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"FERC
2100

SPW-1 Project Effects on Water Quality Designated Beneficial Uses for Surface Waters

Aquatic Toxicity

shown
summary
9
Tox / Station
Draft Rep Site
02/11/03 C. O. H. H.

Progress Summary
September 24, 2003

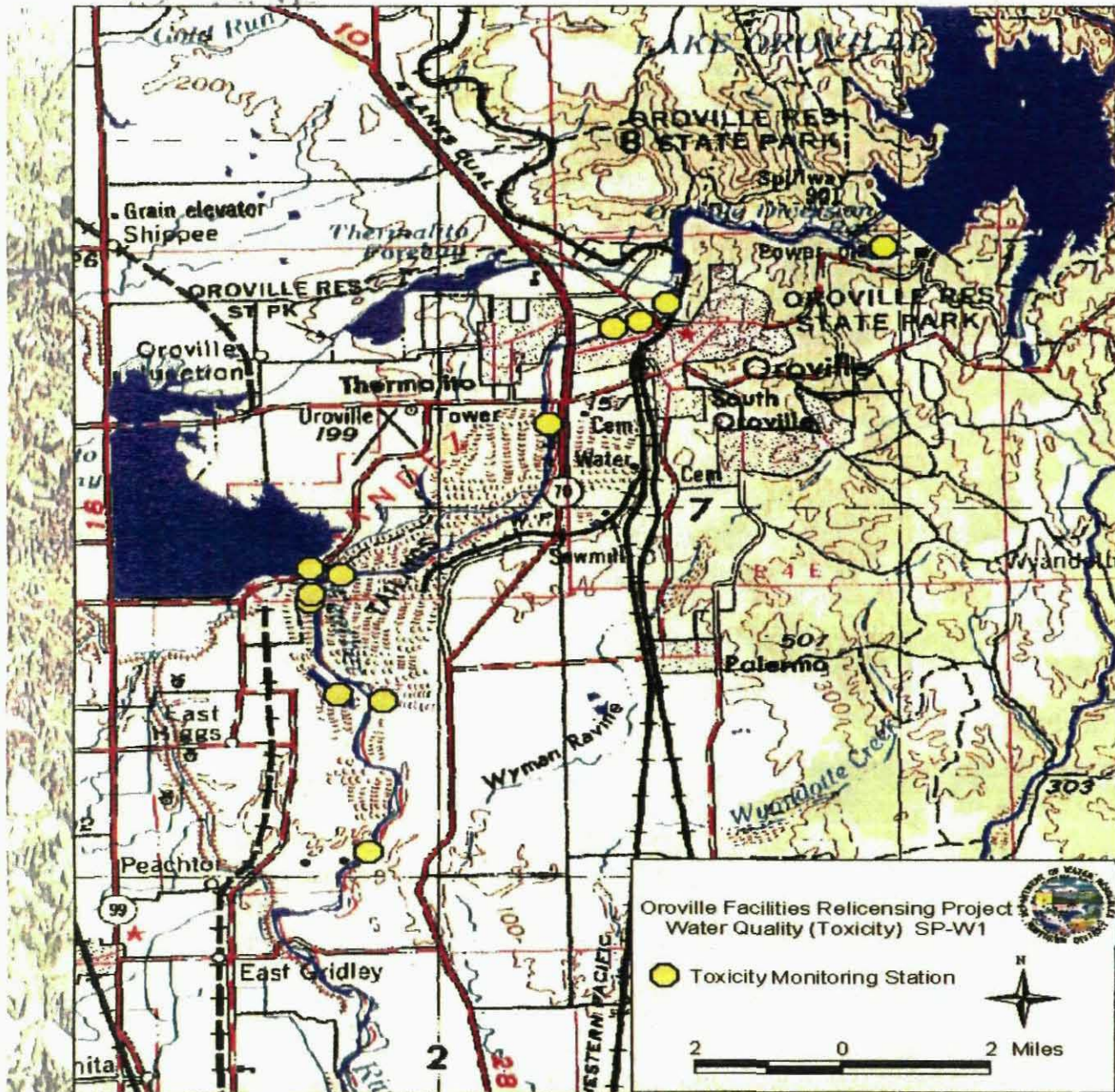
Scott McReynolds
Northern District
California Dept. of Water Resources

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P-5



Toxicity Monitoring Stations Tributary to Lake Oroville

7.8.2002



Toxicity Monitoring Stations downstream from Lake Oroville

7.8.2002

SPW1. Aquatic Toxicity

Ceriodaphnia
Results

Effects of Oroville Dam Drainage Ambient Water Samples on survival of Ceriodaphnia dubia.

Treatment/ Sample ID	Percent Survival															
	Year	2002														
	4/24	5/15	5/16	5/21	5/30	6/25	7/15	7/24	8/21	9/24	9/25	10/22	11/12	11/13	11/14	12/11
Laboratory Control	100	100	90	90	90	100	90	100	100	100	80	100	100	100	90	100
Concow C A Jordan Hill Rd. (CCJHR)		90					90			80			100			
West Branch Near Paradise (WBNPA)										80			100			
West Branch A Oroville Res. (WBAOR)	90			70			100									
NF Feather R DS Poe PH (NFPPH)		70					100			80						
Poe Powerhouse Discharge (PPHD)							100			70			100			
Feather R MF NR Merrimack (MFMBR)		100					100			100			100			
Fall R US Feather Falls (FRUFF)			80				90			100				90		
SF Feather R AB Ponderosa Res. (SFUPR)			20				90			100			100			
SF Feather R DS Ponderosa Res. (SFDPR)																
Miners Ranch Canal (MIRAC)										100			100			
Sucker Run NR Forbestown (SRNFT)			90				80			100			100			
Diversion Pool DS Powerhouse (DIVDPP)																
Feather R A Oroville (FRFBD)				60		90	90	100		80	100				100	100
Feather R Hatchery Settling Pond (FRHSP)																
Feather R DS from Hatchery (FRDFH)	10			80		90	90	90		80	80				100	100
Feather R US from Afterbay Outlet (FRUAO)	90			80		100	100	100		100	80				100	100
Afterbay Outlet Canal to Feather R (AOCFR)	80			80		90	100			90	80	100			100	90
Feather R DS from Afterbay Outlet (FRDAO)	90			90		80	100	90		100	100				100	100
Feather R DS from SCOR Outfall (FRDSO)	90			90		80	100	100		100	80				90	100
Feather R DS from Project Boundary (FRDPB)	100			100		100	100	100		80	70				100	100
Oroville Wildlife Area Fishing Pond (OWAFP)					100			100								
Oroville Wildlife Area Mile Long Pond (OWAMP)					70			100								
Oroville Wildlife Area Lower Pacific Heights Pond (OWALP)					90			90								

Bold = Significantly less than the Control treatment at p= <0.05.

Effects of Oroville Dam Drainage Ambient Water Samples on reproduction of Ceriodaphnia dubia.

Treatment/ Sample ID	# neonates/female															
	Year	2002														
	4/24	5/15	5/16	5/21	5/30	6/25	7/15	7/24	8/21	9/24	9/25	10/22	11/12	11/13	11/14	12/11
Laboratory Control	29.0	26.5	23.6	23.7	30.7	25.3	28.3	25.4	23.9	20.0	21.9	42.8	33.0	23.6	19.3	28.7
Concow C A Jordan Hill Rd. (CCJHR)		26.5					22.0			18.6				46.1		
West Branch Near Paradise (WBNPA)		25.6					32.3			22.1			50.3			
West Branch A Oroville Res. (WBAOR)				6.4			30.0									
NF Feather R DS Poe PH (NFPPH)		9.2					29.4			15.2			53.7			
Poe Powerhouse Discharge (PPHD)										15.8			51.5			
Feather R MF NR Merrimack (MFMBR)										19.8			52.5			
Fall R US Feather Falls (FRUFF)			12.4				16.0			31.0				15.7		
SF Feather R AB Ponderosa Res. (SFUPR)			0.7				21.4			28.4			49.8			
SF Feather R DS Ponderosa Res. (SFDPR)																
Miners Ranch Canal (MIRAC)										13.7			53.6			
Sucker Run NR Forbestown (SRNFT)			16.6				13.3			27.1			51.8			
Diversion Pool DS Powerhouse (DIVDPP)																
Feather R A Oroville (FRFBD)	24.6			7.9		19.3		25.5	26.1		20.1	42.4			22.2	27.6
Feather R Hatchery Settling Pond (FRHSP)																
Feather R DS from Hatchery (FRDFH)	2.0			7.3		24.1		11.7	23.6		19.1	24.2			6.9	25.9
Feather R US from Afterbay Outlet (FRUAO)	27.9			5.6		23.7		25.3	24.5		25.6	37.4			17.9	25.1
Afterbay Outlet Canal to Feather R (AOCFR)	20.5			7.9		18.8		24.0	24.0		17.2	43.2			20.9	29.0
Feather R DS from Afterbay Outlet (FRDAO)	27.4			6.6		21.8		27.6	24.3		21.3	44.1			14.7	26.9
Feather R DS from SCOR Outfall (FRDSO)	22.5			4.8		13.5		28.1	28.1		21.9	37.5			18.7	26.9
Feather R DS from Project Boundary (FRDPB)	31.0			11.2		13.7		22.3	31.2		20.7	33.5			7.0	27.1
Oroville Wildlife Area Fishing Pond (OWAFP)					34.1			28.6								
Oroville Wildlife Area Mile Long Pond (OWAMP)					27.6			28.7								
Oroville Wildlife Area Lower Pacific Heights Pond (OWALP)					27.5			25.2								

Bold = Significantly less than the Control treatment at p= <0.05.

Effects of Oroville Dam Drainage Ambient Water Samples on survival of Ceriodaphnia dubia.								
Treatment/ Sample ID	Percent Survival							
	Year	2003						
	1/14	2/18	3/19	3/26	4/15	4/17	4/24	5/15
Laboratory Control	90	100	100	100	100	90	100	100
Concow C A Jordan Hill Rd. (CCJHR)		100			100			
West Branch Near Paradise (WBNPA)		90			100			
West Branch A Oroville Res. (WBAOR)								
NF Feather R DS Poe PH (NFPPH)		90			100			
Poe Powerhouse Discharge (PPHDI)		100			100			
Feather R MF NR Merrimack (MFMBR)		100			100			
Fall R US Feather Falls (FRUFF)		100			90			
SF Feather R AB Ponderosa Res. (SFUPR)					90			
SF Feather R DS Ponderosa Res. (SFDPR)		90			90			
Miners Ranch Canal (MIRAC)								
Sucker Run NR Forbestown (SRNFT)		100			100			
Diversion Pool DS Powerhouse (DIVDPP)					80			
Feather R A Oroville (FRFBD)	90		100			100		90
Feather R Hatchery Settling Pond (FRHSP)						90		70
Feather R DS from Hatchery (FRDFH)	90		100			100		10/80*
Feather R US from Afterbay Outlet (FRUAO)	100		100			90		100
Afterbay Outlet Canal to Feather R (AOCFR)	100		100			90		90
Feather R DS from Afterbay Outlet (FRDAO)	100		100			100		100
Feather R DS from SCOR Outfall (FRDSO)	90		100			50		70
Feather R DS from Project Boundary (FRDPB)	80		100			90		100
Oroville Wildlife Area Fishing Pond (OWAFP)				100			90	
Oroville Wildlife Area Mile Long Pond (OWAMP)				100			100	
Oroville Wildlife Area Lower Pacific Heights Pond (OWALP)				100			90	

Bold = Significantly less than the Control treatment at $p = <0.05$.

* = Sample retested on 5/20/03 (Control value = 100 percent)

Effects of Oroville Dam Drainage Ambient Water Samples on reproduction of Ceriodaphnia dubia.								
Treatment/ Sample ID	# of neonates/female							
	Year	2003						
	1/14	2/18	3/19	3/26	4/15	4/17	4/24	5/15
Laboratory Control	90	30	26.1	22.1	28.4	15.3	24	20.2
Concow C A Jordan Hill Rd. (CCJHR)		27.9			20.8			
West Branch Near Paradise (WBNPA)		25.2			24.6			
West Branch A Oroville Res. (WBAOR)								
NF Feather R DS Poe PH (NFPPH)		27.4			12.9			
Poe Powerhouse Discharge (PPHDI)					25.8			
Feather R MF NR Merrimack (MFMBR)		29.2			26.1			
Fall R US Feather Falls (FRUFF)		24.1			24.6			
SF Feather R AB Ponderosa Res. (SFUPR)		25.8			3.8			
SF Feather R DS Ponderosa Res. (SFDPR)		22.2			17.7			
Miners Ranch Canal (MIRAC)								
Sucker Run NR Forbestown (SRNFT)		30.3			22.5			
Diversion Pool DS Powerhouse (DIVDPP)					20.1			
Feather R A Oroville (FRFBD)	90		15.7			38.1		8.0
Feather R Hatchery Settling Pond (FRHSP)						36.8		4.5
Feather R DS from Hatchery (FRDFH)	90		18.2			36.9		0.4/10.8*
Feather R US from Afterbay Outlet (FRUAO)	100		26.8			37.6		22.7
Afterbay Outlet Canal to Feather R (AOCFR)	100		18.3			33.1		20.2
Feather R DS from Afterbay Outlet (FRDAO)	100		23.8			39.6		25.7
Feather R DS from SCOR Outfall (FRDSO)	90		24.9			29.5		12.3
Feather R DS from Project Boundary (FRDPB)	80		21.3			39.3		21.9
Oroville Wildlife Area Fishing Pond (OWAFP)				22.4			14.1	
Oroville Wildlife Area Mile Long Pond (OWAMP)				20.2			23.0	
Oroville Wildlife Area Lower Pacific Heights Pond (OWALP)				17.6			17.8	

Bold = Significantly less than the Control treatment at $p = <0.05$.

SPW1. Aquatic Toxicity

Fathead Minnow

Results:

Survival Testing

Effects of Oroville Dam Drainage Ambient Water Samples on survival of Larval Fathead Minnow.

Treatment/ Sample ID	Overall Mean (%) Survival															
	Year	2002														
	4/24	5/15	5/16	5/21	5/30	6/25	7/15	7/24	8/21	9/24	9/25	10/22	11/12	11/13	11/14	12/11
Laboratory Control	97.5	100	83.3	93.3	73.3	96.7	90.0	100	97.0	100	100	100	96.7	100	96.7	96.7
Concow C A Jordan Hill Rd. (CCJHR)		80					63.3			96.7			70			
West Branch Near Paradise (WBNPA)										96.7			0			
West Branch A Oroville Res. (WBAOR)				53.3			93.3									
NF Feather R DS Poe PH (NFPPH)		26.7					26.7			96.7			13			
Poe Powerhouse Discharge (PPHDI)							23.3			100			20			
Feather R MF NR Merrimack (MFMBR)		100					40.0			96.7			40			
Fall R US Feather Falls (FRUFF)			56.7				50.0			90				40		
SF Feather R AB Ponderosa Res. (SFUPR)			56.7				53.3			100			56.7			
SF Feather R DS Ponderosa Res. (SFDPR)																
Miners Ranch Canal (MIRAC)										100			90			
Sucker Run NR Forbestown (SRNFT)			16.7				53.3			83.3			40			
Diversion Pool DS Powerhouse (DIVDPP)																
Feather R A Oroville (FRFBD)	0.0			73.3		100		87	33.0		80.0	60			63.3	86.7
Feather R Hatchery Settling Pond (FRHSP)																
Feather R DS from Hatchery (FRDFH)	0.0			53.3		30.0		0	30.0		76.7	76.7			83.3	60
Feather R US from Afterbay Outlet (FRUAO)	20.0			96.7		90.0		47	17.0		66.7	90			76.7	26.7
Afterbay Outlet Canal to Feather R (AOCFR)	0.0			93.3		70.0	73.3		50.0		100	63.3			66.6	70
Feather R DS from Afterbay Outlet (FRDAO)	52.5			76.7		80.0		70	23.0		96.7	73.3			96.7	36.7
Feather R DS from SCOR Outfall (FRDSO)	0.0			66.7		93.3		40	20.0		76.7	86.7			83.3	36.7
Feather R DS from Project Boundary (FRDPB)	15.0			46.7		93.3		87	43.0		96.7	70			96.7	40
Oroville Wildlife Area Fishing Pond (OWAFP)					73.3			90								
Oroville Wildlife Area Mile Long Pond (OWAMP)					70.0			70								
Oroville Wildlife Area Lower Pacific Heights Pond (OWALP)					36.7			33								

Bold = Significantly less than the Control treatment at p= <0.05.

Effects of Oroville Dam Drainage (FILTERED) Water Samples on survival of Larval Fathead Minnow.

Treatment/ Sample ID	Overall Mean (%) Survival															
	Year	2002														
	5/15	5/16	5/21	5/30	6/25	7/15	7/24	8/21	9/24	9/25	10/22	11/12	11/13	11/14	12/11	
Laboratory Control	100	90.0	100	76.7	96.7	96.7	97	100	100	100	100	96.7	100	93.3	90.0	
Concow C A Jordan Hill Rd. (CCJHR)	100					90			96.7			53.3				
West Branch Near Paradise (WBNPA)									96.7			13.3				
West Branch A Oroville Res. (WBAOR)			96.7			90										
NF Feather R DS Poe PH (NFPPH)	100					70			96.7			10				
Poe Powerhouse Discharge (PPHDI)						86.6			100			26.7				
Feather R MF NR Merrimack (MFMBR)	96.7					70			96.7			26.7				
Fall R US Feather Falls (FRUFF)		70				60			100				100			
SF Feather R AB Ponderosa Res. (SFUPR)		86.7				90			96.7			20				
SF Feather R DS Ponderosa Res. (SFDPR)																
Miners Ranch Canal (MIRAC)									100			63.3				
Sucker Run NR Forbestown (SRNFT)		93.3				86.7			100			100				
Diversion Pool DS Powerhouse (DIVDPP)																
Feather R A Oroville (FRFBD)			96.7		83.3		90	97		93.3	83.3			90	25.6	
Feather R Hatchery Settling Pond (FRHSP)																
Feather R DS from Hatchery (FRDFH)			93.3		100		80	97		96.7	80			73.3	83.3	
Feather R US from Afterbay Outlet (FRUAO)			86.7		63.3		90	70		93.3	93.3			70	96.7	
Afterbay Outlet Canal to Feather R (AOCFR)			93.3		36.7	93.3		100		96.7	93.3			93.3	80	
Feather R DS from Afterbay Outlet (FRDAO)			86.7		60		90	100		100	86.7			100	93.3	
Feather R DS from SCOR Outfall (FRDSO)			96.7		73.3		87	97		86.7	100			46.7	90	
Feather R DS from Project Boundary (FRDPB)			96.7		40		100	97		96.7	96.7			90	93.3	
Oroville Wildlife Area Fishing Pond (OWAFP)				70.0				97								
Oroville Wildlife Area Mile Long Pond (OWAMP)				76.7				77								
Oroville Wildlife Area Lower Pacific Heights Pond (OWALP)				63.3				100								

Bold = Significantly less than the Control treatment at p= <0.05.

Effects of Oroville Dam Drainage Ambient Water Samples on Survival of Larval Fathead Minnow.

Treatment/ Sample ID	Overall Mean (%) Survival							
	Year	2003						
	1/14	2/18	3/19	3/26	4/15	4/17	4/24	5/15
Laboratory Control	100	86.7	96.7	100	80	100	100	100
Concow C A Jordan Hill Rd. (CCJHR)		70			50			
West Branch Near Paradise (WBNPA)		26.7			70			
West Branch A Oroville Res. (WBAOR)								
NF Feather R DS Poe PH (NFPPH)		40			6.7			
Poe Powerhouse Discharge (PPHDI)		60			63.3			
Feather R MF NR Merrimack (MFMBR)		43.3			66.7			
Fall R US Feather Falls (FRUFF)		66.7			73.3			
SF Feather R AB Ponderosa Res. (SFUPR)		33.3			96.7			
SF Feather R DS Ponderosa Res. (SFDPR)		96.7			96.7			
Miners Ranch Canal (MIRAC)								
Sucker Run NR Forbestown (SRNFT)		3.3			80			
Diversion Pool DS Powerhouse (DIVDPP)					46.7			
Feather R A Oroville (FRFBD)	56.7		66.7			100		96.7
Feather R Hatchery Settling Pond (FRHSP)						100		80
Feather R DS from Hatchery (FRDFH)	76.7		10			73.3		96.7
Feather R US from Afterbay Outlet (FRUAO)	56.7		53.3			80		76.7
Afterbay Outlet Canal to Feather R (AOCFR)	80		93.3			66.7		66.7
Feather R DS from Afterbay Outlet (FRDAO)	50		43.3			60		96.7
Feather R DS from SCOR Outfall (FRDSO)	96.7		56.7			60		90
Feather R DS from Project Boundary (FRDPB)	73.3		34.4			33.3		33.3
Oroville Wildlife Area Fishing Pond (OWAFP)				90			70	
Oroville Wildlife Area Mile Long Pond (OWAMP)				80			80	
Oroville Wildlife Area Lower Pacific Heights Pond (OWALP)				26.7			33.3	

Bold = Significantly less than the Control treatment at p = <0.05.

Effects of Oroville Dam Drainage (FILTERED) Water Samples on Survival of Larval Fathead Minnow.

Treatment/ Sample ID	Overall Mean (%) Survival							
	Year	2003						
	1/14	2/18	3/19	3/26	4/15	4/17	4/24	5/15
Laboratory Control	96.7	100	100	83	93.3	90	100	100
Concow C A Jordan Hill Rd. (CCJHR)		63.3			93.3			
West Branch Near Paradise (WBNPA)		96.7			53.3			
West Branch A Oroville Res. (WBAOR)								
NF Feather R DS Poe PH (NFPPH)		93.3			83.3			
Poe Powerhouse Discharge (PPHDI)		96.7			70			
Feather R MF NR Merrimack (MFMBR)		93.3			96.7			
Fall R US Feather Falls (FRUFF)		96.7			73.3			
SF Feather R AB Ponderosa Res. (SFUPR)		93.3			93.3			
SF Feather R DS Ponderosa Res. (SFDPR)		100			80			
Miners Ranch Canal (MIRAC)								
Sucker Run NR Forbestown (SRNFT)		96.7			73.3			
Diversion Pool DS Powerhouse (DIVDPP)					83.3			
Feather R A Oroville (FRFBD)	83.3		100			100		86.7
Feather R Hatchery Settling Pond (FRHSP)						100		86.7
Feather R DS from Hatchery (FRDFH)	93.3		93.3			93.3		86.7
Feather R US from Afterbay Outlet (FRUAO)	90		80/96.7*			100		93.3
Afterbay Outlet Canal to Feather R (AOCFR)	96.7		100			93.3		51.0
Feather R DS from Afterbay Outlet (FRDAO)	66.7		100			96.7		96.7
Feather R DS from SCOR Outfall (FRDSO)	100		73.3			100		83.3
Feather R DS from Project Boundary (FRDPB)	96.7		96.7			100		53.3
Oroville Wildlife Area Fishing Pond (OWAFP)				80			100	
Oroville Wildlife Area Mile Long Pond (OWAMP)				80			90	
Oroville Wildlife Area Lower Pacific Heights Pond (OWALP)				86.7			93.3	

Bold = Significantly less than the Control treatment at p = <0.05.

* = Sample retested on 4/8/03 (new control value = 96.7 percent)

SPW1. Aquatic Toxicity

Fathead Minnow

Results:

Growth

Effects of Oroville Dam Drainage Ambient Water Samples on growth of Larval Fathead Minnow.

Treatment/ Sample ID	Overall Mean Biomass (mg)															
	Year	2002														
	4/24	5/15	5/16	5/21	5/30	6/25	7/15	7/24	8/21	9/24	9/25	10/22	11/12	11/13	11/14	12/11
Laboratory Control	0.31	0.49	0.25	0.30	0.23	0.44	0.22	0.417	0.33	0.39	0.32	0.49	0.34	0.46	0.32	0.41
Concow C A Jordan Hill Rd. (CCJHR)		0.38					0.16			0.34			0.29			
West Branch Near Paradise (WBNPA)										0.45			0.00			
West Branch A Oroville Res. (WBAOR)				0.27			0.20									
NF Feather R DS Poe PH (NFPPH)		0.16					0.09			0.44			0.06			
Poe Powerhouse Discharge (PPHD)							0.05			0.46			0.09			
Feather R MF NR Merrimack (MFMBR)		0.38					0.09			0.39			0.17			
Fall R US Feather Falls (FRUFF)			0.18				0.16			0.40				0.21		
SF Feather R AB Ponderosa Res. (SFUPR)			0.17				0.15			0.37			0.26			
SF Feather R DS Ponderosa Res. (SFDPR)																
Miners Ranch Canal (MIRAC)										0.36			0.36			
Sucker Run NR Forbestown (SRNFT)			0.09				0.14			0.40			0.17			
Diversion Pool DS Powerhouse (DIVDPP)																
Feather R A Oroville (FRFBD)	0.00			0.22		0.54		0.393	0.10		0.35	0.29			0.30	0.45
Feather R Hatchery Settling Pond (FRHSP)																
Feather R DS from Hatchery (FRDFH)	0.00			0.23		0.17		0.000	0.16		0.36	0.38			0.40	0.34
Feather R US from Afterbay Outlet (FRUAO)	0.06			0.36		0.45		0.242	0.09		0.31	0.39			0.35	0.14
Afterbay Outlet Canal to Feather R (AOCFR)	0.00			0.32		0.39	0.22		0.17		0.46	0.26			0.28	0.30
Feather R DS from Afterbay Outlet (FRDAO)	0.25			0.30		0.40		0.350	0.10		0.33	0.36			0.44	0.17
Feather R DS from SCOR Outfall (FRDSO)	0.00			0.24		0.41		0.149	0.10		0.37	0.44			0.41	0.20
Feather R DS from Project Boundary (FRDPB)	0.07			0.20		0.46		0.437	0.19		0.32	0.34			0.37	0.24
Oroville Wildlife Area Fishing Pond (OWAFP)					0.24			0.357								
Oroville Wildlife Area Mile Long Pond (OWAMP)					0.19			0.246								
Oroville Wildlife Area Lower Pacific Heights Pond (OWALP)					0.13			0.140								

Bold = Significantly less than the Control treatment at p= <0.05.

Effects of Oroville Dam Drainage (FILTERED) Water Samples on growth of Larval Fathead Minnow.

Treatment/ Sample ID	Overall Mean Biomass (mg)															
	Year	2002														
	5/15	5/16	5/21	5/30	6/25	7/15	7/24	8/21	9/24	9/25	10/22	11/12	11/13	11/14	12/11	
Laboratory Control	0.53	0.25	0.33	0.25	0.42	0.27	0.437	0.31	0.42	0.33	0.5	0.37	0.42	0.36	0.44	
Concow C A Jordan Hill Rd. (CCJHR)	0.44					0.18			0.34			0.22				
West Branch Near Paradise (WBNPA)									0.44			0.05				
West Branch A Oroville Res. (WBAOR)			0.32			0.25										
NF Feather R DS Poe PH (NFPPH)	0.46					0.17			0.37			0.04				
Poe Powerhouse Discharge (PPHD)						0.19			0.47			0.10				
Feather R MF NR Merrimack (MFMBR)	0.37					0.17			0.46			0.12				
Fall R US Feather Falls (FRUFF)		0.19				0.15			0.37				0.42			
SF Feather R AB Ponderosa Res. (SFUPR)		0.23				0.19			0.43			0.08				
SF Feather R DS Ponderosa Res. (SFDPR)																
Miners Ranch Canal (MIRAC)									0.36			0.21				
Sucker Run NR Forbestown (SRNFT)		0.25				0.21			0.43			0.42				
Diversion Pool DS Powerhouse (DIVDPP)																
Feather R A Oroville (FRFBD)			0.33		0.27		0.374	0.36		0.38	0.37			0.37	0.26	
Feather R Hatchery Settling Pond (FRHSP)																
Feather R DS from Hatchery (FRDFH)			0.35		0.37		0.263	0.32		0.41	0.38			0.23	0.31	
Feather R US from Afterbay Outlet (FRUAO)			0.32		0.21		0.367	0.21		0.42	0.46			0.32	0.36	
Afterbay Outlet Canal to Feather R (AOCFR)			0.29		0.12	0.22		0.34		0.36	0.40			0.34	0.37	
Feather R DS from Afterbay Outlet (FRDAO)			0.32		0.21		0.305	0.27		0.34	0.40			0.42	0.41	
Feather R DS from SCOR Outfall (FRDSO)			0.29		0.18		0.291	0.26		0.38	0.46			0.22	0.48	
Feather R DS from Project Boundary (FRDPB)			0.35		0.19		0.365	0.30		0.33	0.43			0.36	0.43	
Oroville Wildlife Area Fishing Pond (OWAFP)					0.24			0.458								
Oroville Wildlife Area Mile Long Pond (OWAMP)					0.23			0.285								
Oroville Wildlife Area Lower Pacific Heights Pond (OWALP)					0.22			0.400								

Bold = Significantly less than the Control treatment at p= <0.05.

Effects of Oroville Dam Drainage Ambient Water Samples on Growth of Larval Fathead Minnow.

Treatment/ Sample ID	Overall Mean Biomass (mg)							
	Year	2003						
	1/14	2/18	3/19	3/26	4/15	4/17	4/24	5/15
Laboratory Control	0.44	0.31	0.29	0.20	0.21	0.39	0.35	0.32
Concow C A Jordan Hill Rd. (CCJHR)		0.27			0.16			
West Branch Near Paradise (WBNPA)		0.11			0.18			
West Branch A Oroville Res. (WBAOR)								
NF Feather R DS Poe PH (NFPPH)		0.15			0.03			
Poe Powerhouse Discharge (PPHDI)		0.23			0.20			
Feather R MF NR Merrimack (MFMBR)		0.18			0.17			
Fall R US Feather Falls (FRUFF)		0.23			0.25			
SF Feather R AB Ponderosa Res. (SFUPR)		0.15			0.27			
SF Feather R DS Ponderosa Res. (SFDPR)		0.35			0.28			
Miners Ranch Canal (MIRAC)								
Sucker Run NR Forbestown (SRNFT)		0.02			0.26			
Diversion Pool DS Powerhouse (DIVDPP)					0.09			
Feather R A Oroville (FRFBD)	0.29*		0.29			0.29		0.38
Feather R Hatchery Settling Pond (FRHSP)						0.35		0.36
Feather R DS from Hatchery (FRDFH)	0.38		0.95			0.23		0.43
Feather R US from Afterbay Outlet (FRUAO)	0.29		0.19			0.32		0.34
Afterbay Outlet Canal to Feather R (AOCFR)	0.43		0.34			0.23		0.25
Feather R DS from Afterbay Outlet (FRDAO)	0.24		0.21			0.21		0.34
Feather R DS from SCOR Outfall (FRDSO)	0.41		0.23			0.19		0.36
Feather R DS from Project Boundary (FRDPB)	0.36		0.18			0.12		0.12
Oroville Wildlife Area Fishing Pond (OWAFP)				0.22			0.33	
Oroville Wildlife Area Mile Long Pond (OWAMP)				0.17			0.30	
Oroville Wildlife Area Lower Pacific Heights Pond (OWALP)				0.08			0.15	

Bold = Significantly less than the Control treatment at $p < 0.05$.

Effects of Oroville Dam Drainage (FILTERED) Water Samples on Growth of Larval Fathead Minnow.

Treatment/ Sample ID	Overall Mean Biomass (mg)							
	Year	2003						
	1/14	2/18	3/19	3/26	4/15	4/17	4/24	5/15
Laboratory Control	0.40	0.32	0.30	0.19	0.20	0.39	0.39	0.30
Concow C A Jordan Hill Rd. (CCJHR)		0.20			0.19			
West Branch Near Paradise (WBNPA)		0.25			0.16			
West Branch A Oroville Res. (WBAOR)								
NF Feather R DS Poe PH (NFPPH)		0.30			0.25			
Poe Powerhouse Discharge (PPHDI)		0.28			0.18			
Feather R MF NR Merrimack (MFMBR)		0.27			0.23			
Fall R US Feather Falls (FRUFF)		0.28			0.16			
SF Feather R AB Ponderosa Res. (SFUPR)		0.35			0.23			
SF Feather R DS Ponderosa Res. (SFDPR)		0.35			0.24			
Miners Ranch Canal (MIRAC)								
Sucker Run NR Forbestown (SRNFT)		0.34			0.20			
Diversion Pool DS Powerhouse (DIVDPP)					0.21			
Feather R A Oroville (FRFBD)	0.42		0.33			0.47		0.27
Feather R Hatchery Settling Pond (FRHSP)						0.33		0.29
Feather R DS from Hatchery (FRDFH)	0.42		0.34			0.42		0.34
Feather R US from Afterbay Outlet (FRUAO)	0.40		0.27			0.45		0.34
Afterbay Outlet Canal to Feather R (AOCFR)	0.55		0.35			0.43		0.22
Feather R DS from Afterbay Outlet (FRDAO)	0.28		0.32			0.45		0.35
Feather R DS from SCOR Outfall (FRDSO)	0.45		0.27			0.45		0.27
Feather R DS from Project Boundary (FRDPB)	0.46		0.35			0.46		0.19
Oroville Wildlife Area Fishing Pond (OWAFP)				0.19			0.32	
Oroville Wildlife Area Mile Long Pond (OWAMP)				0.20			0.24	
Oroville Wildlife Area Lower Pacific Heights Pond (OWALP)				0.20			0.32	

Bold = Significantly less than the Control treatment at $p < 0.05$.

SPW1. Aquatic Toxicity

Mean Biomass

VS.

Mean Dry Weight

**Fathead minnow mean dry weight and biomass results for DWR samples collected from
April 2002 - January 2003**

Sample Date	Percent of samples with Growth Toxicity (mean dry weight)	Percent of samples with Growth Toxicity (biomass)
4/24/2002	0	0
5/15/2002	33.3	33.3
5/16/2002	0	0
5/21/2002	0*	12.5
5/30/2002	0*	25
6/25/2002	0	0
7/15/2002	0*	11.1
7/24/2002	11.1	11.1
8/21/2002	0	0
9/24/2002	0*	11.1
9/25/2002	0	0
10/22/2002	0*	42.9
11/12/2002	0	0
11/13/2002	0*	100
11/14/2002	0	0
12/11/2002	0	0
1/14/2003	0*	14.3

* Represents an improvement in fathead minnow growth when compared to the biomass growth calculation method.

**Fathead minnow mean dry weight and biomass results for filtered DWR samples
collected from April 2002 - January 2003**

Sample Date	Percent of samples with Growth Toxicity (mean dry weight)	Percent of samples with Growth Toxicity (biomass)
5/15/2002 (f)	33.3	33.3
5/16/2002 (f)	0*	33.3
5/21/2002 (f)	0	0
5/30/2002 (f)	0	0
6/25/2002 (f)	14.3	0
7/15/2002 (f)	55.6*	66.7
7/24/2002 (f)	44.4	44.4
8/21/2002 (f)	0*	14.3
9/24/2002 (f)	0	0
9/25/2002 (f)	0	0
10/22/2002 (f)	28.6*	71.4
11/12/2002 (f)	0*	12.5
11/13/2002 (f)	100	100
11/14/2002 (f)	0*	14.3
November Retests (f)	0	0
12/11/2002 (f)	28.6*	42.9
1/14/2003 (f)	0	0

* Represents an improvement in fathead minnow growth when compared to the biomass growth calculation method.

(f) = Samples filtered to remove pathogen related mortality (PRM).

SPW1. Aquatic Toxicity

- Summary

Summary of Survival Toxicity by Monitoring Location - April, 2002 through May, 2003				
Treatment/ Sample ID	Ceriodaphnia		Fathead Minnow	
	Samples	Percent of samples Toxic	Ratio of toxic ambient samples	Ratio of toxic filtered samples
Concow C A Jordan Hill Rd. (CCJHR)	6	0	0	1 out of 6
West Branch Near Paradise (WBNA)	4	0	1 out of 4	1 out of 4
West Branch A Oroville Res. (WBAOR)	2	0	1 out of 2	0
NF Feather R DS Poe PH (NFPPH)	6	1 out of 6	5 out of 6	1 out of 6
Poe Powerhouse Discharge (PPHDI)	5	0	2 out of 5	1 out of 5
Feather R MF NR Merrimack (MFMBR)	6	0	1 out of 6	1 out of 6
Fall R US Feather Falls (FRUFF)	6	0	1 out of 6	1 out of 6
SF Feather R AB Ponderosa Res. (SFUPR)	5	1 out of 5	2 out of 5	1 out of 5
SF Feather R DS Ponderosa Res. (SFDPR)	2	0	0	0
Miners Ranch Canal (MIRAC)	2	0	0	0
Sucker Run NR Forbestown (SRNFT)	6	0	3 out of 6	0
Diversion Pool DS Powerhouse (DIVDPP)	1	0	0	0
Feather R A Oroville (FRFBD)	13	0	4 out of 13	1 out of 13
Feather R Hatchery Settling Pond (FRHSP)	2	0	0	0
Feather R DS from Hatchery (FRDFH)	13	2 out of 13/ 1 out of 13*	7 out of 13	2 out of 13
Feather R US from Afterbay Outlet (FRUAO)	13	0	6 out of 13	1 out of 13
Afterbay Outlet Canal to Feather R (AOCFR)	13	0	5 out of 13	1 out of 13
Feather R DS from Afterbay Outlet (FRDAO)	13	0	5 out of 13	1 out of 13
Feather R DS from SCOR Outfall (FRDSO)	13	0	7 out of 13	2 out of 13
Feather R DS from Project Boundary (FRDPB)	13	0	6 out of 13	1 out of 13
Oroville Wildlife Area Fishing Pond (OWAFP)	4	0	1 out of 4	0
Oroville Wildlife Area Mile Long Pond (OWAMP)	4	0	1 out of 4	0
Oroville Wildlife Area Lower Pacific Heights Pond (OWALP)	4	0	4 out of 4	0

* After Retest