY	22-Aug-00
R3-2000-0288	TRENCH A (PA TO ROBBINS)	CATE, MISTY	18-Sep-00
R3-2000-0289	BORE A (PA TO ROBBINS)	CATE, MISTY	07-Aug-00
R3-2000-0290	TEN MILE CREEK TRIBUTARY	MCKEE, ROB	01-Sep-00
R3-2000-0291	ALLEN CREEK, OLSEN GULCH +1	GALLIANI, ALICIA	30-Aug-00
R3-2000-0292	TRENCH B (PA TO SACRAMENTO)	CATE, MISTY	07-Sep-00
R3-2000-0293	BRIDGE EXTENSION (PA TO SAC)	CATE, MISTY	22-Aug-00
R3-2000-0294	RUSSIAN RIVER TRIBS (BORE A)	CATE, MISTY	18-Aug-00
R3-2000-0319	GREENWOOD CREEK	ANDERSON, JOHN	29-Aug-00
R3-2000-0333	GUALALA LITTLE NORTH FORK	KELLY, SCOTT	01-Sep-00
R3-2000-0295	PERENNIAL/SEASONAL DRAINAGES	CATE, MISTY	12-Oct-00
R3-2000-0296	PERENNIAL/SEASONAL DRAINAGES	CATE, MISTY	02-Oct-00
R3-2000-0299	PERENNIAL/SEASONAL DRAINAGES	CATE, MISTY	21-Sep-00
R3-2000-0300	PERENNIAL/SEASONAL DRAINAGES	CATE, MISTY	12-Oct-00
R3-2000-0301	RUSSIAN RIVER	RUDDICK, CHRIS	16-Apr-01
R3-2000-0302	HOWELL CREEK	RUDDICK, CHRIS	11-Sep-00
R3-2000-0332	PERRY GULCH	HOWELL, MICHAEL	29-Aug-00
R3-2000-0345	TEN MILE CREEK - GRAVEL	WEAVER, VIC	11-Aug-00
R3-2000-0346	MILL CREEK	NORTH COAST REDWOODS DIST	11-Sep-00
R3-2000-0347	RUSSIAN RIVER	WHITE, BRIAN J.	30-Oct-00

Streambed Alteration Agreements
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R3-2000-0349	EEL RIVER MIDDLE FORK	PARNUM PAVING, INC.	11-Sep-00
R3-2000-0350	EEL RIVER MIDDLE FORK	PARNUM PAVING, INC.	11-Sep-00
R3-2000-0351	RUSSIAN RIVER	PARNUM PAVING, INC.	11-Sep-00
R3-2000-0285	RAMON & METTICK CREEK	SCRIVEN, JOSEPH	25-Aug-00
R3-2000-0364	RUSSIAN RIVER	HILDRETH, MIKE	02-Apr-01
R3-2000-0365	RUSSIAN RIVER	HILDRETH, MIKE	02-Apr-01
R3-2000-0366	FELIZ CREEK	RICHARDSON, DIANE	30-May-02
R3-2000-0383	ELK CREEK	ANDERSON,JOHN	01-Sep-00
R3-2000-0385	NAVARRO RIVER	WOESSNER, JON	03-Jul-00
R3-2000-0370	WAGES CREEK TRIBUTARY	MALLORY, DOUGLAS	29-Aug-00
R3-2000-0407	GARCIA RIVER	ENGBER, EVAN	29-Aug-00
R3-2000-0422	DRY CREEK	BARR, KEVIN & LINDA	04-Oct-00
R3-2000-0423	DRY CREEK	BARR, KEVIN & LINDA	01-Sep-00
R3-2000-0128	NAVARRO RIVER	HALLER, MELODY OR PAUL	30-Aug-00
R3-2000-0139	COLD CREEK	EMBREE, LISA	21-Jun-00
R3-2000-0145	ACKERMANN CREEK UNNAMED TRIB	FIDLER, MICHAEL	06-Apr-00
R3-2000-0146	RUSSIAN RIVER	FIDLER, MICHAEL	27-Sep-00
R3-2000-0187	RANCHERIA CREEK	RICE, RONALD	06-Apr-00
R3-2000-0188	RUSSIAN RIVER	BURKE, KIERAN	17-Aug-00
R3-2000-0231	JOHN SMITH CREEK TRIBUTARY	BORRAS, THEMBI	15-May-00
R3-2000-0444	HOLLOW TREE & VARIOUS CREEKS	MEESE, DALE	01-Sep-00
R3-2000-0447	GARCIA RIVER	STORNETTA, LARRY,JUDITH	20-Sep-00
R3-2000-0452	REDWOOD CREEK	RIBAR, PETER	01-Sep-00
R3-2000-0454	ORRS CREEK	SCRIVEN, JOSEPH	02-Aug-00
R3-2000-0455	COLD CREEK TRIBUTARY	JOE CINEK CONSULTING FORE	29-Aug-00
R3-2000-0456	PARDALOE CREEK	TOWN, CHRIS	30-Aug-00
R3-2000-0471	GARCIA RIVER	JACOBSZOON, RANDY	28-Jun-00
R3-2000-0475	HULLS VALLEY CREEK	SCRIVEN, JOSEPH	15-Sep-00
R3-2000-0479	HARE CREEK TRIBUTARY	HAYTER, CHRIS	29-Aug-00
R3-2000-0480	MCNAB CREEK TRIBUTARY	FETZER, JAMES	28-Aug-00
R3-2000-0507	RUSSIAN RIVER TRIBUATRIES	WALTER, RICH	08-Aug-00
R3-2000-0534	RUSSIAN RVR TRIB BORING S-120	WALTER, RICH	11-Aug-00
R3-2000-0535	RUSSIAN RVR TRIB BORING S-121	WALTER, RICH	11-Aug-00
R3-2000-0536	RUSSIAN RVR TRIB BORING S-126	WALTER, RICH	11-Aug-00
R3-2000-0537	RUSSIAN RVR TRIB BORING S-127	WALTER, RICH	11-Aug-00
R3-2000-0539	RUSSIAN RVR TRIB BORING S-164	WALTER, RICH	11-Aug-00
R3-2000-0540	RUSSIAN RVR TRIB BORING S-165	WALTER, RICH	11-Aug-00
R3-2000-0541	RUSSIAN RVR TRIB BORING S-166	WALTER, RICH	11-Aug-00
R3-2000-0542	DIRECTIONAL BORING B S-121	WALTER, RICH	11-Aug-00
R3-2000-0543	RUSSIAN RVR TRIB BORING S-173	WALTER, RICH	11-Aug-00

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R3-2000-0544	RUSSIAN RVR TRIB BORING S-174A	WALTER, RICH	11-Aug-00
R3-2000-0545	RUSSIAN RVR TRIB BORING S-179	WALTER, RICH	11-Aug-00
R3-2000-0546	RUSSIAN RVR TRIB BORING S-208	WALTER, RICH	11-Aug-00
R3-2000-0547	RUSSIAN RVR TRIB BORING S-224	WALTER, RICH	11-Aug-00
R3-2000-0548	BRUSH CREEK TRIB BORING S-238	WALTER, RICH	11-Aug-00
R3-2000-0551	BRUSH CREEK TRIB BORING S-239	WALTER, RICH	11-Aug-00
R3-2000-0555	TRENCHING A	WALTER, RICH	28-Jul-00
R3-2000-0564	RANCHERIA CREEK UNNAMED TRIB	WALTER, RICH	08-Aug-00
R3-2000-0487	BUSHNELL & BURRIGHT CREEKS	STRICKLER, BRUCE	29-Aug-00
R3-2000-0495	CASING/CONDUIT	WALTER, RICH	26-May-00
R3-2000-0496	CONSTRUCTION TRAFFIC	WALTER, RICH	11-Aug-00
R3-2000-0497	BRUSH CREEK TRIBUTARY (S-236)	WALTER, RICH	11-Aug-00
R3-2000-0568	OTHER CULVERT CROSSINGS	WALTER, RICH	27-Jun-00
R3-2000-0576	INDIAN CREEK	SOLINSKY, WILLIAM	01-Sep-00
R3-2000-0578	RUSSIAN RIVER	MILOVINA, MICHAEL	02-Apr-01
R3-2000-0579	NAVARRO & RANCHERIA	HALLER, PAUL	14-Jun-00
R3-2000-0580	BIG RIVER SOUTH FORK	BORRAS, THEMBI	29-Aug-00
R3-2000-0581	RUSSIAN RIVER	BARRETT, TOM	15-Sep-00
R3-2000-0582	REDWOOD CREEK - 271	COVELLA, MARK	23-Aug-00
R3-2000-0583	HUCKLEBERRY CREEK - 271	COVELLA, MARK	23-Aug-00
R3-2000-0584	FLYNN CREEK - 271	COVELLA, MARK	23-Aug-00
R3-2000-0585	NAVARRO RIVER SB NO.- 271	COVELLA, MARK	23-Aug-00
R3-2000-0607	JAMES CREEK NF TRIB	BAXTER, BILL	01-Sep-00
R3-2000-0631	BIG RIVER SOUTH FORK TRIBUTARY	HAYTER, CHRIS	29-Aug-00
R3-2000-0632	PUDDING CREEK TRIBUTARY	TADLOCK, MICHAEL	01-Sep-00
R3-2000-0635	LITTLE NORTH FORK	WOESSNER, JON	01-Sep-00
R3-2000-0644	MILL CREEK	POLSEY, RAMOND	15-Sep-00
R3-2000-0649	SALT SPRING CREEK (BORE B/S-1)	LORENZINI, KEVIN	08-Aug-00
R3-2000-0650	ASH CREEK (BORE B/S-4)	LORENZINI, KEVIN	08-Aug-00
R3-2000-0654	ASH CRK UNNAMED TRIBS(S-2)	LORENZINI, KEVIN	11-Aug-00
R3-2000-0655	ASH CRK UNNAMED TRIBS(S-3)	LORENZINI, KEVIN	11-Aug-00
R3-2000-0657	OTHER CULVERT CROSSINGS	LORENZINI, KEVIN	27-Jun-00
R3-2000-0662	GARCIA RIVER TRIB CROSSING 1&2	ROGERS, ROBERT	29-Aug-00
R3-2000-0676	MULE CREEK TRIBUTARIES	MALLORY, DOUGLAS	29-Aug-00
R3-2000-0680	GARCIA RIVER SOUTH FORK	TROUT UNLIMITED	28-Jun-00
R3-2000-0684	DOAN, TOWN, BIG ROCK, GRIST CR	KEITH'S MEAT MARKET	29-Aug-00
R3-2000-0685	ANDERSON CREEK	ELKE, THOMAS	11-Oct-00

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R3-2000-0686	RUSSIAN RIVER NORTH FORK TRIB	CORDIS, DAVID	12-Jul-00
R3-2000-0694	BIG RIVER TRIBUTARY	MALLORY, DOUGLAS	29-Aug-00
R3-2000-0699	BIG RIVER TRIBUTARY	ROACH, GARY	23-Aug-00
R3-2000-0700	COVINGTON GULCH & HARE CREEK	ROACH, GARY	21-Aug-00
R3-2000-0701	ACKERMAN CREEK - 271	MENDOCINO REDWOOD COMPANY	31-Aug-00
R3-2000-0703	BIG RIVER SOUTH FORK	COOK, JON	01-Sep-00
R3-2000-0704	YORK CREEK	RICE, RONALD	28-Aug-00
R3-2000-0724	FORSYTHE CREEK - 271	ENGBER, EVAN	31-Aug-00
R3-2000-0734	RUSSIAN RIVER	JOHNSON, WILLIAM	11-Apr-01
R3-2000-0735	RUSSIAN RIVER WEST FORK	JOHNSON, WILLIAM	11-Apr-01
R3-2000-0736	ALBION RIVER	WOESSNER, JON	28-Aug-00
R3-2000-0739	RUSSIAN RIVER	ASH, TIM	23-Aug-00
R3-2000-0740	ORRS CREEK	ASH, TIM	01-Sep-00
R3-2000-0741	BRIDGES CREEK	ASH, TIM	31-Jul-01
R3-2000-0742	EEL RIVER, SOUTH FORK	ASH, TIM	31-Aug-00
R3-2000-0746	SMITH GULCH, LITTLE GULCH & TR	MENDOCINO REDWOOD COMPANY	29-Aug-00
R3-2000-0748	UNNAMED TRIBUTARIES	KOCH, ANN	01-Sep-00
R3-2000-0751	FISH ROCK CREEK	HENDERSON, MIKE\	11-Aug-00
R3-2000-0782	NOYO RIVER TRIBUTARIES	RIBAR, PETER	29-Aug-00
R3-2000-0783	DAVIS CREEK TRIBUTARY	LONGCRIER, JEFF	29-Aug-00
R3-2000-0784	HORSE & RANCHERIA TRIBUTARIES	HINCKLEY, JONATHAN	01-Sep-00
R3-2000-0785	ROSS CREEK TRIBUTARY	TUNHEIM, EDWARD	29-Aug-00
R3-2000-0786	WATERSHED MORRISON CREEK TRIB	WADDINGTON, DAYLE & DAN	30-May-01
R3-2000-0819	BLUE WATERHOLE CREEK	MENDOCINO COUNTY	06-Sep-00
R3-2000-0820	MCNAB CREEK - 271	SCRIVEN, JOSEPH	06-Sep-00
R3-2000-0821	ROBINSON CREEK	ONACREST PROPERTIES	04-Jan-01
R3-2000-0877	BORE B (PA TO ROBBINS)	WILLIAMS COMMUNICATIONS	18-Sep-00
R3-2000-0879	RUSSIAN RIVER D/R-UKIAH-16	WILLIAMS COMMUNICATIONS	24-Sep-00
R3-2000-0880	GARCIA/RANCHERIA/RUSSIAN RVR T	WILLIAMS COMMUNICATIONS	18-Sep-00
R3-2000-0881	TRENCH B (PA TO SACRAMENTO)	WILLIAMS COMMUNICATIONS	18-Sep-00
R3-2000-0882	BORE B	WILLIAMS COMMUNICATIONS	24-Jul-00
R3-2000-0938	ANDERSON & FARRER CREEKS & TRI	MADRIGAL VINEYARD MANAGEM	16-Nov-00
R3-2000-0939	COTTONEVA & HOLLOW TREE CREEK	HANSEN, STEVE	16-Feb-01
R3-2000-0940	GUALALA RIVER	MENDOCINO COUNTY TRANSPOR	18-Sep-00
R3-2000-0942	GUALALA RIVER	MENDOCINO COUNTY TRANSPOR	18-Sep-00
R3-2000-0976	LOW GAP CREEK TRIBUTARY	COOMBS TREE FARMS	29-Aug-00
R3-2000-0977	PACIFIC OCEAN UNNAMED TRIB	PARKS & RECREATION DEPART	18-Sep-00
R3-2000-0981	RUSSIAN RIVER	BURKE, KIERAN C.	24-Oct-00
R3-2000-0995	RUSSIAN RIVER, MAIN STERN	OMAN, RON & MARY	25-Oct-00
R3-2000-1003	INDIAN CREEK & NORTH FORK TRIB	ALAN MOHR & ASSOCIATES, I	29-Aug-00
R3-2000-1012	MILL CREEK	BARBER, TERI JO	05-Oct-00

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R3-2000-1018	DUTCH CHARLIE, REDWOOD & S FRK	DA ROSA, ERIC	29-Aug-00
R3-2000-1019	VARIOUS CULVERT CROSSINGS	WILLIAMS COMMUNICATIONS	24-Jul-00
R3-2000-1028	ROBINSON CREEK	MENDOCINO COUNTY	06-Sep-00
R3-2000-1036	TEN MILE RIVER, NORTH FORK	BALLARD, ROBERT	03-Nov-00
R3-2000-1042	RUSSIAN RIVER	FETZER, JOHN	25-Sep-00
R3-2000-1050	WAGES CREEK	MARGLER, LARRY	17-Oct-00
R3-2000-1055	EDWARDS CREEK (S-125X)	LORENZINI, KEVIN	11-Aug-00
R3-2000-1056	RUSSIAN RVR TRIB BOR(S-226C&D)	LORENZINI, KEVIN	11-Aug-00
R3-2000-1057	UNNAMED POND	LINDHOLME PROPERTIES LTD.	22-Sep-00
R3-2000-1058	NOYO RIVER UNNAMED TRIBUTARIES	MENDES, EDDIE	11-Dec-00
R3-2000-1061	ELK CREEK	ANDERSEN, JOHN	03-Nov-00
R3-2000-1071	ALBION RIVER NORTH FORK	DERIDDER, WILLIAM	27-Nov-00
R3-2000-1076	WAGES CREEK & UNNAMED TRIBS	VANDERHORST, STEVEN	03-Nov-00
R3-2000-1081	RUSSIAN RIVER TRIBUTARY	FETZER, JOHN	28-Sep-00
R3-2000-1103	PIETA CREEK	BURMESTER, DANIEL	15-Feb-01
R3-2000-1109	GARCIA RIVER TRIBUTARY	SHIVELY, RUSS	30-Nov-00
R3-2000-1115	TOMKI CREEK	MAYES, JANETTE	02-Nov-00
R3-2000-1122	ROBINSON CREEK SOUTH BRANCH	FOREST, SOIL & WATER	19-Jul-01
R3-2000-1138	RUSSIAN RIVER	MENDOCINO COUNTY RUSSIAN	17-Apr-01
R3-2000-1149	HAYWORTH CREEK & MINOR TRIBUTA	MENDOCINO REDWOOD COMPANY	09-Nov-00
R3-2000-1150	BIG GULCH, GULCH 15	VANDERHORST, STEVEN A.	20-Nov-00
R3-2000-1155	BAECHTEL CREEK	HASCHAK, ART	01-Jul-02
R3-2000-1164	SULFUR CREEK (ET AL.)	ASHOFF, GILBERT	05-Sep-01
R3-2000-1174	BEAR TRAP CREEK - 271	MERRILL, TOM	28-Aug-00
R3-2000-1175	HORSE CREEK - 271	MERRILL, TOM	21-Aug-00
R3-2000-1176	DOOLEY CREEK - 271	BIO-ENGINEERING INSTITUTE	01-Sep-00
R3-2000-1184	BIG RIVER TRIBUTARY	PARKS & RECREATION	23-Apr-01
R3-2000-1185	ROCK CREEK	BAREILLES, KEN	13-Sep-00
R3-2000-1209	CULVERT	WILLIAMS COMMUNICATIONS	21-Sep-00
R3-2000-1211	HOWARD CREEK TRIBUTARY	BUEREN, THAD	21-Nov-00
R3-2000-1213	ANDERSON CREEK	KUIMELIS, MICHAEL	02-Nov-00
R3-2000-1229	TEN MILE RIVER NORTH FORK	MALLORY, DOUGLAS	26-Jun-01
R3-2000-1232	PACIFIC OCEAN UNNAMED TRIBUTAR	UNSOELD, GEORGE	27-Oct-00
R3-2000-1236	BIG RIVER TRIBUTARY	KAMB, BUD	03-Oct-00
R3-2000-1237	SALT HOLLOW CREEK TRIBUTARY	LOLONIS, GREG	05-Oct-01
R3-2000-1247	ORRS CREEK	WIPF CONSTRUCTION	27-Sep-00
R3-2000-1275	BUSCH CREEK	PIELASZCZYK, ADAM	05-Apr-02
R3-2000-1279	SHORT CREEK	PROSCHOLD, TERRY	21-Feb-02
R3-2000-1290	BIG RIVER MAIN STEM TRIBUTARY	HAYTER, CHRIS	28-Nov-00
R3-2000-1314	PACIFIC OCEAN TRIBUTARY	ROGERS, ROBERT	07-Aug-01
R3-2000-1324	RUSSIAN GULCH CREEK	MCKINNEY, JOHN	28-Feb-01
R3-2000-1335	FORSYTHE CREEK	DUTRA, FRANK	12-Apr-02

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R3-2000-1337	GREENWOOD CREEK TRIBUTARY	SHIVELY, RUSS	03-Apr-01
R3-2000-1342	THOMAS CREEK	LONGERIER, JEFF	07-Feb-01
R3-2000-1351	TWO LOG CRK & NORTH FORK	MENDOCINO REDWOOD COMPANY	30-Jan-01
R3-2000-1356	BIG RIVER	MENDOCINO REDWOOD COMPANY	01-May-02
R3-2000-1393	RUSSIAN RIVER TRIB CULVERT	LENCZOWSKI, HUBERT	07-Aug-01
R3-2000-1402	NOYO RIVER NORTH FORK	FRYKMAN, DAVID	02-Mar-01
R3-2000-1412	RUSSIAN RIVER	FLIGHT RAIL CORPORATION	10-Sep-01
R3-2000-0780B	CRAWFORD CREEK & RUSSIAN RIVER	MILOVINA, JOHN & JAMES	05-Jun-02

Exhibit

Exhibit # 17

COUNTY OF MENDOCINO
DEPARTMENT OF PLANNING AND BUILDING SERVICES
501 LOW GAP ROAD · ROOM 1440 · UKIAH · CALIFORNIA · 95482

RAYMOND HALL, DIRECTOR
Telephone 707-463-428
FAX 707-463-570
pbs@co.mendocino.ca.us
www.co.mendocino.ca.us/planning

August 16, 2000

Fred & Alberta Zmarzly
PO Box 7581
Santa Rosa Ca 95402

SUBJECT: PROPOSED POND LOCATED AT: 4617 Rd 110., Hopland

Dear Mr. & Mrs. Zmarzly:

On August 10, 2000, Building Inspector, Guy Parry conducted a Special Inspection at the above address. The purpose of the inspection was to document his observations regarding the location, height of dam, area in water capacity, terrain and setbacks to property lines and structures of the proposed pond.

I have reviewed Mr. Parry's documentation and have approved your proposed pond as grading in an isolated, self-contained area and that there is no danger to private or public property as long as the work is done according to the information provided by you to Mr. Parry at the time of inspection.

This exemption is only from Mendocino County Planning & Building Services grading permit process and does not exempt you from any other Federal/State laws or local ordinance regarding the taking, extracting, capturing, pumping or storage of water

If you have any questions, please feel free to call Monday through Friday from 8:00am to 5:00pm.

Sincerely,

Chris Warrick
Chief Building Inspector

CW/tlh

MENDOCINO COUNTY PLANNING & BUILDING SERVICES
POND EXEMPTION APPLICATION

Project location: 4617 ROAD 110, HOPLAND, CA **Project A/P #:** 047-100-39

Owners name: FRED & ALBERTA ZMARZLY **Phone:** 544-5776 OR 744-1848

Mailing address: P.O. BOX 7581
SANTA ROSA, CA 95407

Description of Project: AG EXEMPT POND

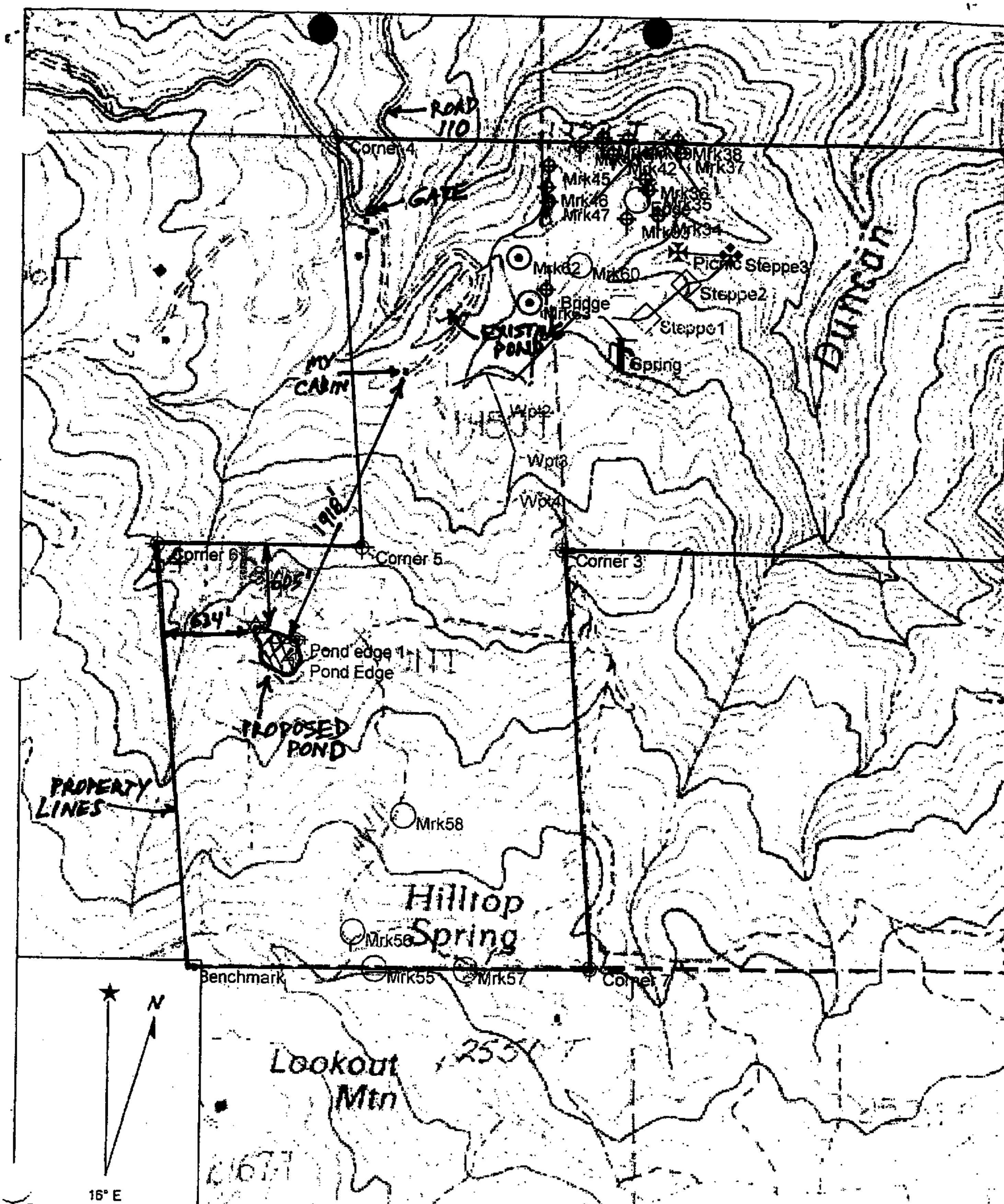
To be filled out by the Owner		For County use only: VERIFIED	UNABLE TO CONFIRM
POND LOCATION Distance (in feet) from:			
A) Property lines	605' & 634'	✓	
B) Private roads	557'	✓	
C) County roads	2764'	✓	
D) Structures	1918'	✓	
SIZE OF POND			
A) Length	245'	✓	
B) Width	250'	✓	
C) Depth	8'		✓
D) Capacity (in acre ft)	APPROX. 10 ac-FT.		✓
POND CONSTRUCTION			
A) Pit pond	N/A		
B) Berm containment	N/A		
C) Dam (height to spillway and over flow size)	24'	✓	
D) Gradient of interior & exterior slopes	2½ TO 1		✓
E) Method of filling pond with water	RAIN	✓	
F) How much material (in cubic yards) will be moved to construct pond	APPROX. 5000 YDS³		✓
8 ½" x 11" PLOT PLAN ATTACHED? (Showing the above information)	Yes ☒ No ☐		

Comments:

Is the pond existing? ☐ Proposed? ☒

I certify the above to be true and accurate and that I will allow the Mendocino County Building Inspector to conduct a site inspection of the proposed/existing pond location.

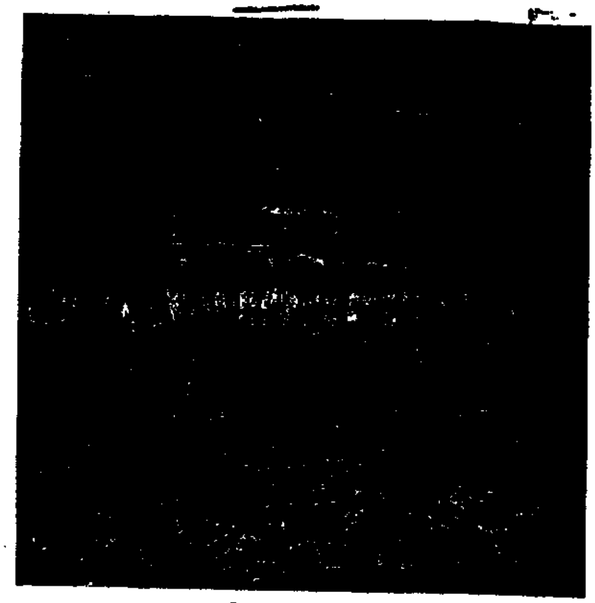
Owners Signature: *Fred Zmarzly* Date: 8/8/00



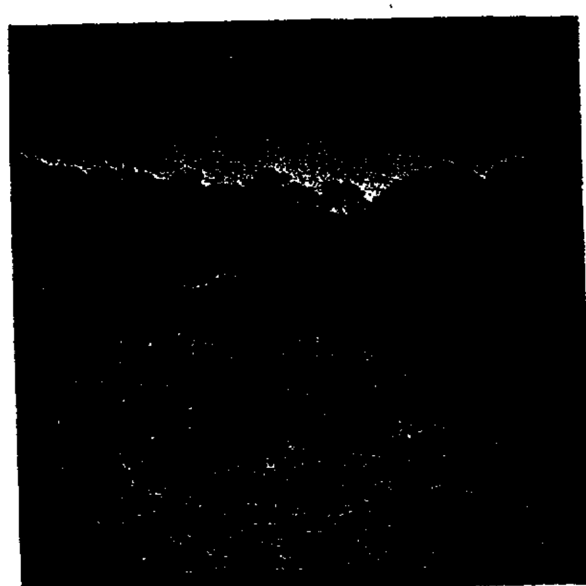
Name: YORKVILLE
Date: 8/8/100
Scale: 1 inch equals 800 feet

Location: 038° 56' 27.8" N 123° 09' 30.9" W
APN 047-100-39

Proposed Dam Location 8-10-00
4617 Rd 110 Hwy Parry



Zmarzly Proposed Dam 8-10-00
4617 Rd 110 Hwy Parry



4617 Rd 110 Hwy. 8/10/00
Zmarzly Parry