HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Draft Final Revised – August 5, 2016

Appendix A:
Conservation Facility Operations Summary

Year	Facility	Funding	Broodstock Collection	Broodstock Available	Permitting	Production
2010	Small-scale Interim Facility initiated.	No capital funds. Operational funds only (includes monitoring funds).	None collected.	None.	Prep/review 10(a)1(A), 10(j) designation, 4(d) regulations.	No spring-run. Some experimental unlisted fall-run collected as eggs from Merced Hatchery to fulfill fish/habitat research needs.
2011	Interim Facility in use. Pending funding approval, SCARF construction planning begins.	Capital funds available when state budget is approved, if included. Operational funding continues.	None collected	None.	NMFS reviewing the above.	No spring-run. Some experimental unlisted fall-run broodyear (BY) 2010 production.
2012	Interim Facility in use. Begin construction.	Capital funding continues. Reclamation agrees to fund operations and maintenance for period of 10 years.	Conservation Facility Subgroup recommendations for broodstock collection is made in February, 2012. Collected 560 eyed eggs from brood year (BY) 2012, Eyed eggs transferred to Silverado Fish Base for quarantine.	Broodstock from BY 2012 collected from Feather River Hatchery in October 2012.	NMFS 10(a)1(A) Permit issued October 11, 2012.	None. Eggs may be placed directly into the river, pending permitting.
2013	Interim Facility should have capacity for juveniles identified in Broodstock Collection column. Expansion continues. SCARF preliminary planning begins.	Capital/operational funding continues.	CWTd and transported 436 BY 2012 juveniles from Silverado Fish Base to the Interim Facility in April 2013. Collected 560 BY 2013 spring-run Chinook Salmon eggs from FRH in Sep.-Oct. 2013, and transported them to Silverado Fish Base for quarantine.	None. BY 2012 will be the first brood year available to spawn as adults in fall 2015.	NMFS 10(a)1(A) Permit issued October 11, 2012.	None.

Year	Facility	Funding	Broodstock Collection	Broodstock Available	Permitting	Production
2014	Interim Facility in use, but will be integrated into the SCARF as it comes on line. SCARF design planning continues.	Capital funding completed in 2014. Operational funding to continue through 2022.	CWTd and transported 440 BY 2013 juveniles from Silverado Fish Base to the Interim Facility in March 2014. Continue rearing fish collected in 2012 and 2013. Collected 560 BY 2014 spring-run Chinook Salmon eggs from FRH in Sep.-Oct. 2013, and transported them to Silverado Fish Base for quarantine.	None. Jacks (Age 2 from BY 2012) may be available. If so, their milt will be frozen for later use. Jacks will generally be ripe at age 2 and incorporated into the spawning process.	Permits in hand.	No spring-run production.
2015	Interim Facility retired. SCARF 65% design planning progresses into 100% design.	Operational funding.	As described above, but collections increased to 1,935 for BY 2015. Continue rearing fish collected in 2012, 2013, and 2014.	BY 2012 and 2013 jacks, and precocious males from 2014.	Permits in hand.	Spring-run production = 62,500 smolts: (50 females, 2500 eggs per female), 50% survival from BY 2012 spawned adults.
2016	SCARF design planning complete. SCARF Construction begins.	BOR Operational and Maintenance funding.	As described above, but collections are recommended to increase to 2,760 for BY 2016. Continue rearing fish collected in 2012, 2013, 2014, and 2015. May be returns from egg boxes.	BY 2011, 2012, 2013, and additional precocious males.	Permits in hand. Submit application for new 10(a)1(A) permit beginning in 2018.	48,341 BY 2015 smolts released to the San Joaquin River.
2017	SCARF construction continues. SCARF online by end of year.	BOR Operational and Maintenance funding.	As described above, but collections are recommended to increase to 2,760 for BY 2017.Continue rearing fish collected in 2013, 2014, 2015, and 2016. First significant returns, from fish produced in 2014, and some of these adults may be collected for use as broodstock.	BY 2012, 2013, 2014, and additional precocious males.	Permits in hand.	Production goal of spring-run Chinook salmon juveniles: 151,875 (egg number would be higher). May need to reduce to allow for natural production.

Year	Facility	Funding	Broodstock Collection	Broodstock Available	Permitting	Production
2018	SCARF online	BOR Operational and Maintenance funding.	As described above, but collections are anticipated to increase to 5,400 for BY 2018, + 60 fish (for pathology studies) from each collection event. Collections are planned to expand to Butte Creek and from the San Joaquin River experimental population. Continue rearing fish collected in 2014, 2015, 2016, and 2017.	BY 2013, 2014, 2015, and additional precocious males.	Beginning of new 10(a)1(A) permit term.	Production goal of 200,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.
2019	SCARF	BOR Operational and Maintenance funding.	As described above: 5,400 for BY 2019, + 60 fish (for pathology studies) from each collection event. Continue rearing fish collected in 2015, 2016, 2017, and 2018. First returns from the full-scale hatchery production (2016) expected in 2019.	BY 2014, 2015, 2016, and additional precocious males.	Permits in hand.	Production goal of 600,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.
2020	SCARF	BOR Operational and Maintenance funding.	As described above: 5,400 for BY 2020, + 60 fish (for pathology studies) from each collection event. Continue rearing fish collected in 2016, 2017, 2018, and 2019.	BY 2015, 2016, 2017, and additional precocious males.	Permits in hand.	Production goal of 700,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.
2021	SCARF	BOR Operational and Maintenance funding	As described above: 5,400 for BY 2021, + 60 fish (for pathology studies) from each collection event. Continue rearing fish collected in 2017, 2018, 2019, and 2020.	BY 2016, 2017, 2018, and additional precocious males.	Permits in hand. Submit application for new 10(a)1(A) permit beginning in 2023.	Production goal of 960,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.

Year	Facility	Funding	Broodstock Collection	Broodstock Available	Permitting	Production
2022	SCARF	BOR Operational and Maintenance funding	As described above: 5,400 for BY 2022, + 60 fish (for pathology studies) from each collection event. Continue rearing fish collected in 2018, 2019, 2020 and 2021.	BY 2017, 2018, 2019, and additional precocious males.	Permits in hand.	Expected to be the maximum SCARF production of 1,000,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.
2023	SCARF	Operational funding not yet secured.	Expand collection to include Deer and Mill Creek Complex, depending on population status and permitting. Continue rearing fish collected in 2019, 2020, 2021 and 2022.	BY 2018, 2019, 2020.	Beginning of new 10(a)1(A) permit term.	1,000,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.
2024	SCARF	Operational funding not yet secured.	Continue collections from FRH, Butte Creek, The San Joaquin River, and the Deer and Mill Creek Complex. Continue rearing fish collected in 2020, 2021, 2022 and 2023.	BY 2019, 2020, 2021	Permits in hand.	1,000,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.
2025	SCARF	Operational funding not yet secured.	Continue collections from FRH, Butte Creek, The San Joaquin River, and the Deer and Mill Creek Complex. Continue rearing fish collected in 2021, 2022, 2023, and 2024.	BY 2020, 2021, 2022	Permits in hand.	1,000,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.
2026	SCARF	Operational funding not yet secured.	Continue collections from FRH, Butte Creek, The San Joaquin River, and the Deer and Mill Creek Complex. Continue rearing fish collected in 2022, 2023, 2024, and 2025.	BY 2021, 2022, 2023	Permits in hand. As needed, submit application for new 10(a)1(A) permit beginning in 2023.	1,000,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.

Year	Facility	Funding	Broodstock Collection	Broodstock Available	Permitting	Production
2027	SCARF	Operational funding not yet secured.	Continue collections from FRH, Butte Creek, The San Joaquin River, and the Deer and Mill Creek Complex. Continue rearing fish collected in 2023, 2024, 2025, and 2026.	BY 2022, 2023, 2024	Permits in hand.	1,000,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.
2028	SCARF	Operational funding not yet secured.	Evaluate continued need for artificial propagation contributing to the naturally produced San Joaquin River population. If conditions permit, begin/continue ramping down broodstock collections and annual production in hatchery.	BY 2023, 2024, 2025	Beginning of new 10(a)1(A) permit term.	1,000,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.
2029	SCARF	Operational funding not yet secured.	Evaluate continued need for artificial propagation contributing to the naturally produced San Joaquin River population. If conditions permit, begin/continue ramping down broodstock collections and annual production in hatchery.	BY 2024, 2025, 2026	Permits in hand.	Up to 1,000,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.
2030	SCARF	Operational funding not yet secured.	Evaluate continued need for artificial propagation contributing to the naturally produced San Joaquin River population. If conditions permit, begin/continue ramping down broodstock collections and annual production in hatchery.	BY 2025, 2026, 2027	Permits in hand.	Up to 1,000,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.

Year	Facility	Funding	Broodstock Collection	Broodstock Available	Permitting	Production
2031	SCARF	Operational funding not yet secured.	Evaluate continued need for artificial propagation contributing to the naturally produced San Joaquin River population. If conditions permit, begin/continue ramping down broodstock collections and annual production in hatchery.	BY 2026, 2027, 2028	Permits in hand.	Up to 1,000,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.
2032	SCARF	Operational funding not yet secured.	Evaluate continued need for artificial propagation contributing to the naturally produced San Joaquin River population. If conditions permit, begin ramping down broodstock collections and annual production in hatchery.	BY 2027, 2028, 2029	Permits in hand.	Up to 1,000,000 spring-run Chinook salmon juveniles (egg number would be higher). May need to reduce to allow for natural production.

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Draft Final Revised – August 5, 2016

Appendix B:
Standard Operating Procedures for
Adult and Juvenile Transport

Title: Adult and Juvenile Salmon Transport ***2***
1.0 Introduction ***2***
2.0 Equipment Description ***3***
3.0 Procedures ***3***
4.0 Qualified Personnel ***8***
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Title: Adult and Juvenile Salmon Transport

SOP # SCF-TRN-001-03
Effective Date: March 15, 2013

1.0 Introduction

Purpose

This is a Standard Operating Procedure (SOP) for the transportation of adult and juvenile spring-run Chinook salmon within the context of the San Joaquin River Restoration Program (Program). The protocol provides techniques that will reduce negative impacts while transporting this ESA threatened species.

Planning

1.0.1 Be certain that required permits are issued and copies are present if required. Receive prior approval for fish movements from the CDFW Fish Health Lab.

1.0.2 Necessary worksheets to accompany fish transport:

- Vehicle and Trailer Inspection Checklist (Appendix A)
- Fish Transport Data Sheet (Appendix B)

Scope

This SOP must be followed by all personnel within the SJRRP for the transportation of adult and juvenile Chinook salmon to and from the Conservation Facility.

Summary of Methods

To minimize the potential negative effects of transporting juveniles, transfer protocols will be followed to:

- Use appropriate hauling equipment
- Monitor and maintain dissolved oxygen
- Provide isotonic conditions to maintain ionic balance with use of salt
- Temper the transport water to within 2 °F when receiving and releasing fish to minimize temper shock to fish
- Maintain an appropriate fish density during transport
- Use handling methods to minimize stress to fish

2.0 Equipment Description

Both juvenile and adult salmon will be transported in a 500-gallon insulated aluminum fish hauling tank or similar tank that has a proven history for safely hauling live fish. Hauling tanks must have a redundant aeration system that includes both mechanical aerators and gaseous diffused oxygen. Fish should be easily loaded and unloaded to and from the tank with no harm to fish (See Appendix A: Additional Equipment). The single-compartment tank is designed to be transported by, at minimum, a one-ton flatbed truck, or a heavy-duty transport trailer with gross vehicle weight rating of approximately 10,000 lbs. The tank is made of double-wall aluminum, insulated with 2 inch polyurethane foam, with the dimensions 46" wide x 84" long x 42" high. The tank is fitted with a 12" x 16" dump gate for easy release of large salmon and has a large 41" x 48" hinged lid to allow easy access to fish. Oxygen gas is supplied to the tank using compressed oxygen gas cylinders and one Pointfour micro-bubble diffuser and one oxygen soaker hose. Additional oxygenation and CO2 degassing is provided by two Fresh Flow®, 75 GMP, 12-volt, impeller-driven aerators. The aerators will be powered by the vehicle's 12-volt electrical system. Aerator indicator lights and oxygen gas flow meters will be viewable by the driver at all times.

3.0 Procedures

Equipment Decontamination

Equipment should be disinfected anytime there is a risk of disease or invasive species transfer, particularly when traveling between hatchery facilities and after equipment has been used on a river system. Empty tanks and equipment should be disinfected with 200 ppm chlorine or PVP Iodine for at least 1 hour. The chlorine and iodine should be neutralized with sodium thiosulfate and rinsed before being used for a new group of fish. One liter of 200 ppm available chlorine is neutralized by 1.5 g of sodium thiosulfate (Timmons and Ebeling, 2007).

Title: Adult and Juvenile Salmon Transport

SOP # SCF-TRN-001-03
Effective Date: March 15, 2013

4.0 Introduction

4.0 Purpose

This is a Standard Operating Procedure (SOP) for the transportation of adult and juvenile spring-run Chinook salmon within the context of the San Joaquin River Restoration Program (Program). The protocol provides techniques that will reduce negative impacts while transporting this ESA threatened species.

4.1 Planning

4.1.1 Be certain that required permits are issued and copies are present if required. Receive prior approval for fish movements from the CDFW Fish Health Lab.

4.1.2 Necessary worksheets to accompany fish transport:

- Vehicle and Trailer Inspection Checklist (Appendix A)
- Fish Transport Data Sheet (Appendix B)

4.2 Scope

This SOP must be followed by all personnel within the SJRRP for the transportation of adult and juvenile Chinook salmon to and from the Conservation Facility.

4.3 Summary of Methods

To minimize the potential negative effects of transporting juveniles, transfer protocols will be followed to:

- Use appropriate hauling equipment
- Monitor and maintain dissolved oxygen
- Provide isotonic conditions to maintain ionic balance with use of salt
- Temper the transport water to within 2 °F when receiving and releasing fish to minimize temper shock to fish
- Maintain an appropriate fish density during transport
- Use handling methods to minimize stress to fish

5.0 Equipment Description

Both juvenile and adult salmon will be transported in a 500-gallon insulated aluminum fish hauling tank or similar tank that has a proven history for safely hauling live fish. Hauling tanks must have a redundant aeration system that includes both mechanical aerators and gaseous diffused oxygen. Fish should be easily loaded and unloaded to and from the tank with no harm to fish (See Appendix A: Additional Equipment). The single-compartment tank is designed to be transported by, at minimum, a one-ton flatbed truck, or a heavy-duty transport trailer with gross vehicle weight rating of approximately 10,000 lbs. The tank is made of double-wall aluminum, insulated with 2 inch polyurethane foam, with the dimensions 46" wide x 84" long x 42" high. The tank is fitted with a 12" x 16" dump gate for easy release of large salmon and has a large 41" x 48" hinged lid to allow easy access to fish. Oxygen gas is supplied to the tank using compressed oxygen gas cylinders and one Pointfour micro-bubble diffuser and one oxygen soaker hose. Additional oxygenation and CO2 degassing is provided by two Fresh Flow®, 75 GMP, 12-volt, impeller-driven aerators. The aerators will be powered by the vehicle's 12-volt electrical system. Aerator indicator lights and oxygen gas flow meters will be viewable by the driver at all times.

6.0 Procedures

6.0 Equipment Decontamination

Equipment should be disinfected anytime there is a risk of disease or invasive species transfer, particularly when traveling between hatchery facilities and after equipment has been used on a river system. Empty tanks and equipment should be disinfected with 200 ppm chlorine or PVP Iodine for at least 1 hour. The chlorine and iodine should be neutralized with sodium thiosulfate and rinsed before being used for a new group of fish. One liter of 200 ppm available chlorine is neutralized by 1.5 g of sodium thiosulfate (Timmons and Ebeling, 2007).

6.1 Pre-inspection

6.1.1 Complete worksheet from Appendix A.

6.1.2 Ensure all equipment is in proper working order, and has been properly decontaminated.

6.1.3 Check all batteries and backup batteries (i.e. aerators, sensors, etc.) to make sure they are fully charged. If transportation will occur over several days, bring proper battery chargers.

6.1.4 Make sure all oxygen tanks contain sufficient oxygen for transport and for potential delays. To estimate oxygen requirement, anticipate using 1 liter per minute per 100 lbs of fish. If transportation will occur over several days, transportation staff should be made aware of locations near, en-route, etc. to fill oxygen tanks.

6.1.5 If using equipment which requires gasoline to operate (i.e. water pump, generator etc.), check fuel levels in equipment and gas cans. If equipment requires oil or other fluids, check those levels and bring back-up fluid.

6.2 Transporting Juveniles and Adults

6.2.1 Arrival on site

6.2.1.1 Make sure all gates and ports on the tank are closed or sealed.

6.2.1.2 Add sodium chloride and anti-foaming agent to tank in the appropriate amounts. Salt should be added at 0.8 % or 6.4 lbs per 100 gallons.

6.2.1.3 Fill tank with cold stream/hatchery water (< 58 F) immediately prior to transport. If using stream water, use portable screened pump to fill tank.

6.2.1.4 Turn on oxygen to appropriate level. Transport water would be oxygenated using compressed oxygen gas with oxygen stones and impellor-driven aerators.

6.2.1.5 Add ice (non-chlorinated) if necessary to cool water.

6.2.2 Adding Fish

6.2.2.1 If possible, transfer fish into tank with "in-water" techniques, such as purse-style stretchers that hold both fish and water. Fish may be transferred directly into the holding tank OR may be transferred into small cages within the holding tank.

6.2.2.2 Oxygen levels and water temperature should be monitored and recorded approximately every hour.

6.2.2.3 Add fish up to the maximum allowable density. Maximum density for Chinook larger than 1.5 inches is 0.5 lbs per gallon (Piper et al. 1982).

6.2.2.4 Just prior to transport, take dissolved oxygen percentage (DO%), dissolved oxygen parts per million (DO ppm), and water temperature, and record on transportation datasheet.

6.2.2.5 Look for mortalities. Record and remove all mortalities. All mortalities should immediately be placed in a properly-labeled specimen bag and placed in a cooler on ice. These fish will go to CDFW pathology.

6.2.2.6 Record start of transport time.

6.2.3 During Transport

6.2.3.1 Drive slowly and carefully. The weight of the water will impair the braking and cornering ability of the vehicle. Sloshing water will also stress the fish.

6.2.3.2 The truck will be stopped after 30 minutes of transportation and each hour thereafter for visual inspection of the life-support system and fish health and wellbeing.

6.2.3.3 Dissolved oxygen levels will be monitored and maintained near saturation during transport.

6.2.3.4 All mortalities should immediately be placed in a properly-labeled specimen bag and placed in a cooler on ice. These fish will go to CDFW pathology.

6.3 Backup

6.3.1 A gas-powered AC/DC generator may be needed when hauling high densities of fish to operate aerators in the event of failure of the vehicle's electrical system.

6.3.2 In the event that the vehicle becomes immobilized, a towing company will be used to tow the vehicle to the release location. If the tank is used on the trailer, a backup vehicle will be used to complete the delivery.

6.4 Fish Release

6.4.1 Record end time and take oxygen level and water temperature measurement in tank. Record on datasheet.

6.4.2 Look for mortalities. Record and remove all mortalities. All mortalities should immediately be placed in a properly-labeled specimen bag and placed in a cooler on ice. These fish will go to CDFW pathology.

6.4.3 Take water temperature of receiving water and record on datasheet.

6.4.4 Temper transport water to within 2 ºF of the receiving water by pumping receiving water directly into the transportation tank until desired temperature is reached.

6.4.5 Transfer fish from tank into receiving water with "in-water" techniques if possible, such as purse-style stretchers that hold both fish and water.

6.4.6 River water from donor watersheds will be considered to contain pathogens. Release transport water into quarantine tanks and/or release water at predetermined appropriate location on dry ground where there is no drainage to the hatchery or aquatic area.

7.0 Qualified Personnel

Transportation of donor stock from donor watersheds to the Conservation Facility or to the San Joaquin River will be accomplished by personnel from either the CDFW or USFWS with previous experience transporting live fish. Personnel transporting juvenile and/or adult Chinook salmon must have experience using one-ton 4-wheel drive truck with heavy-duty suspension and a gross vehicle weight rating (GVWR) of 12,500 pounds equipped with a 500-gallon Aquaneering® fish transport tank.

8.0 Roles and responsibilities

Name	Department	Title	Role	Responsibilities
Paul Adelizi	CDFW	Environmental Scientist	Conservation Facility Lead	Transportation, Receiving eggs and fish at facility
Matt Bigelow	CDFW	Environmental Scientist	Collection/Release of Fish Safety Officer	Transportation/Holding fish in the field.
Patrick Ferguson	CDFW	Environmental Scientist	CDFG Donor Stock Collection Lead	Collection, Transport

8.0 **All personnel working with fish will be properly trained in safe fish-handling procedures described above.**

8.1 **All personnel operating transportation equipment must be able to couple and uncouple the truck from the trailer and have the ability to troubleshoot the aeration and oxygenation equipment.**

8.2 **All personnel with no prior experience operating the trucks while hauling water in tanks will have to successfully demonstrate their ability to operate such an equipped vehicle to the CDFW SJRRP safety officer.**

9.0 References

Timmons, Michael B. and James M. Ebeling, 2007. Recirculating Aquaculture. Ithaca, NY, Cayuga Aqua Ventures, 629 p.

Wurts, William A. 1995. Using salt to reduce handling stress in channel catfish. World Aquaculture, 26(3): 80-81.

10.0 Attachments: All field forms/data sheets

Attachment B-1

Fish Transportation Check List

To be carried out before transporting fish and when a change of driver takes place.
Vehicle Number _____ Date:_____

	Check ☑ if in good Condition	**Comments**		**Check ☑ if in good Condition**	**Comments**
	Tires			Wipers	
	Tire Tread			Lights	
	Tire Pressure			Horn	
	Tire Condition			**Trailer**	
	Rim Condition			Tires	
	Wheel Nuts			Safety Chains attached	
	Dust Caps			Break Line attached	
	Engine			Trailer Lights	
	Oil Level			Extra Fuses	
	Steering Fluid			**Fish Transport Supplies**	
	Coolant			Oxygen Supply	
	Break Fluid			Aerators Functioning	
	Battery Water Level			Proper Oxygen Stones	
	Hoses			Non iodized Salt	
	Belts			Anti-Foaming Agent	
	Wiring			Nets	
	Other			Buckets	
	Emergency Lights			Water Pump	
	Steering System			Generator	
	Brakes Operation			Gas and oil for Gen.	
	Loose Objects			Loose Objects	
	Tool Kit			Multi Meter	
	Transport Receipt			Cooler for Morts	
	Spare Tire			Ice for Cooler	
	Jack			Sample Bags	
	Blocks for Tires			**Applicable Permits**	

Attachment B-2

Fish Transport Data Sheet

Transfer Date_____ Staff_____

Pickup Location_____ Pickup Time_____

Source/River Water Temp and DO at Time of Pickup_____

Transport Tank Temp and DO at Time of Pickup_____

Release Location(s) and Time(s)_____

_____

Delivery point water temp and DO at time of delivery _____

Amount of salt added (use 32LB for 500 gallon Tank)_____

Hourly Transport Data

Time	Temperature	DO	Comments.

Table 1. Types, concentrations and quantities* of food-grade salts used in live fish transport water. (Wurts 1995)

Chemical name	Common name	Concentration	Teaspoons per gallon	Cups per 100 gallons	Pounds per 100 gallons
Sodium chloride	feed mixing or table salt	8 g/l (0.8% salt)	4 3/4	9 3/4	6.4
Calcium sulfate	agricultural gypsum	125-250 mg/l (as $CaSO_4$)	1/4 - 4/10	1/2 - 8/10	0.18-0.36
Sodium bicarbonate	baking soda	100-200 mg/l (as $Ca(HCO_3)$)	1/8 - 1/4	1/4 - 1/2	0.14-0.28

* Amounts listed assume a starting concentration of zero (none present). For accuracy, concentrations should be checked before, during and after the addition of each salt. Use level household measures.

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

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Appendix C:
Temperature Data for
Source Watersheds and the Restoration Area

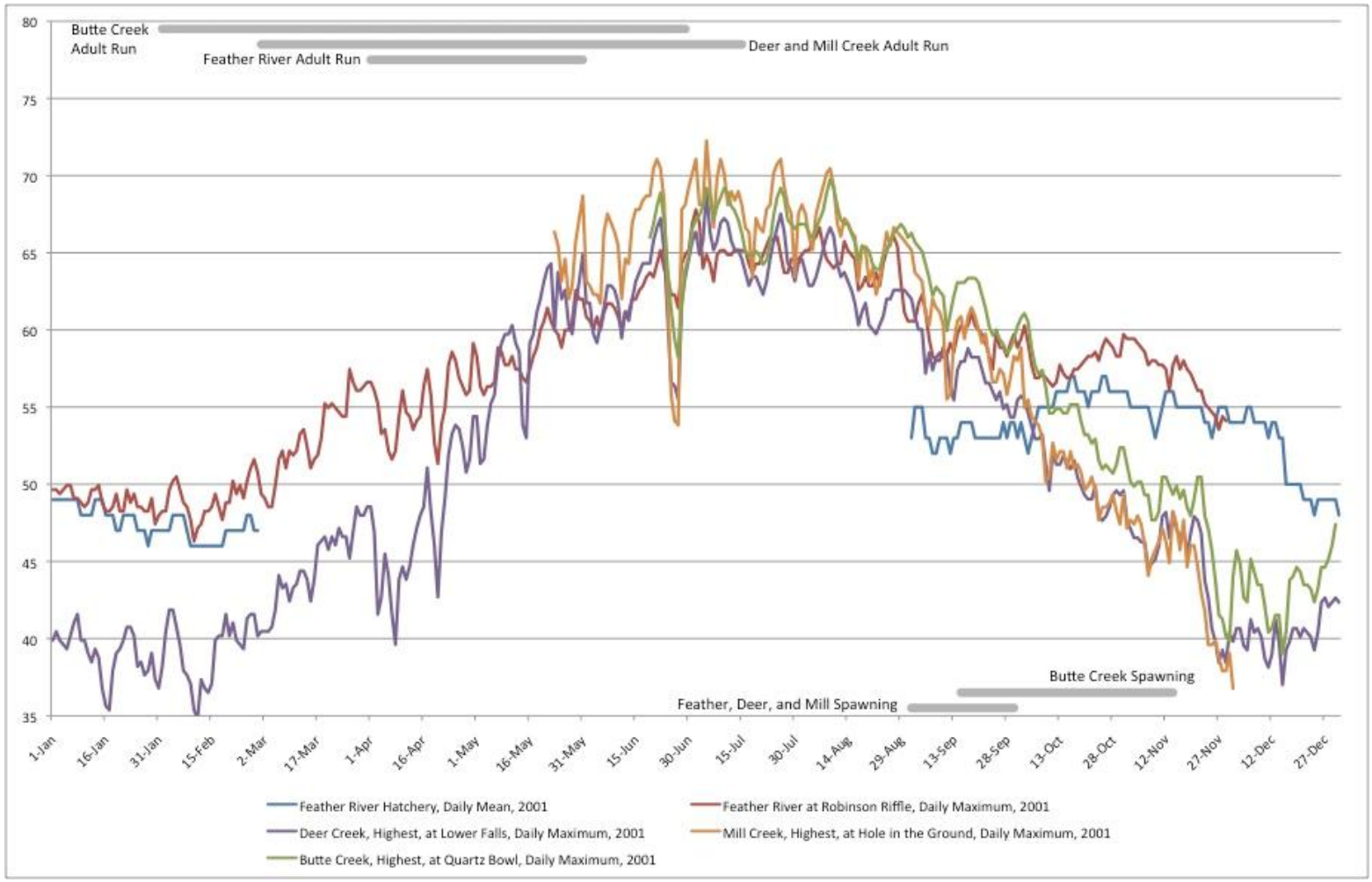

Figure C.1: Higher elevation water temperatures\ data for source stock populations

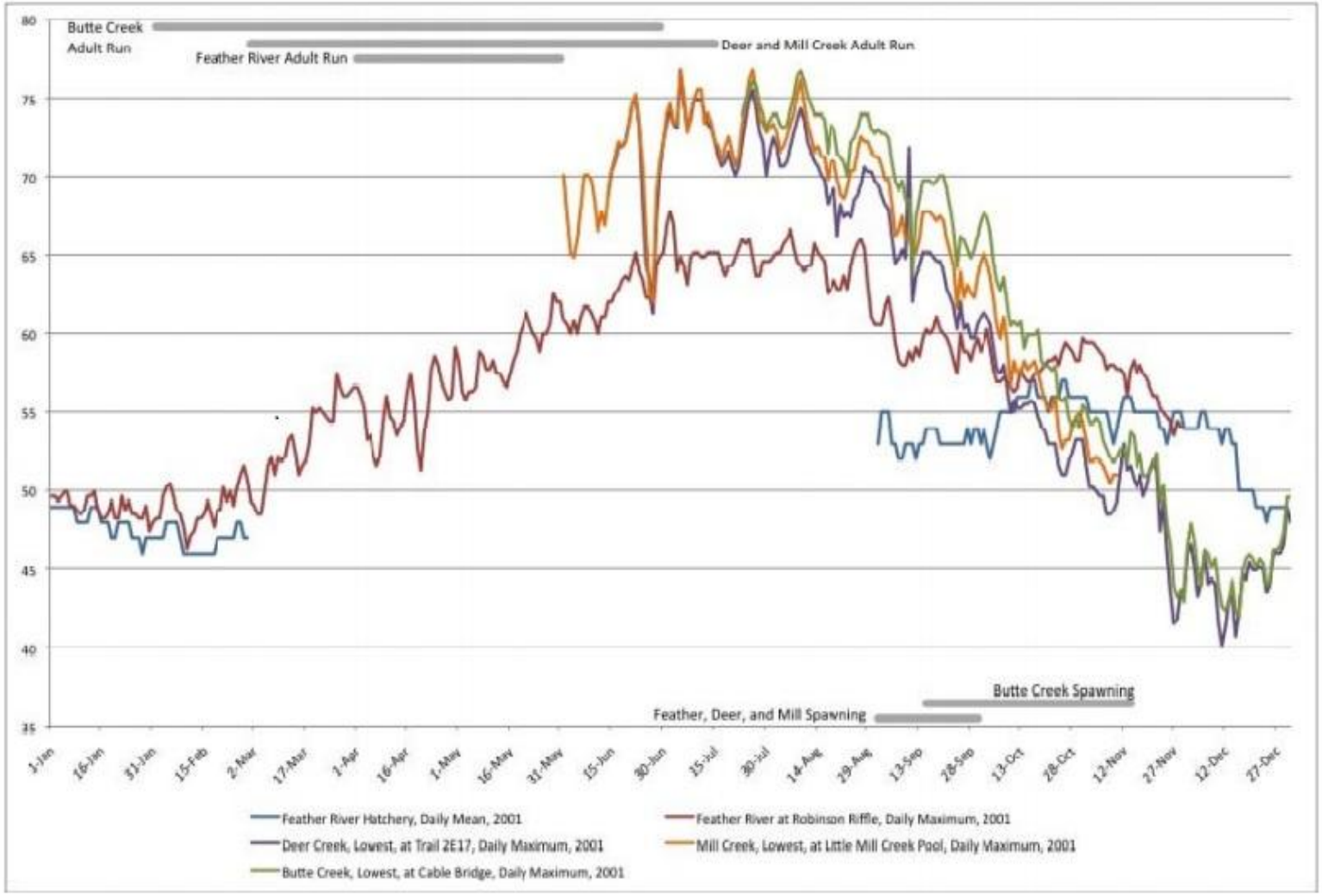

Figure C.2: Lower elevation water temperature data for Conservation Program broodstock source populations

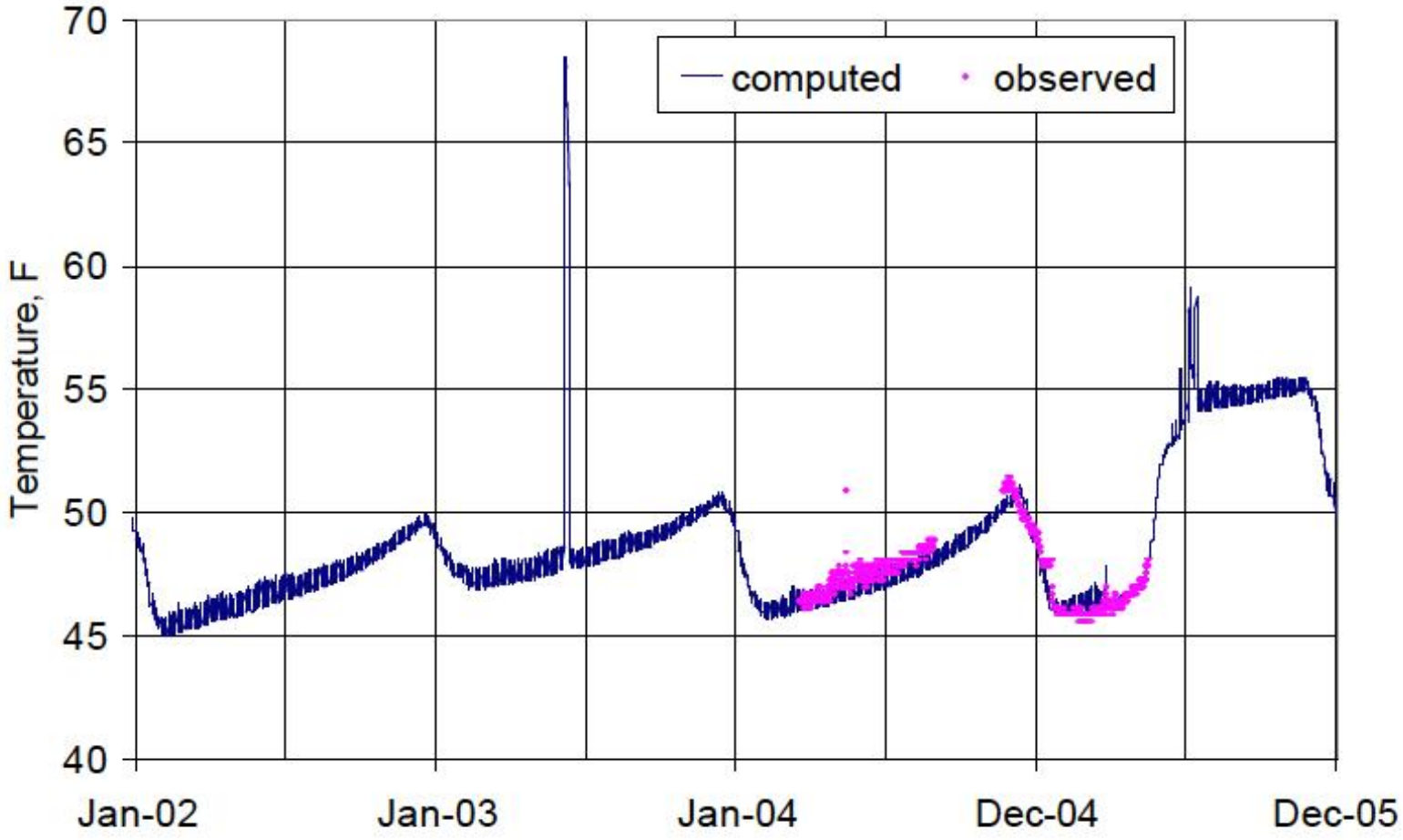

Figure C.3: Computed and observed temperatures at Friant Dam (0.1 miles D/S). Originally Figure 3-13 in Resource Management Associates, Inc. (2007)

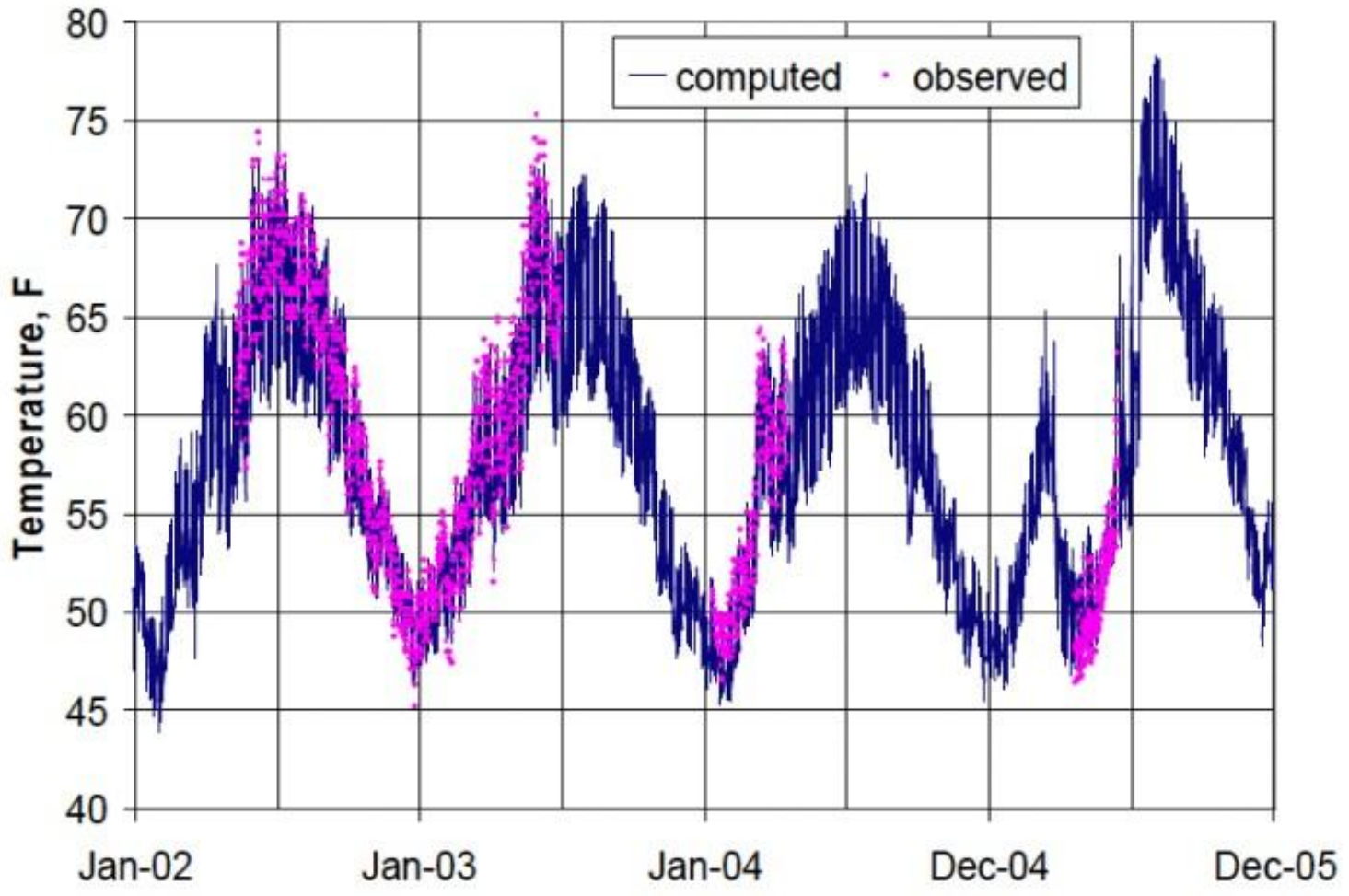

Figure C.4: Computed and observed temperatures at Sportsman Club (12 miles D/S). Originally Figure 3-18 in Resource Management Associates, Inc. (2007)

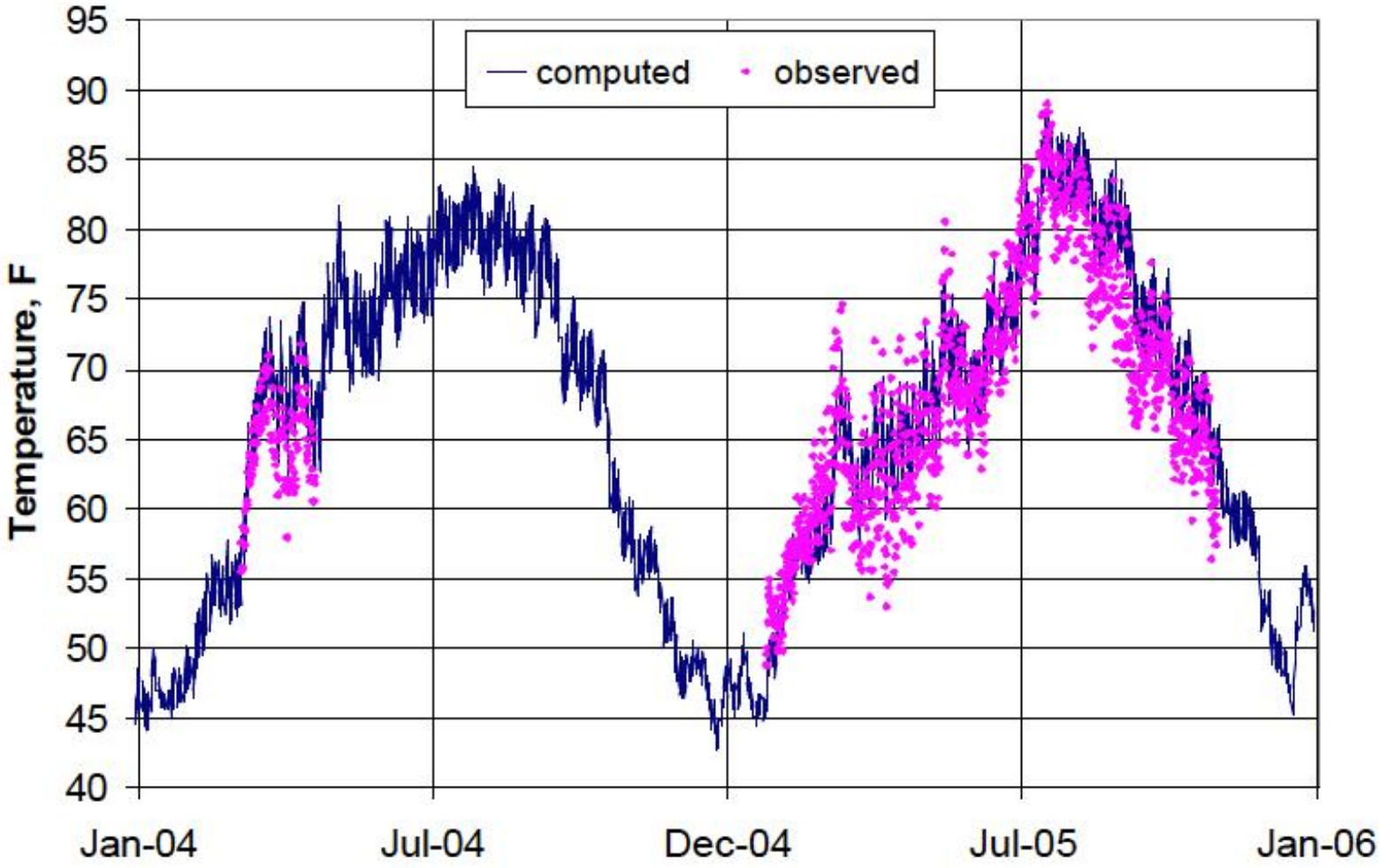

Figure C.5: Computed and observed temperatures at Sack Dam (85 miles D/S). Originally Figure 3-26 in Resource Management Associates, Inc. (2007)

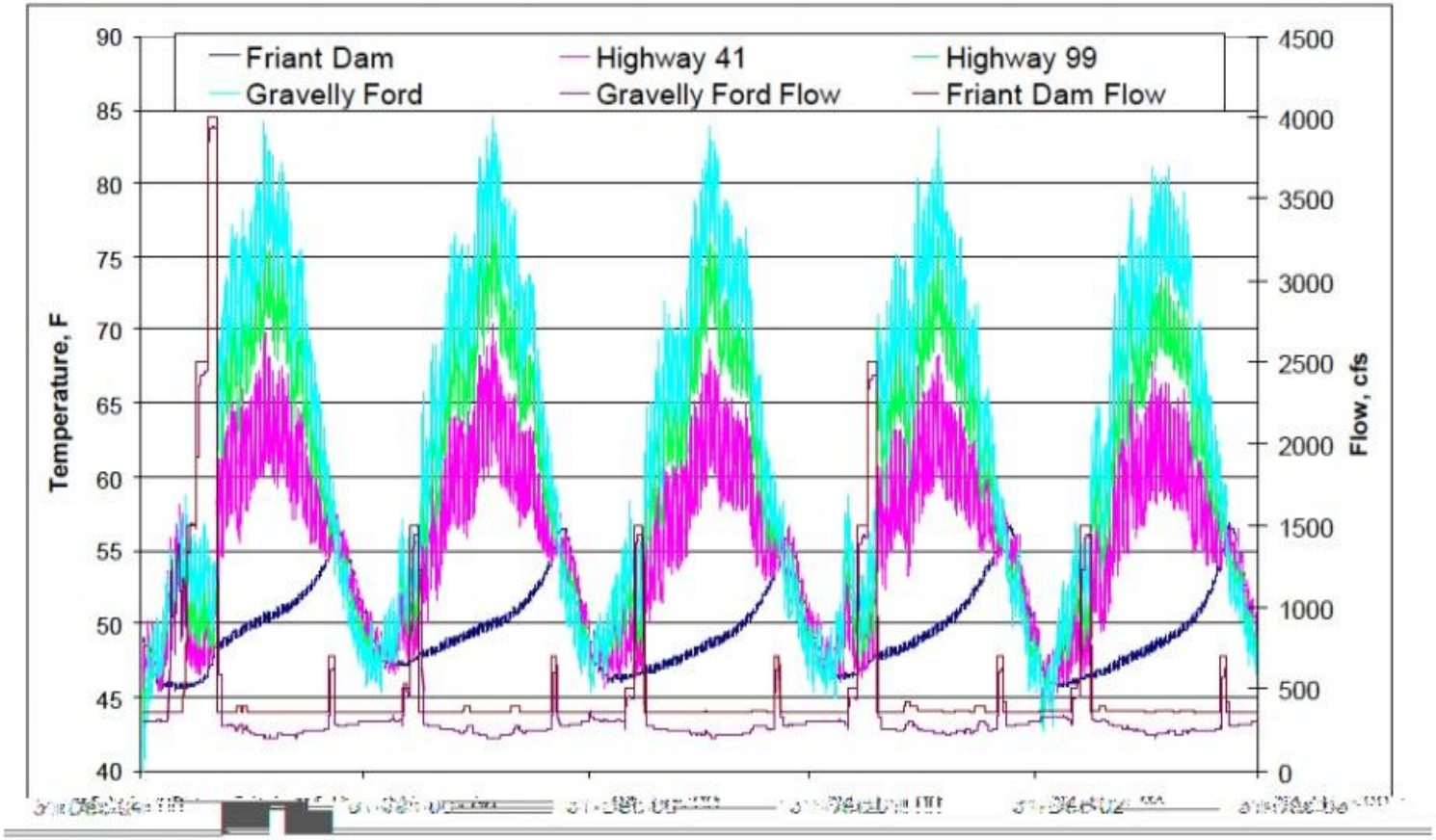

Figure C.6: Kondolf Hydrographs - Computed Temperatures and Flow during 2000 through 2004, if water management in those years had been under settlement conditions. Locations are in Reach 1, approximately 1/8, 14, 23 and 39 miles below Friant Dam. Originally Figure 4-1 in Resource Management Associates, Inc. (2007)

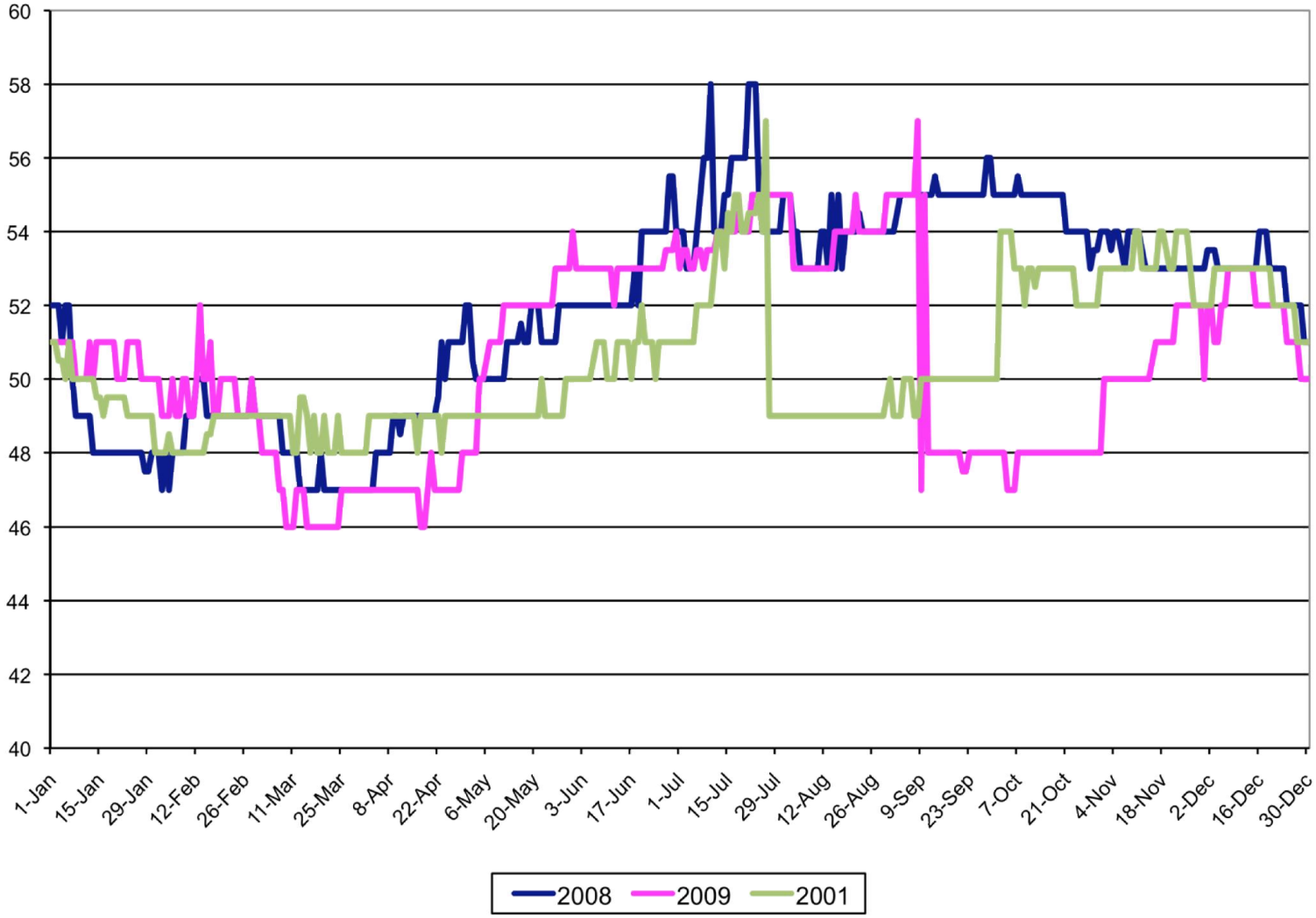

Figure C.7: Observed temperatures at the San Joaquin Fish Hatchery in 2001, 2008, and 2009

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Appendix D:
Standard Operating Procedures for Egg Transport

Title: Salmon Egg Transport ***2***
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Title: Salmon Egg Transport

SOP # SCF-TRN-002-02

Effective Date: October 18, 2013

1.0 Introduction

2.0 Purpose

This is a Standard Operating Procedure (SOP) for the transportation of Central Valley (CV) spring-run Chinook Salmon eggs within the context of the San Joaquin River Restoration Program (SJRRP). CV spring-run Chinook Salmon are listed as threatened under both the Federal Endangered Species Act and the California Endangered Species Act requiring that this SOP set a high standard.

2.1 Scope

This SOP will be followed by all personnel within the SJRRP for the transportation of spring-run Chinook Salmon eggs.

2.2 Planning

Early planning and coordination will occur within the Conservation Facility and Reintroduction Monitoring Subgroups.

3.0 Procedures

3.1 Summary of methods

Possible adverse effects to eggs include: ionic and respiratory disturbance of the egg membrane, injury due to jostling, or death if the membrane is ruptured or punctured (ADFG 2010, Thedinga et al. 2005). To minimize these effects, eggs would be placed in a specialized shipping container to reduce excessive movement and limit damage to the egg membrane. The eggs would not be transported until they are fairly resistant to ―shock, at the eyed-egg stage.

Eggs will be wrapped in non-chlorinated water soaked cheesecloth or burlap to keep moist, and placed in a specialized Styrofoam shipping container. Eggs will be cooled using non-chlorinated ice and transported in a dark environment.

4.0 Equipment and Supplies

The following equipment will be needed:

- Specialized Styrofoam egg shipping container
- Non-chlorinated ice
- Cheese cloth and/or burlap

- Thermometer
- Iodine
- 5 gallon Plastic Bucket

5.0 Procedure

Possible adverse effects to eggs include: ionic and respiratory disturbance of the egg membrane, injury due to jostling, or death if the membrane is ruptured or punctured (ADFG 2010, Thedinga et al. 2005). To minimize these effects, eggs would be placed in a specialized shipping container to reduce excessive movement and limit damage to the egg membrane. The eggs should not be transported until they enter the eyed-egg stage when they are less effected by handling.

Eggs will be wrapped in non-chlorinated water soaked cheesecloth or burlap, to keep moist, and placed in a specialized Styrofoam shipping container, and will be cooled using non-chlorinated ice and transported in a dark environment.

Below is the procedure for transporting spring-run Chinook Salmon eggs.

- Prior to leaving facility, ensure all equipment is in proper working order, and all equipment has been properly decontaminated.
- Upon arrival on site, prepare specialized containers. Put non-chlorinated ice in bottom portion of container and place perforated insert on top of ice. Use wet cheese cloth with stream/hatchery water (non-chlorinated).
- Place eggs in cheesecloth or burlap, and properly wrap/tie to secure eggs.
- Place eggs on top of the perforated insert and place lid on container. Eggs must be cooled and kept moist, and transported in a dark environment.
- Record transportation start time.
- Upon arrival at release site, record transportation end time. Carefully remove eggs, keeping eggs in cheese cloth. The temperature of the eggs should be taken and a sharp rise in temperature increase should be avoided when transferring eggs to water. Disinfect eggs with a 10 minute bath treatment using a solution containing 100 parts per million (ppm) of free iodine.
- Eggs should be placed at an acceptable egg incubator at the appropriate density and water flow.

6.0 Qualified Personnel

Transportation of donor stock from donor watersheds to the Conservation Facility, or to the San Joaquin River will be accomplished by personnel from either the CDFG or USFWS with previous experience transporting live fish

6.1 Roles and responsibilities

Name	Department	Title	Role	Responsibilities
Paul Adelizi	CDFW	Environmental Scientist	Conservation Facility lead	Transportation, Receiving eggs and fish at facility
Matt Bigelow	CDFW	Environmental Scientist	Collection/Release of Fish Safety Officer	Transportation/Holding fish in the field.
Patrick Ferguson	CDFW	Environmental Scientist	CDFW Donor Stock Collection Lead	Collection, Transport
Joseph Kirsh	USFWS	Fisheries Biologist		Collection, Transport, Receiving eggs and fish at facility

6.2 Safety and training

All personnel working with fish will be properly trained in safe handling procedures described above.

Egg Transport Data Sheet

Transfer Date_____ Staff_____

Pickup Location_____ Pickup Time_____

Source/River Water Temp at Time of Pickup_____

Delivery point water temp and time of delivery _____

Iodine Concentration (PPM) _____ Disinfection Time_____

Additional Comments:

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Draft Final Revised – August 5, 2016

Appendix E:
Standard Operating Procedures for Spawning

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Title: Spawning ***2***
1.0 Introduction ***2***
2.0 Procedures ***2***

Title: Spawning

SOP # SCF-AQT-001-01
Effective Date: November 15, 2012

1.0 Introduction

1.1 Purpose

This is a Standard Operating Procedure (SOP) for the spawning Chinook salmon within the context of the San Joaquin River Restoration Program (Program). The protocol provides techniques that will reduced negative impacts during spawning.Procedures

1.2 Sort Fish

1.2.1 Sort males and females that are ready to spawn.

1.2.2 If breeding matrix will be used, segregate and pair fish accordingly.

1.3 Kill and bleed Female (and male if needed)

1.3.1 Use blunt force to the head, sever major artery in throat, sever artery in caudle peduncle, or overdose with MS-222.

1.4 Cut abdomen of female to expel eggs.

1.4.1 Dry female

1.4.2 Avoid blood and water in eggs

1.4.3 Expel eggs into a strainer to remove ovarian fluid

1.4.4 Divide eggs into four equal sections and place eggs in four stainless steel or plastic pans.

1.4.5 Add 0.09% saline solution to the pans. Maintain saline solution with in 2 °C of the rearing water temperature using a water bath if necessary.

1.5 Fertilize eggs

1.5.1 Squeeze milt from four males onto eggs for about 2-3 seconds to provide a sufficient volume of milt. Each of the four pans is to receive milt from a different male. Record parentage data and track crosses accordingly.

1.6 **Wash eggs**

1.6.1 Gently rinse eggs with 100 PPM buffered iodine to remove milt excess milt. Maintain iodine solution (Ovadine) with in 2 °C of the rearing water temperature using a water bath if necessary.

1.7 **Place eggs in 100 PPM Ovadine for 30 minutes for disinfection.**

1.7.1 Place eggs in cheese cloth sac or similar device to keep eggs segregated while immersed in iodine.

1.8 **Measure eggs**

1.8.1 After disinfected, take 2 oz egg count to determine the number of eggs per oz.

1.8.2 Measure the total volume of eggs from each quarter section of eggs using a graduated cylinder.

1.8.3 Place eggs into a vertical stack incubator egg tray that has been divided into four sections for an additional 1 ½ hours for water hardening. Record egg stack, tray, and tray section data and track crosses accordingly.

1.9 **Treat each stack daily to reduce fungus levels by pouring 4 oz of Ovadine into the top tray. Do not disturb eggs until eyed.**

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Draft Final Revised – August 5, 2016

Appendix F:
Emergency Action Plan

EMERGENCY EVACUATION PLAN
(Further Instructions)

SJRRP Salmon Conservation and Research Facility (SCARF) and Interim Facility

Updated December 2015

When releases from Friant Dam approach 12,000 CFS there is a potential for the SCARF, Interim Facility and adjoining residences to flood.

Notification:

(1) If flood conditions are expected, the Reclamation Dam Tender at Friant Dam will notify CDFW.

(2) If flooding is imminent the Emergency Coordinator or designee will initiate a Flood Alert to hatchery personnel and other residents plus regional management/supervisory staff.

(3) Upon receiving a Flood Alert, hatchery personnel will take the prioritized actions identified below, and prepare to evacuate.

(4) Upon receiving an Evacuation Notice, hatchery personnel will immediately exit the premises as detailed below.

Actions:

Never jeopardize your own personal safety when carrying out the Flood Alert actions specified below. If at any time you feel your safety is at risk, do not wait for the Evacuation Notice from the Hatchery Manager, and evacuate the premises accordingly.

FLOOD ALERT

1. Remove Fish from Premises Using Hauling Tank[1]
2. Remove Mobile Fish Lab and/or USFWS Tagging Trailer
3. Remove Other Mobile Equipment that is Prone to Water Damage

Evacuate the Premises as soon as these actions are met, or immediately upon receiving an Evacuation Notice, whichever comes first.

[1] If satellite incubation and rearing facility is being operated at Friant Dam, relocate fish there. Otherwise, fish should remain in tanks and secured with tank covers/screens.

1. Remove Spring-run, and/or Fall-run Chinook from the premises

Chinook salmon are currently housed at the Interim Facility and/or SCARF. Fish need to be placed in a fish hauling tank that is equipped with its own life support system. The hauling tank and trailer at the facility can be used, but requires a truck with a 2 and 5/16 ball in the bed of the truck (i.e. gooseneck receiver). Use one of the SJRRP 1.5 ton, flatbed trucks to haul the transport tank. Alternatively, contact either Tony Spada for the use of the 1 ton undercover Ford truck, or Brian Beal to use the hauling tank and trailer located at the storage yard behind the main office. Make sure to take the DO meter that is in the Mobile Fish Lab and periodically check DO and temperature and adjust oxygen flow accordingly.

2. Remove the Mobile Fish Lab and/or USFWS Tagging Trailer

Once fish have been removed, close the 4 inch brass gate valve that is just outside the Mobile Fish Lab. A second 4 inch valve should be close that is located at the aeration tower that feeds the facility. Two 4 inch PVC pipes are attached to the trailer that must be cut to remove trailer. The USFWL tagging trailer should also be removed.

3. Remove Other Mobile Equipment that is Prone to Water Damage

If time allows, move any other equipment that is prone to water damage.

EVACUATION NOTICE

Upon receiving an Evacuation Notice, hatchery personnel will immediately exit the premises via the main ingress/egress roadway, Belcher Avenue, to Friant Avenue and out of the 100-year floodplain.

CONTACTS

Paul Adelizi - (559) 908-8793
Matt Bigelow (Emergency Coordinator) – (559) 246-0877
San Joaquin Hatchery – (559) 822-2374
Manager Ron Samra – (559) 417-5948
Manager Greg Paape – (559) 417-5949
Senior Manager Greg Kollenborn – (599) 903-6917
Gerald Hatler – (559) 341-1814
Brian Erlandsen – (559) 903-0862
Brian Beal – (559) 250-5780
Tony Spada – (559) 243-4005 ext 153

OTHER ACTIONS (as time and safety allows)

Electricity (Interim Facility)

During power outage, backup generators will automatically turn on, powering only vital components for fish and some interior lights. A protocol is provided in the facility

building for periodically test-running the generator, transfer switches, etc. to ensure proper function. Flashlights are kept inside the building in case of generator failure. Call PG&E to determine the duration of the outage, check equipment to be sure all are running on the generator, and again when power comes back on.

In the event flooding is imminent, turn off gas and electrical supplies to facilities.

Water Supply

Bypass the Interim Facility building intake strainer to avoid clogging and restriction of water supply to fish tanks.


Flemming Rd
Brooktrout Rd
San Joaquin Hatchery Evacuation Route and Assembly Area
SCARF/Interim Facility
San Joaquin Hatchery
Friant Rd
SCARF Evacuation Route and Assembly Area
Belcher Rd
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