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January 11, 2008

Tam Doduc, Chair
State Water Resources Control Board
P. O. Box 100
Sacramento, CA 95812

Re: Consideration of Pelagic Organism Decline in the San Francisco Bay / Sacramento-San Joaquin Delta Estuary

Dear Ms. Doduc:

In accordance with the State Board's Notice of Public Workshop, the State Water Contractors submit these written materials to provide information and specific recommendations regarding the Pelagic Organism Decline in the San Francisco Bay / Sacramento-San Joaquin Delta Estuary. Because of our long-held concern about the decline of pelagic species, we have been actively involved with the issue through the Bay-Delta Conservation Plan, the Delta Vision Process and as a party in the recent federal court OCAP litigation. Thus, we believe we have information and recommendations that may be particularly useful to the State Board as it considers how it can best assist the many other federal and state agencies that are currently investigating the multiple causes of and potential solutions for the pelagic organism decline.

INTRODUCTION

As the State Board is aware, a number of events relevant to the subject of pelagic organism decline have occurred subsequent to the Board's June 19, 2007 workshop on POD issues. These include the ongoing efforts to develop a Bay-Delta Conservation Plan and the recent release of the Delta Vision report. Chief among these recent activities, from a regulatory perspective, was a two-week trial in the United States District Court in the case of *Natural Resources Defense Council, et al. v. Dirk Kempthorne, et al*.; Case No. C:05-CV-1207 OWW. The trial involved the presentation of extensive expert testimony regarding the Delta smelt decline and a range of potential remedial measures related to State Water project and Central Valley Project operations that could be imposed during the interim period before a new biological opinion is issued by the United States Fish and Wildlife Service with respect to SWP and CVP operations.

The trial took place in August 2007 and resulted in lengthy Findings of Fact and Conclusions of Law and a related Interim Remedial Order issued by the federal court on December 14, 2007. Copies of these two documents are attached as Exhibits 1 and 2. Several key concepts are immediately apparent from a review of the Court's determinations. First, the Court recognized that the pelagic species before it – the Delta smelt – *is* in a state of serious decline and faces the possibility of extinction. Exh. 2, pp.4-5. As the Court found, "It is undisputed that the current status of the Delta smelt is serious." *Id*. Second, the Court recognized that the decline "is the result of multiple factors." *Id.,* p. 5. According to the Court, these factors include (1) the presence of toxic materials (such as pesticides) in the Delta; (2) an overall reduction in the abundance of zooplankton that are a food source for

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pelagic species; (3) the introduction and propagation of invasive species, including the Asian Overbite Clam (*Corbula*), a second freshwater clam (*Corbicula*) and the invasive Inland Silverside; (4) unscreened agricultural diversions in the Delta; (5) power plant diversions, including diversions for consumptive use and for cooling water; (6) modifications to the hydrology of the Delta; and (7) operations of the SWP, the CVP and other water diversions in the Delta. Exh. 2, p. 5. Finally, in its Remedial Order, which will remain in effect until a new OCAP biological opinion is issued by the USFWS, the Court took steps to limit the impact of only *one* of these multiple factors; *viz*., SWP and CVP operations. It did so by imposing substantial, new requirements upon the operation of both Projects. The Court could not – and did not – impose duties, limitations or restrictions related to the other causes of the pelagic organism decline it identified for the simple reason that it lacked jurisdiction to do so. It had only the operations of the SWP and CVP before it.

With respect to the SWP and CVP, the federal court's Remedial Order imposes new requirements that are intended to protect Delta smelt pending the issuance of a new biological opinion of the USFWS. These requirements are mandatory and significantly expand the obligations of the Bureau of Reclamation and the Department of Water Resources to monitor for the presence of larval and juvenile smelt in the Delta. Exh. 1, pp. 3-5. The Court's Remedial Order also imposes substantial new restrictions on reverse flows in Old and Middle Rivers (OMR) that are intended to reduce the entrainment of smelt. *Id*., pp. 5-8. These OMR flow restrictions have the effect of dramatically reducing SWP and CVP exports compared with prior flow and export limitations imposed upon the Projects by Water Right Decision 1641.[1] According to recent estimates by DWR, the impact of the federal Court's decision upon the 25 million Californians who receive water from the SWP will range between a 10% and a 30% reduction in water supplies in 2008 compared to operations under D-1641, depending upon actual hydrology and the location of Delta smelt spawning and rearing. By any reckoning, these reductions will have substantial adverse effects upon the millions of Californians who rely upon the SWP and CVP to provide water for their homes, their farms and their businesses. Depending upon actual hydrologic conditions in 2008, they have the potential to result in extensive water rationing, the fallowing of valuable agricultural lands, substantial job losses, and significant impacts to the State's economy.

[1] In D-1641, the State Board required DWR and Reclamation to comply with the requirements of the federal ESA. Specifically, as Condition 7 imposed upon the permits issued for both the SWP and CVP, the Board provided:

> This permit does not authorize any act which results in the taking of a threatened or endangered species or any act which is now prohibited or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code sections 2050 to 2097) or the federal Endangered Species Act (16 U.S.C.A. sections 1531 to 1544). If a "take" will result from any act authorized under this water right, the permittee/licensee shall obtain authorization for an incidental take prior to construction or operation of the project. Permittee / Licensee shall be responsible for meeting all requirements of the applicable Endangered Species Act for the project authorized under this permit/license.

D-1641, p. 148.

The State Water Contractors share the federal court's view that the decline of pelagic species is the result of multiple causes. On June 28, 2007, well before the trial in *NRDC v. Kempthorne*, we wrote to the Director of the Department of Fish and Game and the California-Nevada Operations Manager of the USFWS, urging them to recognize that the decline of Delta pelagic species is caused by multiple factors including toxic point and non-point source discharges from lands within the Delta, in-Delta diversions unrelated to the SWP and CVP, and imported exotic species and predation by competitive species such as striped, small-mouth and large-mouth bass. We noted that their agencies had done little to determine the sources and impacts of *any* of these other stressors of pelagic species and we requested them to publish or otherwise make available the documentation, monitoring data, and other relevant information they have in their possession relating to the take of Delta smelt incidental to non-Project, in-Delta diversions. We also requested the USFWS and CDFG to implement a monitoring and reporting program so that the sources and effects of those other stressors could be known more clearly. A copy of our letter is attached as Exhibit 3. To date, neither agency has provided the requested data or initiated any of the requested monitoring or reporting programs. Our letter to the USFWS and CDFG also asserted the following:

> A more holistic approach is needed to provide meaningful protection for Delta smelt and other pelagic fish species in the Delta. Simply turning the knob tighter on the pumping plants of the SWP and CVP, which are already the subject of intense scrutiny by the state and federal courts and fishery agencies, is not the answer.
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> Exh. 3, p. 2.

We believe that statement is even truer today than when it was written. The Remedial Order issued by the federal court on December 14, 2007, limits SWP and CVP operations to the maximum extent consistent with the evidence adduced at trial and carves out a regulatory exception only for public health and safety. It engages in no balancing of competing beneficial uses of the water made available for consumptive purposes by the SWP and CVP. Exh. 1, p. 10. As described more fully below in our response to matter # 4 from the Board's Notice of Workshop, recent work by an eminent ecological statistician, Dr. Bryan Manly, indicates that the Court-imposed restrictions on flows in Old and Middle Rivers are generally more stringent than what is actually required to eliminate most entrainment of Delta smelt in the export facilities. Meanwhile, the *other* factors causing the decline of pelagic species are effectively left unregulated. Thus, while the operations of the SWP and CVP have been subjected to intense scientific scrutiny and have been further regulated by the imposition of strict flow limitations in Old and Middle Rivers, other municipal and agricultural diversions that impact OMR flows have no pelagic species-related restrictions at all. Similarly, while the SWP and CVP are now obliged to monitor for larval and juvenile smelt throughout much of the year, more than 2,000 other in-Delta diverters face no pelagic species-related monitoring requirements of any kind. Indeed, while the Court recognized that other in-Delta export operations, in-Delta toxic discharges and unscreened in-Delta agricultural diversions are among the factors that have contributed to the decline of the Delta smelt (Exh. 2, p. 5) *not one* of those other in-Delta stressors has been subjected to the kind of judicial and administrative focus faced by the SWP and CVP and *none* have been regulated for the purpose of reducing their impact upon pelagic species. [2]

The result is the emergence of a gross regulatory imbalance among the factors that are believed to contribute to the decline of pelagic species: SWP and CVP operations are now highly regulated, through D 1641[3], the 1995 Bay/Delta Water Quality Control Plan and the recently issued Order of the federal district court, while the operations of other Delta diverters – municipal, agricultural and industrial – and Delta dischargers are not restricted and *have never been examined* to determine the measures needed to minimize their contribution to the decline of pelagic species. While the Water Quality Control Plan and D-1641 contain measures to *protect* in-Delta agriculture, in-Delta municipal diversions and certain in-Delta non-native species such as striped and other species of bass, those documents have never enquired about the impacts of these water uses (and, invasive species) upon the native pelagic species.

This regulatory imbalance ill serves the pelagic species and the Board can now begin to correct it. As the federal court also recognized, there is scientific uncertainty regarding the *cause* of the recent decline of the smelt, which "continues to not be fully understood". *Id*. Similarly, the Court found the *effects* of the various causative factors on the Delta smelt and their relative magnitude are "not fully understood" and are subject to "scientific uncertainty". Exh. 2, p. 6. The State Contractors agree with these findings. They also believe that the State of California – acting through this Board – is well placed to true up the regulatory balance among the factors contributing to the decline of pelagic species. Stated differently, placing more regulatory limitations upon the operations of the SWP and CVP – whose operations have already been thoroughly examined and limited in terms of their impact upon pelagic species – will do little good for pelagic species when other in-Delta factors contributing to the POD continue to operate without any critical examination whatsoever and without any administrative effort to minimize their impact upon native pelagic species. We urge the Board to use this Workshop to begin that examination and take up its regulatory tools to address the many other actions and actors that are contributing to the status of the pelagic organisms.

In the material that follows, we offer the information we possess and our recommendations for action regarding matters 2, 3, 4 and 6 identified in the Board's Notice of Public Workshop.

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[2] In the Environmental Impact Report it issued in connection with D-1641, the State Board recognized that the thousands of *other* in-Delta diversions collectively pump at a rate roughly equivalent to that of the CVP's Jones Pumping Plant. Final EIR for Implementation of the 1995 Bay/Delta WQCP Vol. 1, p. III-23.

[3] As noted above in footnote 1, in D-1641, the Board expressly made the SWP and CVP responsible for meeting all requirements of the federal and State Endangered Species Acts. D-1641, Condition 7, p. 148. And, the Project operators are doing so. In the unlikely event the operators of either Project fail to meet the obligation imposed by the Condition, the Board may take steps to enforce it. To our knowledge, no other in-Delta diverter or discharger operates under a similar requirement.

WORKSHOP ISSUE NO. 2 – INFORMATION REGARDING TOXICOLOGICAL STUDIES RELATED TO THE POD

Numerous sampling programs have detected pesticides in Sacramento-San Joaquin Delta water and sediment samples, occasionally at toxicologically relevant concentrations and often with multiple other pesticides that in combination could be toxicologically relevant. However, while investigators have conducted sampling, there has been no effort to pull the existing data together to develop a comprehensive spatial and temporal evaluation of contamination in the Delta's waterways. Nor has there been any effort to determine gaps where additional data need to be collected. In keeping with the provisions of State Board Resolution 2007-0079 (including paragraphs 7, 9 and 12) as well as efforts pursued by Central Valley Regional board staff, the State Contractors recommend that the Board prepare a synthesis of the existing pesticide monitoring data to help inform the design and implementation of a comprehensive monitoring program for water and sediment samples throughout the Delta. The program should be designed to determine sources of contamination and to facilitate implementation and enforcement of source control measures.

Monitoring data from May 2004 to October 2006 for the Irrigated Lands Program from the Coalition Group Monitoring, University of California and Surface Water Ambient Monitoring Program (SWAMP), exceeded the Central Valley Regional Board's triggers for pesticides at 57% of the sites tested on at least one occasion.

Zone	Pesticides Detections		
	Number of sites exceeding trigger level for at least one pesticide on one occasion	Total number of sites tested	Percent of sites exceeding trigger level at least once
Zone 1	23	57	40.4%
Zone 2	28	46	60.9%
Zone 3	40	55	72.7%
Total Zone 1-3	91	159	57.2%

Table compiled from data within CVRWQCB, 2007.

More recently, Guo, et al., 2007, reported the results of monitoring in the Sacramento River and its tributaries for 26 pesticides following a storm event in January 2005. Five pesticides and one pesticide degradate were detected. Diuron, diazinon and simazine were found in every stream sampled. Diazinon concentrations in the Feather River and Colusa Basin Drain exceeded the water quality criterion of 0.16 ug/l.

Smalling, et al., 2007, analyzed water and sediment samples from the Yolo Bypass and the five areas draining into it for 27 and 41 pesticides, respectively. Thirteen current use pesticides were detected in surface water samples, and 13 in sediment samples. Simazine and hexazinone were detected in all areas, including 2,500 ng/l hexazinone in Willow Slough. Thiobencarb and trifluralin were detected in 80% of the sediment and suspended sediment samples with concentrations as high as 24 ug/kg each. Oxyfluorfen was detected at 50 ug/kg in suspended sediment from Willow Slough.

Kuivila, et al., 2002, sampled fifty-four water samples in spring and summer 2000 from Delta smelt habitat. All samples contained from 3 to 12 different pesticides. Metolachlor was detected in 91% of samples, molinate in 83% and thiobencarb in 76%. Similar results were obtained in 1998 and 1999. Similarly, Amweg, et al., 2006, sampled sediments from 15 urban creeks in and around Sacramento and the East Bay and every sample had detectable pyrethroids.

While many of the detected pesticides are near or below known lethal and effect concentrations for standard test organisms, there is no information on the effect level of many of the pesticides or on the effect of the mix of pesticides detected in many of the Delta samples. In addition, very little is known about Delta smelt sensitivity to contaminants, except that for the few contaminants tested they seem to be significantly more sensitive than standard test species. For example, Werner, 2005, found that 3-month old Delta smelt are 10-12 times more sensitive to copper than 3-month old striped bass. Werner also found that Delta smelt may be more sensitive to unionized ammonia than other fish species. Even less is known about the sensitivity of the copepods they feed on. The State Contractors believe the Board should undertake (or fund) additional studies to investigate the relative sensitivity of the POD species, and the organisms they feed on, to the pesticides and pesticide mixtures that the investigators described above have already found in the Delta.

Significant evidence also exists that water column and sediments within the Sacramento-San Joaquin Delta cause acute and chronic toxicity to standard test species. Monitoring from May 2004 to October 2006 for the Irrigated Lands Program from the Coalition Group Monitoring, University of California and Surface Water Ambient Monitoring Program (SWAMP), showed significant toxicity to at least one test species at 59% of the sites tested on at least one occasion.

Species tested	Number of sites with at least one toxic	Number of sites tested	Percent of sites with at least one toxic sample
Pimephales promelas	26	186	14.0%
Ceriodaphnia dubia	69	185	37.3%
Selenastrum capricornutum	60	157	38.2%
Hyalella azteca	54	139	38.8%
All species combined	119	201	59.2%

Table compiled from data within CVRWQCB, 2007.

In addition, Werner, 2005, and Werner, et al., 2006, 2007a, and 2007b, tested water samples from 15 locations within the Delta and found significant mortality in 10-day tests with *Hyalella azteca* at 11 of the sites on at least one occasion. The sample locations and timing of sampling were selected based on known distribution patterns of the pelagic organism decline species of concern.

Department of Fish and Game sites with significant mortality observed in 10-day test with *Hyalella azteca*

Date	**323**	**340**	**405**	**504**	**508**	**602**	**609**	**704**	**711**	**Light 55**	**804**	**812**	**902**	**910**	**915**
8/10/2005		X													
9/7/2005		X													
1/25/2006	X*														
7/11/2006	X														
7/27/2006	X	X													
8/22/2006									X*						
2/1/2007										X				X	
2/28/2007									X*						
3/30/2007								X*							
4/12/2007									X*						
7/10/2007			X	X*	X*	X					X*				
7/25/2007		X*													
8/8/2007			X*												
8/22/2007			X												
8/23/2007									X						

* Toxicity observed with addition of piperonyl butoxide (PBO)

Werner 2005 and Werner, et al., 2006, 2007a, and 2007b also found growth / biomass effects on *Hyalella azteca* after 10-days exposure in 14 of the 15 sites tested.

Department of Fish and Game sites with significant growth/biomass effect observed in 10-day test with *Hyalella azteca*

Date	**323**	**340**	**405**	**504**	**508**	**602**	**609**	**704**	**711**	**Light 55**	**804**	**812**	**902**	**910**	**915**
6/13/2005									X				X	X	
8/10/2005		X													
9/7/2005		X													
3/20/2006				X*											
4/17/2006															X*
6/13/2006	X														
6/27/2006												X*			
7/11/2006	X*														
7/27/2006	X	X*													
8/22/2006							X*		X*	X*			X		
9/21/2006			X*	X*	X*										
10/4/2006									X*				X*	X*	
1/4/2007														X*	
1/17/2007				X*											
1/18/2007								X*							
2/1/2007														X*	X*
2/13/2007		X*								X*			X*		
3/1/2007					X*										X*
3/14/2007						X*	X*								
4/18/2007							X*								
5/23/2007					X*										
6/6/2007												X*	X*	X*	

*Growth/biomass effect observed with addition of piperonyl butoxide (PBO)

Moreover, significant toxicity has been observed in sediment samples collected from throughout the Delta. For example, Amweg, et al., 2006, tested sediment samples from the Sacramento area and found that 22 of the 33 samples caused significant toxicity to *Hyalella azteca* and 7 of the 8 creeks tested had toxic samples on at least one occasion. Pyrethroid concentrations were sufficient to explain the toxicity in 21 of the 22 toxic samples. Weston, et al., 2004, collected 70 sediment samples from the Central Valley. Forty-two percent of the sites caused significant mortality to *H. azteca* or *Chironomus tentans* on at least one occasion. Pyrethroids were detected in 75% of the samples. Given our growing understanding of the Delta smelt's preference for turbid water, the link between sediment contamination and POD needs to be explored further.

In a river system such as the Delta, contamination events can be sporadic and difficult to detect with grab samples. Investigators are now learning that even short duration exposures can have significant impacts on aquatic populations. For example, Oros, 2005, cites a study by Forbes and Cold (2005) that found that brief (1-hour) exposure to low levels of esfenvalerate during the early larval stage of midge can have measurable population level effects on larval survival and development rates. Also, 30-minute pulse exposures to lambda-cyahalothrin increased the effect after each exposure. Ward, et al., 2008, found when juvenile killifish were exposed to 1.0 ug/l 4-nonylphenol for only 1-hour, unexposed killifish avoided them (disrupted their shoaling behavior). Shoaling is a predation avoidance behavior. Ward cites studies that detected 4-nonylphenol at concentrations from 0.5 to 343 ug/l near sewage outfalls. Investigators are also finding that contaminants below measurable effect levels can have additive and synergistic effects when combined with other contaminants or pathogens. For example, it is now well known that pyrethroid pesticides are more toxic to aquatic organisms when piperonyl butoxide (PBO) is also present. Oros, et al., 2005, cite findings by Wheelock (2004) that PBO can enhance the toxicity of pyrethroids by 10-150 times. PBO is added to many of the pyrethroid formulations on the market. In addition, Clifford, et al., 2005, found that juvenile Chinook salmon exposed to 0.1 ug/l esfenvalerate for 96-hours and to infectious hematopoietic necrosis virus had significantly higher mortality and died sooner than those exposed to either agent separately.

As with contaminant monitoring, numerous investigators have conducted analyses of aquatic toxicity caused by water and sediment samples within the Central Valley. The Board should undertake (or fund) the preparation of a synthesis of all the existing toxicity monitoring data to help inform the design and implementation of a comprehensive monitoring program for water and sediment samples throughout the Delta. Any program that is developed, should include in-situ analyses to capture the effects of sporadic contamination. It should also include evaluations on Delta species of concern and their preferred prey that may be more sensitive than the standard test species that are used in laboratory analyses. The Board should also undertake (or fund) investigations of the link between sediment contamination and possible effects on pelagic organisms either through food web transfers or through re-suspension of sediments during storm and wind events.

Contamination can have more subtle effects on population health as researchers have found. Fish olfactory systems are used for many critical functions including: finding prey, avoiding predators, schooling, finding mates, synchronizing spawning, and avoiding contamination. Sandahl, et al., 2004, measured reductions in olfactory response in coho salmon exposed to copper and chlorpyrifos for 7 days. The calculated concentration at which 50% of the fish were affected (EC50) was 11.1 ug/l for copper and 1.81 ug/l for chlorpyrifos. Esfenvalerate at 0.2 ug/l caused atypical postsynaptic burst activity in the olfactory bulb. Sandahl cites studies that detected copper in surface waters in Oregon up to 21 ug/l and chlorpyrifos in the Sacramento-San Joaquin River basin at 0.5 ug/l. In 2007, Sandahl, et al. found olfactory response in juvenile coho salmon exposed to 2 ug/l dissolved copper for 3-hours was reduced by 40%. This loss in olfactory sensitivity led to a failure to initiate predatory avoidance behaviors in response to chemical alarm cues. Sandahl cites recent monitoring in northern California following a storm event that detected copper at a mean concentration of 15.8 ug/l, ranging from 3.4 - 64.5 ug/l. He also cites two recent studies that indicate that dissolved copper also impacts fish lateral line neurons that provide cues for shoaling, prey capture and predator evasion. Raloff, et al., 2007, cites a study that found Coho salmon olfactory neuron activity was reduced after only 30-minutes exposure to 1 ug/l atrazine. These studies indicate that even very low doses of contamination can have significant impacts even with only short duration exposures. The Board should investigate (or, fund) additional investigations on the effect of metals and other contaminants on Delta pelagic and anadromous fish olfactory response.

In addition to the above studies of contaminant impacts, research on the effects of wastewater treatment plant effluent is beginning to link the impacts of these discharges to aquatic organisms living downstream. For example, Huang, et al., 2001, analyzed secondary wastewater effluent and detected concentrations of estrogenic hormones at levels that cause vitellogenesis in fish. Effluent from secondary wastewater treatment contained 2.75-4.05 ng/l 17β-estradiol and 1.54-2.42 ng/l 17α-ethinyl estradiol. Vitellogenesis in fish has been observed at concentrations greater than 1 ng/l. Sedlak, et al., 2007, (in-progress) cites a study by Williamson and May in 2002 that analyzed over 400 adult Chinook salmon collected from 13 locations in the Sacramento and San Joaquin River watersheds and found that up to 38% of the male Chinook salmon were feminized. Wastewater effluent can also have population level impacts as was observed by Kidd, et al., 2007. Kidd conducted a 7-year whole lake experiment that showed that chronic exposure of fathead minnows to 5-6 ng/l 17α-ethinyl estradiol (a synthetic estrogen) led to feminization of males, impacts on gonadal development, altered oogenesis in females, and near extinction of the species from the lake after only two year's exposure. The Board should undertake (or, fund) additional studies of the concentrations of endocrine disrupting chemicals in the Delta, as well as of the impacts of these chemicals on aquatic organisms. In addition, the Board should begin to require wastewater treatment plants seeking to increase their capacity to evaluate the effect of their expansion on pelagic species residing downstream.

Recent investigations by Mueller-Solger, DWR (pers. comm.), point to ammonia discharges from the Stockton wastewater treatment plant, combined with high pH levels in the San Joaquin River, as a suspect in the death of 116 acoustically tagged salmon released for the Vernalis Adaptive Management Program experiment in 2007. This is not conclusive due to a lack of the appropriate data. The Board should require that wastewater treatment plants increase their monitoring of ammonia, pH, and temperature in their effluent and at several points in the receiving water. Improved monitoring should include increased monitoring frequency and spatial coverage, especially in the vicinity of the outfall. The Board also should require additional fish toxicity testing by these dischargers to better quantify the effect of ammonia discharges on Delta fish species and the food web that supports them.

Finally, biomarkers are becoming a useful tool in the investigation of contaminant effects on aquatic organisms. Anderson 2007 conducted an expert panel review of biomarkers for the pelagic organism decline. The panel recommended a 3-4 year integrated and tiered investigation that focuses on two of the POD species. The investigation includes field and laboratory investigations of larval, juvenile and adult fish and several possible special studies. The Board should support, by providing necessary staff and funding, such an integrated and comprehensive investigation.

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WORKSHOP ISSUE NO. 3 – THE SIGNIFICANCE OF SCIENTIFIC INFORMATION DERIVED FROM CRITICALLY LOW POPULATION LEVELS OF PELAGIC SPECIES

The ability to infer Delta smelt abundance trends and the relative impact of various sources of mortality on smelt deteriorates as fewer and fewer smelt are caught in the ongoing sampling (as more and more samples catch none). However, the deterioration in this ability to measure smelt distribution and population abundance is also partly an artifact of the sampling techniques. Different techniques such as the spring Kodiak trawl (SKT) or the Lampara net are orders of magnitude more efficient than the Fall Midwater Trawl (FMWT) at capturing smelt for the same volume of water sampled, as we will show below.

Effective management of Delta smelt and other pelagic species requires representative data regarding distribution and population, even at low abundances. Since that data can be gathered more effectively with different gear and sampling designs than are used presently, it is essential that the fish agencies immediately move to integrate or add sensitive and statistically valid sampling techniques and designs into their normal monitoring activities for all smelt life stages.

Data collected by the Department of Fish and Game during 1994 suggest that the FMWT is extremely inefficient at capturing pre-adult Delta smelt. In this study, the Interagency Ecological Program (IEP) ran nets side by side and compared the results. The results were that the Kodiak trawl and the Chipps Island trawl were much more efficient than the standard FMWT technique as shown in Figures 3.1 – 3.3.

This conclusion is reinforced by a comparison of smelt abundance estimates derived from FMWT data with smelt populations derived from SKT data.. Delta smelt have a one-year life cycle, although a few fish may live two years. Thus, the population is at its maximum abundance after spring spawning and necessarily drops continuously until the next crop of smelt is born the following spring. Winter abundance must be significantly less than abundance during the previous fall. Yet the SKT catch data leads to greater abundance estimates than does the FMWT routinely. This increase is unrealistic (assuming there is no immigration into the survey area). The SKT population estimates should be significantly lower than the FMWT population estimates. See Figures 3.4-7. Again, an inference to be drawn is that the FMWT is very inefficient compared to other sampling methods. [4]

One clear implication of these findings is that we are capable of gathering data on Delta smelt distributions and abundance that is far more robust than the data currently gathered. A second implication is that smelt abundances are probably significantly higher than previously believed. That is not to say that smelt populations have not declined significantly or that smelt are not at risk of extinction. As Figure 3.8 makes clear, even with the higher estimates of smelt populations generated using the SKT, populations are still down. But more effective management of smelt requires that the relative importance of various sources of mortality be properly evaluated and compared.

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[4] Other fall collection efforts using a purse-seine-like Lampara net also catch many more Delta smelt than the FMWT. Dr. Sitts estimated and compared Delta smelt densities based on FMWT data and Lampara data collected by Department of Fish and Game and by the University of California at Davis researchers. All of these data were collected at similar times and locations in the lower Sacramento River. The FMWT densities for the lower Sacramento River ranged from 0 to 97 delta smelt/10af compared to 0-1,541 delta smelt/10af between the two Lampara programs in the same area. Annual average densities for the FMWT and two Lampara efforts were 8 and 209-372, respectively. Over 2000, 2002 and 2004-06, the annual average FMWT densities declined from 17 to 0, while the Lampara densities fluctuated between 224 and 576 delta smelt/10af. Although the Lampara sampling focuses on areas where Delta smelt are caught, it also samples the same areas as the less efficient FMWT. The Lampara technique is probably more accurate; however, more direct tests are recommended. Even in the absence of such tests, however, the existing data are sufficient to show that the ability to detect (catch) smelt at low abundances is much greater with the Lampara net, or spring Kodiak trawl than with the FMWT.

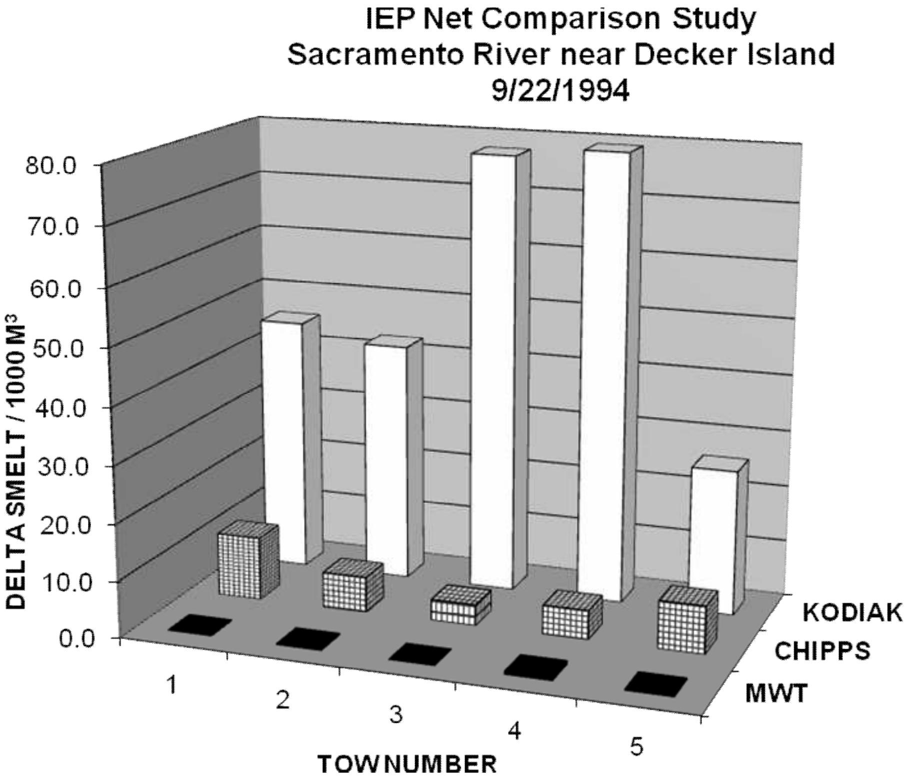


Figure 3.1. IEP Delta smelt catches/1,000 cubic meters sampled by the Fall Midwater Trawl (MWT), Chipps Island trawl (CHIPPS) and the Kodiak trawl (KODIAK) near Decker Island.

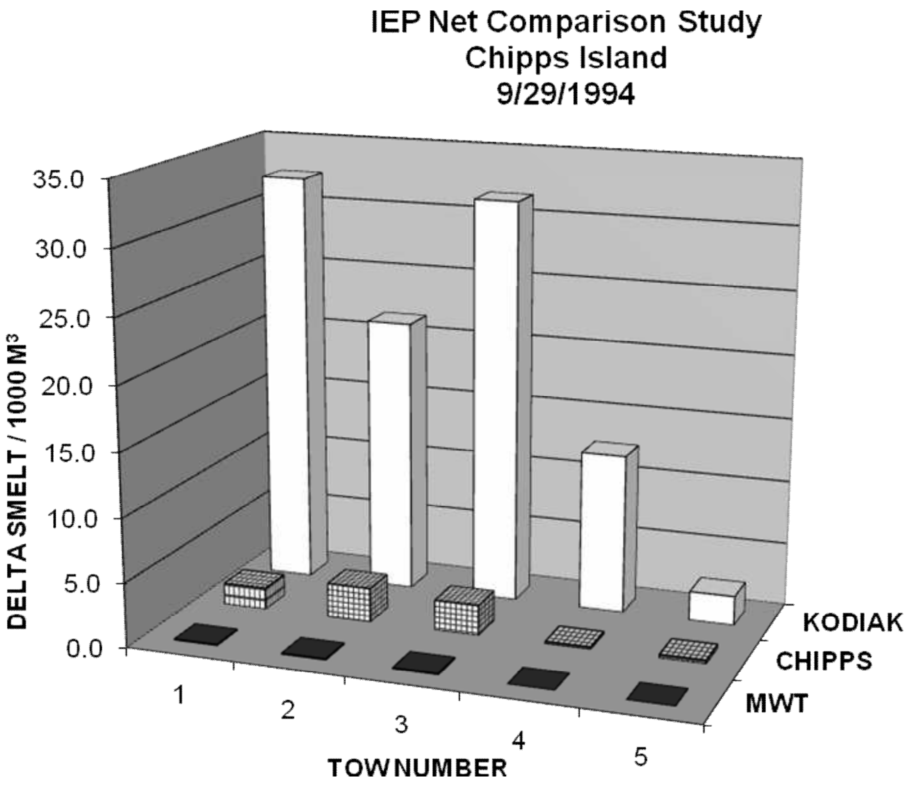


Figure 3.2. IEP Delta smelt catches/1,000 cubic meters sampled near Chipps Island by the Fall Midwater Trawl (MWT), Chipps Island Trawl (Chipps) and the Kodiak trawl. (Kodiak).

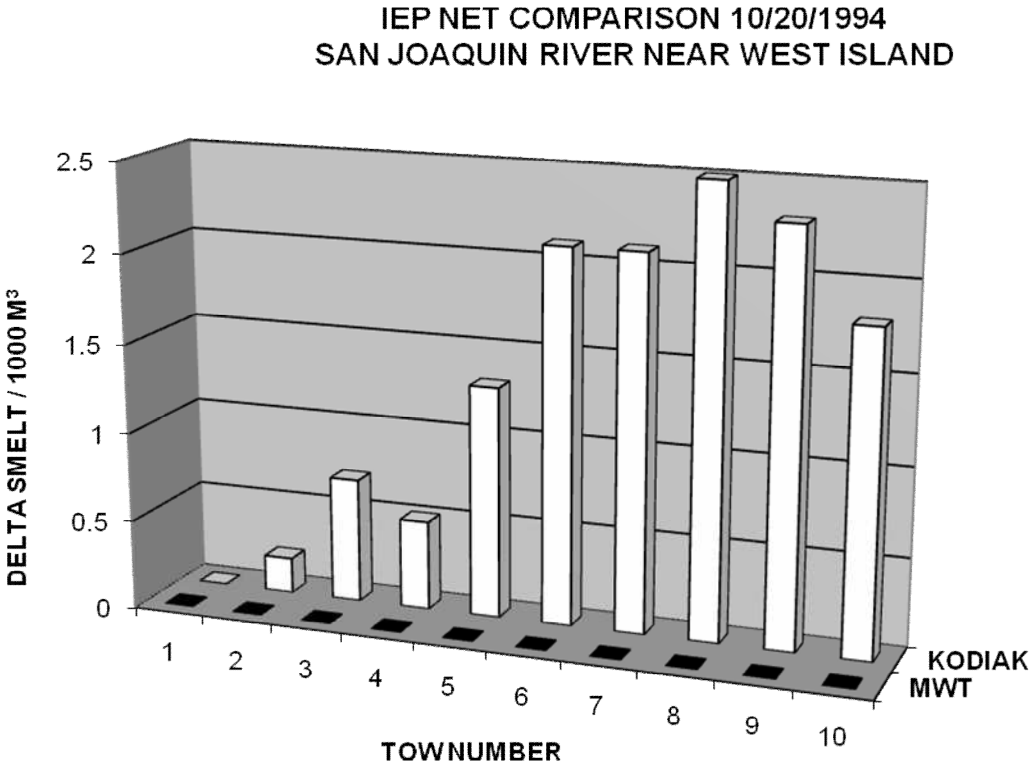


Figure 3.3. IEP Delta smelt catches/1,000 cubic meters sampled by the Fall Midwater Trawl (MWT) and the Kodiak trawl (Kodiak) near West Island.

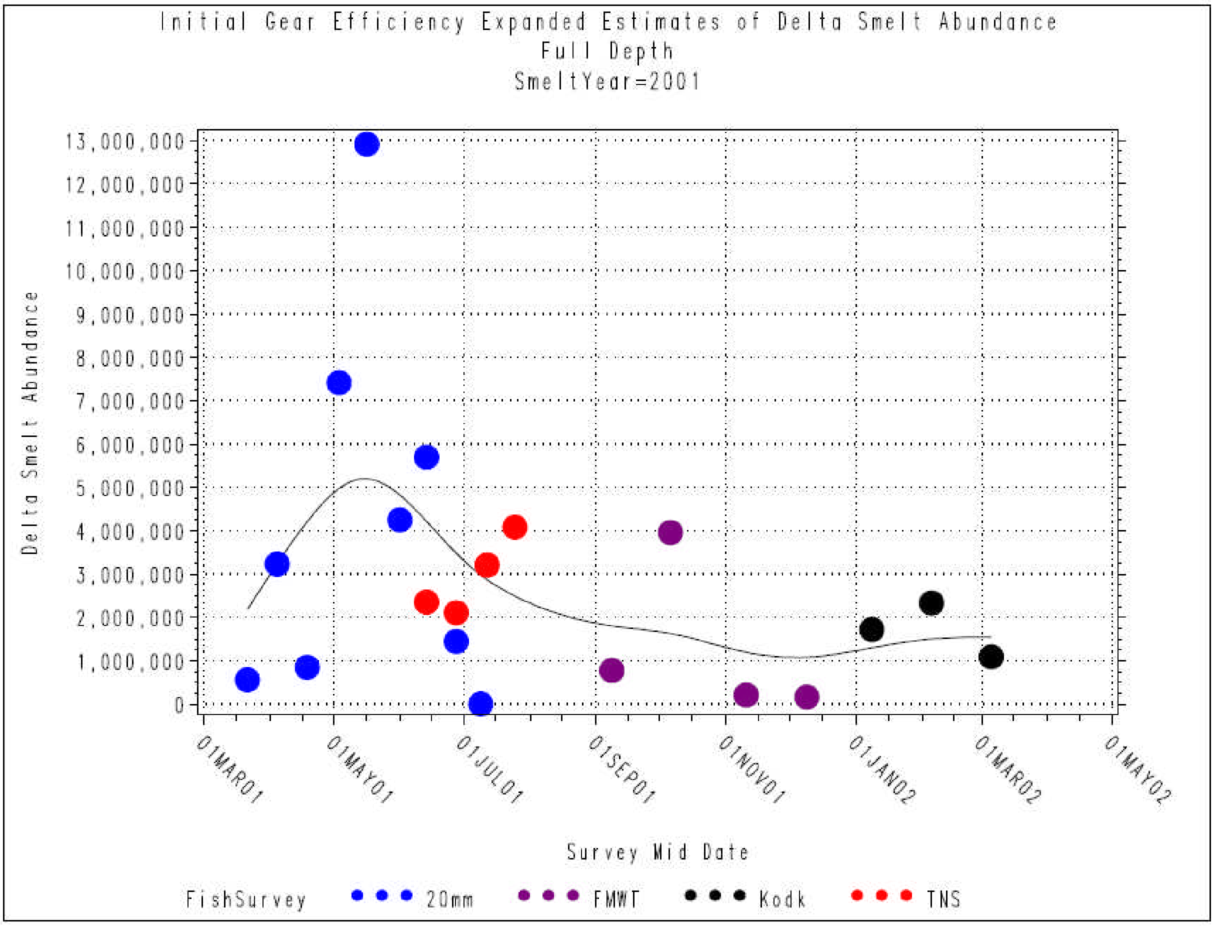


Figure 3.4. Delta smelt abundance estimates for 2001 and 2002. Fall estimates of pre-adult abundance based on the Fall Midwater Trawl (FMWT) are exceeded by abundance estimates for adults based on Kodiak trawl (Kodiak) sampling.

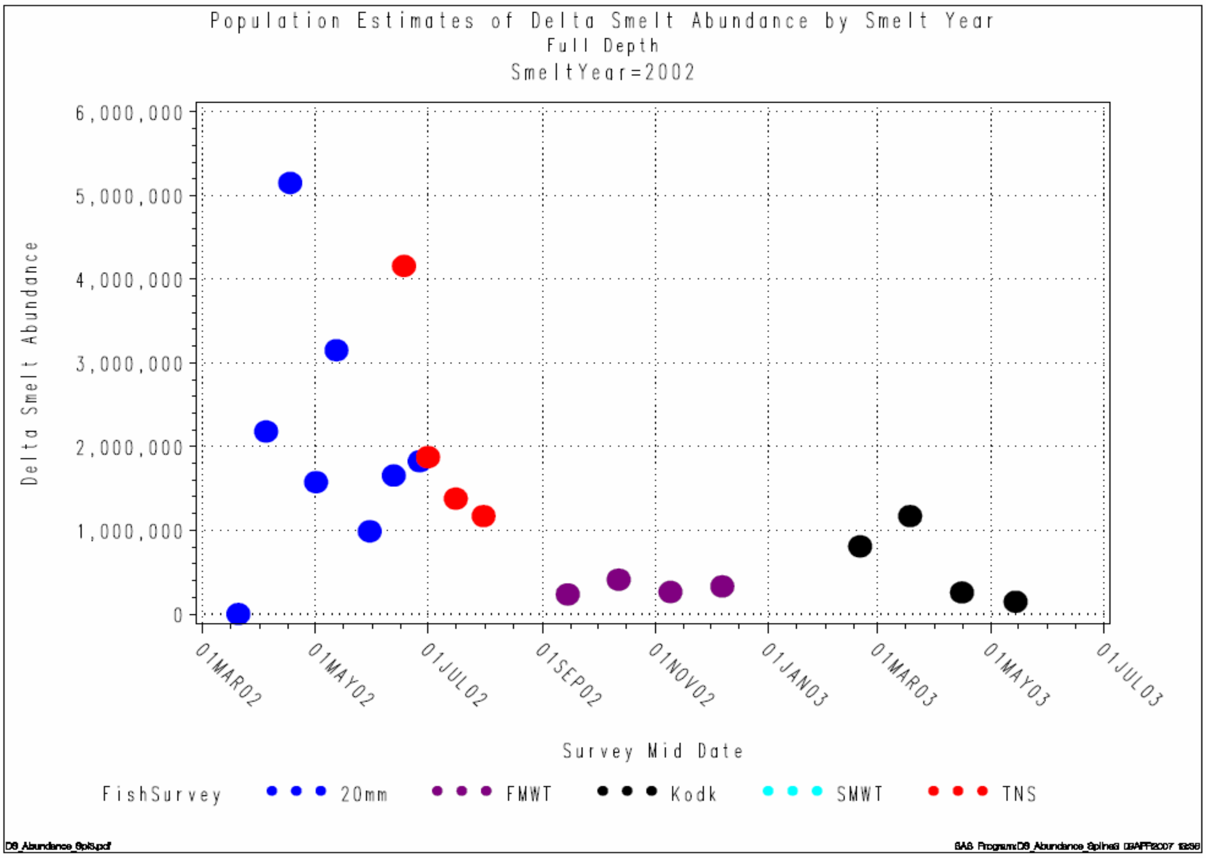


Figure 3.5. Delta smelt abundance estimates for 2002 and 2003. Fall estimates of pre-adult abundance based on the Fall Midwater Trawl (FMWT) are exceeded by abundance estimates for adults based on Kodiak trawl (Kodiak) sampling.

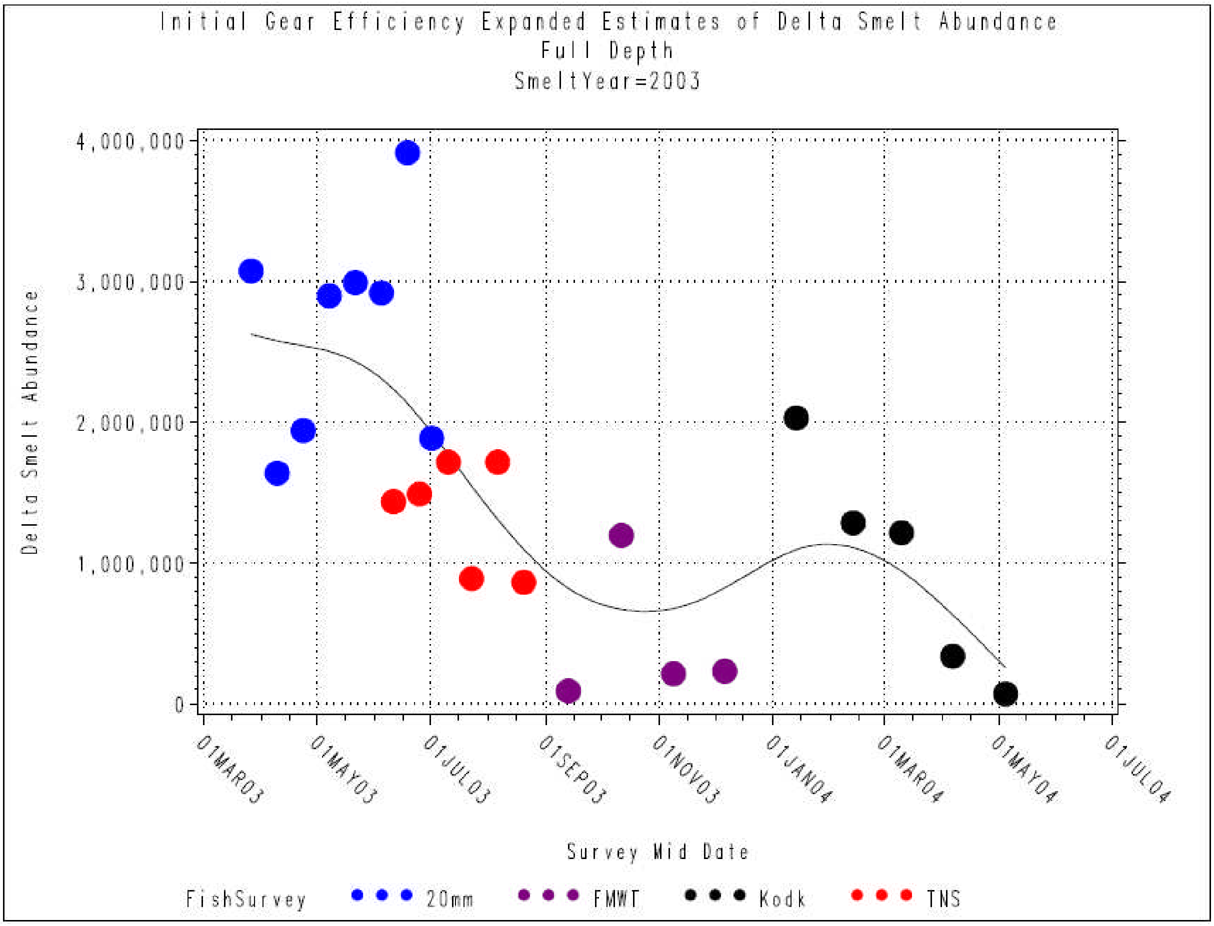


Figure 3.6. Delta smelt abundance estimates for 2003 and 2004. Fall estimates of pre-adult abundance based on the Fall Midwater Trawl (FMWT) are exceeded by abundance estimates for adults based on Kodiak trawl (Kodk) sampling.

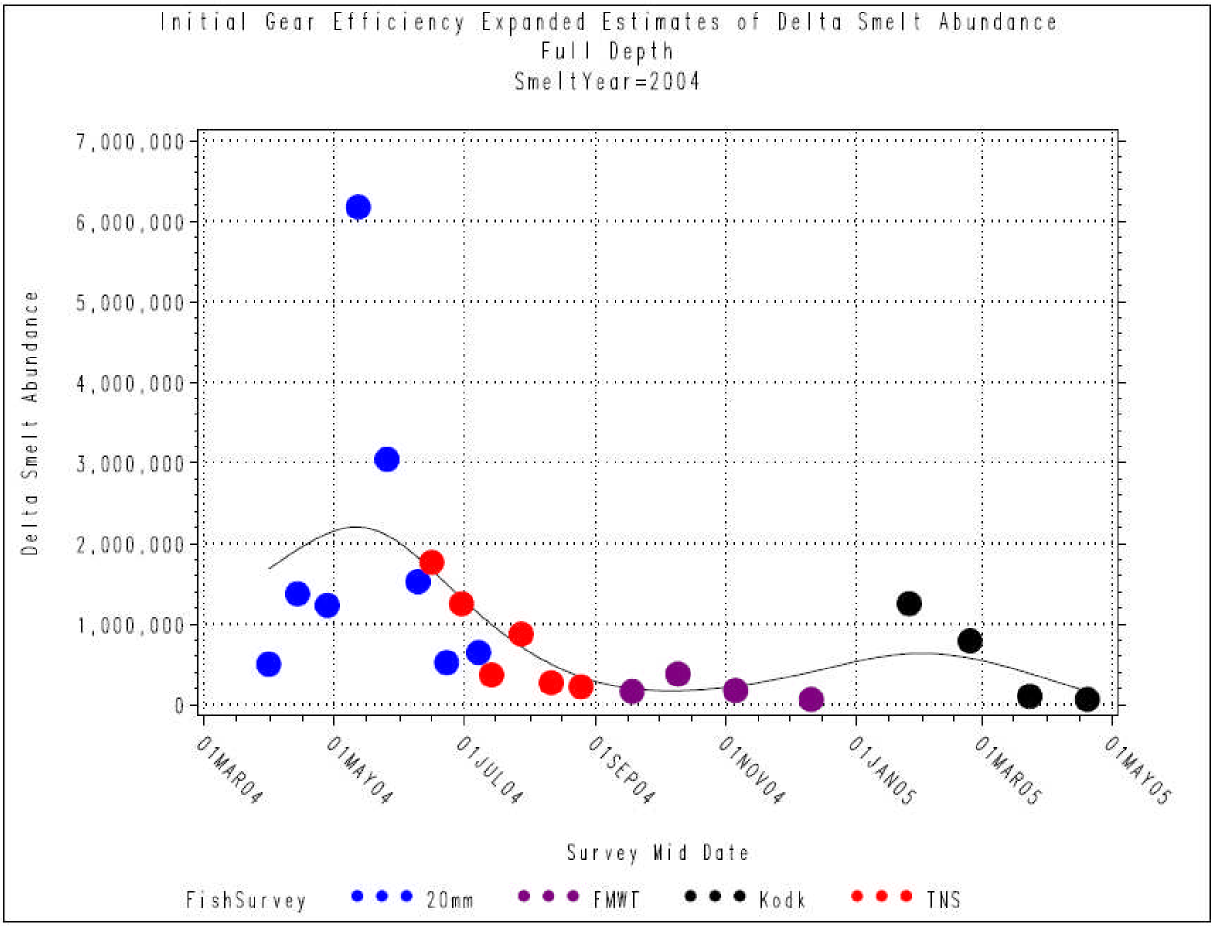


Figure 3.7. Delta smelt abundance estimates for 2004 and 2005. Fall estimates of pre-adult abundance based on the Fall Midwater Trawl (FMWT) are exceeded by abundance estimates for adults based on Kodiak trawl (Kodiak) sampling.

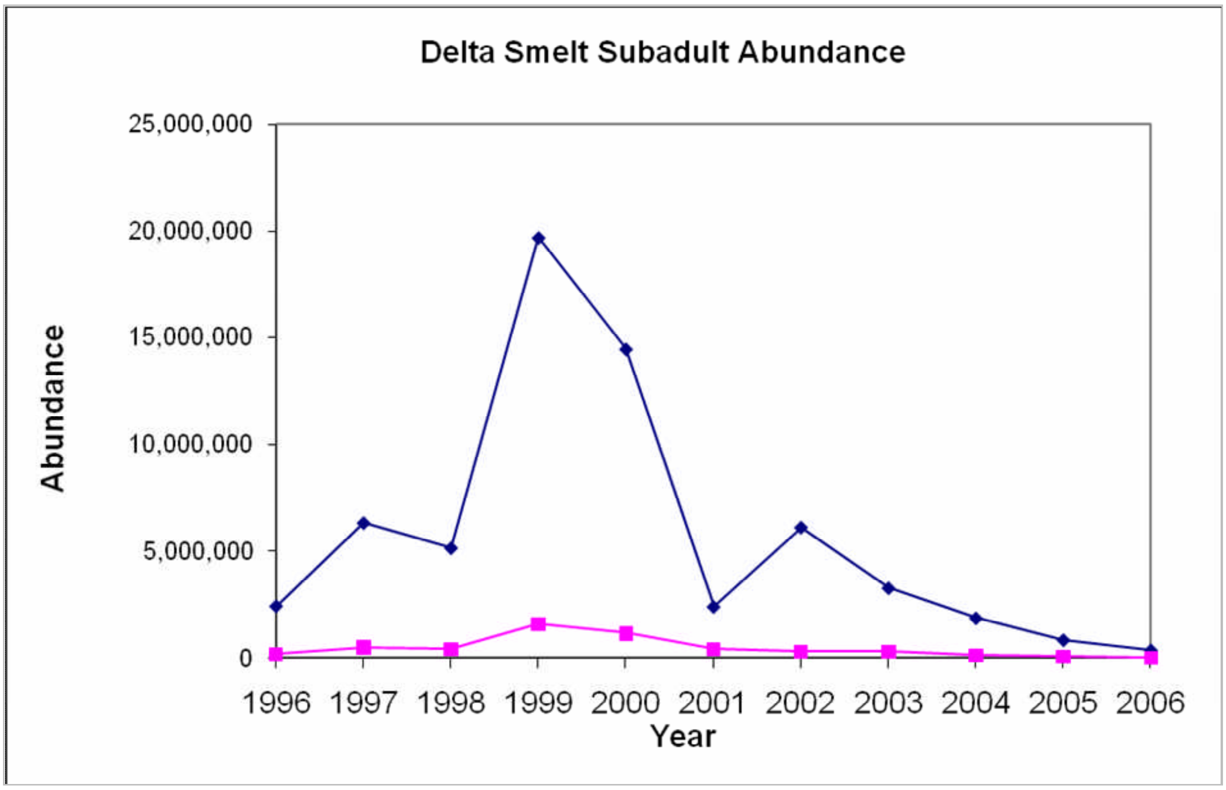


Figure 3.8. Fall Delta smelt abundances estimated two ways. The pink line shows abundance estimated using raw FMWT data. However, as discussed, the FMWT is very inefficient compared to other sampling techniques. The blue line is roughly what the population estimate would have been if a Kodiak Trawl had been performed in the fall instead of the standard FMWT.

WORKSHOP ISSUE NO. 4 – NEW FINDINGS RELATED TO THE EFFECTS OF WATER EXPORTS

Scientific understanding of the circumstances under which adult and juvenile smelt appear at the state and federal export pumps has improved dramatically during the past year. As early as 2006, the fish agencies understood that adult Delta smelt tend to show up at the export pumps immediately following large flow pulses on the Sacramento River. Moreover, Pete Smith of the United States Geological Survey ("USGS") had noted that the greater the reverse flow in Old and Middle Rivers (OMR), the greater the average salvage. These two observations led to SWP and CVP operating criteria for the winter of 2007 that limited OMR flows after three-day average Sacramento flows entering the Delta exceeded 25,000 cfs.

During 2007, David Fullerton of the Metropolitan Water District of Southern California ("MWD") and Pete Smith independently reached similar conclusions to explain the relationship between Sacramento flow, OMR flow and adult salvage. Adult Delta smelt are not commonly found in Delta water of low turbidity (turbidity below about 10 – 15 NTU). For the past two decades, turbidity in the south Delta has been extremely low during the fall and going into the winter (perhaps due to invasive plant species that trap sediment). Thus, while smelt were once occasionally found in the FMWT surveys in the south Delta, no smelt have been detected in the south Delta in the fall since December 1980. Until this turbidity “desert” extending from around Jersey Point to the export pumps is breached during the winter by some source of turbidity, there is no chance whatsoever of significant Delta smelt salvage.

The turbidity desert is commonly breached during many winters by the combination of (1) large flow pulses on the Sacramento River (which carry heavy loads of sediment) and (2) large reverse flows in Old and Middle River. The turbidity reaches the San Joaquin side of the Delta via Georgiana Slough, Three Mile Slough and the confluence. The reverse flows occur because (1) flows on the San Joaquin River typically remain very low except during the wettest winters (because storage capacity on the San Joaquin tributaries is very large compared to normal runoff) and (2) export limits are defined by the 65% or 35% Export/Inflow standard, so higher inflow means more allowable exports.

Smelt swim with the turbidity as it moves from the Sacramento side of the Delta to the San Joaquin side. If the turbidity plume reaches the reverse flows of Old and Middle River, the turbidity and the smelt within the turbidity will soon reach the export pumps. There is some dispute whether these smelt are “migrating” or simply swimming within desirable habitat. In either case, the creation of a bridge of turbidity between the Sacramento River and the export pumps opens the door to salvage.

The increasing acceptance of this physical explanation for how salvage occurs is reflected in the recommendations presented to the court by the USFWS in *NRDC v. Kempthorne* and adopted by the court. In its decision, the federal court mandated the installation of three new turbidity monitors and that exports should be cut to reduce OMR flows should any of these monitors register turbidity greater than 12 NTU starting on December 25th. While a step forward, these criteria are very crude and are not likely to lead to efficient reduction in smelt entrainment (defined as major reductions in salvage at the lowest possible water cost). As an example, the Court’s criteria ignore the need for a continuous band of turbidity extending to the Sacramento River before salvage can occur. Thus, exports were cut on December 28, 2007 as a result of a purely local turbidity spike at Holland Cut that posed little risk of salvage.

In the summer of 2007, MWD commissioned Dr. Bryan Manly, an eminent statistician with a long history of work on Bay- Delta issues, to perform a statistical analysis of smelt salvage. The goal was to explain the onset and magnitude of adult smelt salvage using measurable and predictable physical factors. Dr. Manly has succeeded in developing correlations that allow us to predict the onset and numerical magnitude of adult smelt salvage days in advance and, by controlling Old and Middle River flows, to limit adult smelt salvage to whatever level deemed appropriate at the lowest possible water cost. These correlations are described in the materials attached as Exhibits 4, 5 and 6.

The Manly correlations are consistent with previous observations that smelt salvage is associated with increased Sacramento River flow and that salvage increases as OMR flow becomes more negative. However, the equations also show that major salvage events only occur under particular, well defined circumstances that are easily avoided. Thus, salvage can be kept to *de-minimis* levels while allowing export levels that are significantly higher than those allowed in the Interim Remedial Order issued by the federal court.

Analysis by Manly to date has focused on salvage at Banks and Jones pumping plants during December – January. However, he is now developing correlations for the salvage of adults during February through March and for juvenile salvage in the spring.

The Manly equations can be put into a graphical format in which all variables but one are fixed. Such "parametric" equations help give insight into the conditions under which the correlations predict either high or low salvage. As an example, consider the following parametric curves in figure 1. These curves were generated using a Manly equation with a 12-day averaging period with prediction of salvage on the 12th day. The graph can be compared

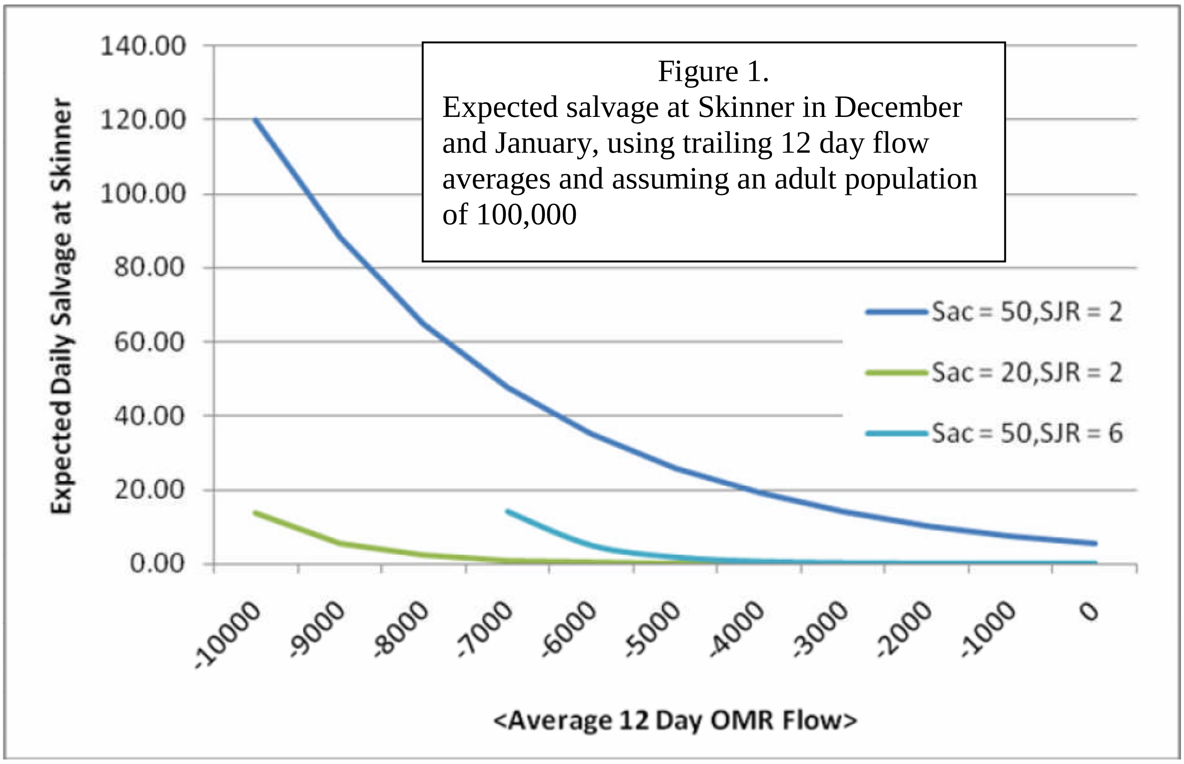


Figure 1.
Expected salvage at Skinner in December and January, using trailing 12 day flow averages and assuming an adult population of 100,000

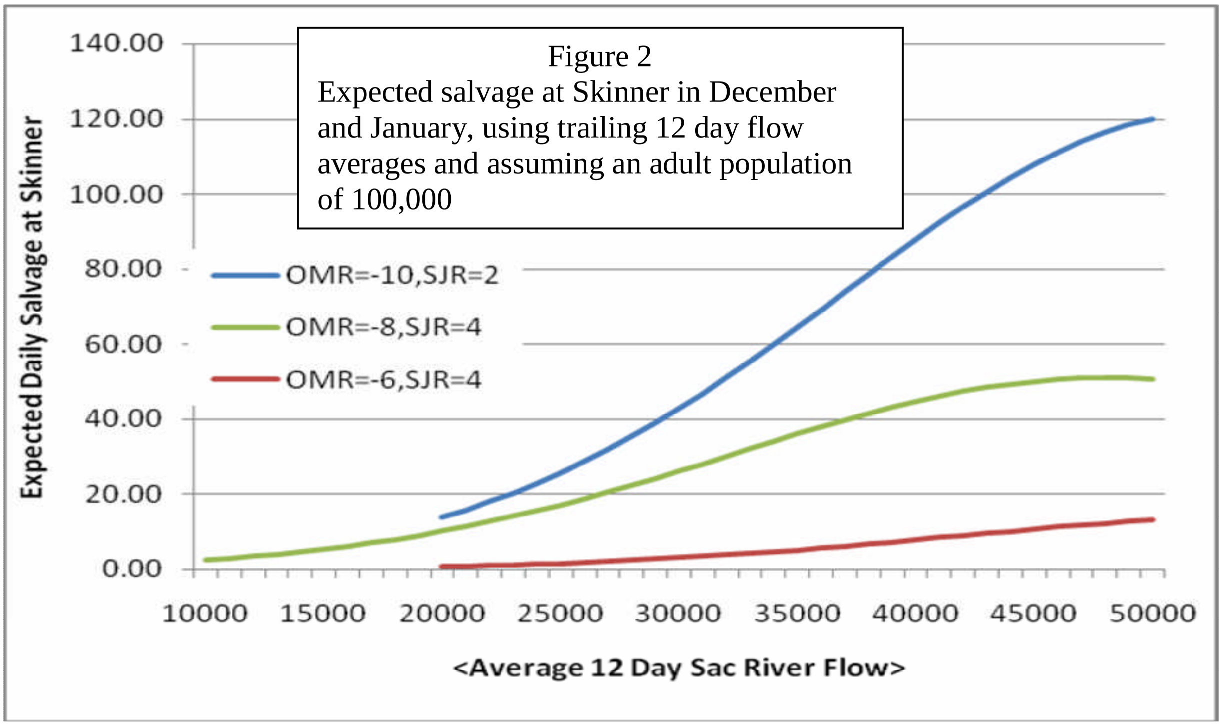
to work by Pete Smith, Sheila Greene and others showing the relationship between Old and Middle River flows and salvage. But this graph is considerably more sophisticated:

- The curves show the exponential nature of the OMR/ salvage relationship as asserted by Greene and now supported by Smith. However, what the correlations indicate is that there are many exponential relationships – one for every combination of Sacramento and San Joaquin flow. Many of the exponential curves never grow much above zero, meaning that expected salvage is low, even with high reverse flows in Old and Middle River. Only very particular combinations of Sacramento and San Joaquin River flow would create a circumstance in which reverse flow less than -5,000 cfs would provide much benefit compared to -5,000 cfs.

- The salvage predictions are for a particular day, not a long term average. Thus, predicted salvage over the next week can be estimated each day in the winter. The graphs show that in order to reduce predicted salvage, all that need be done is to reduce OMR negative flows to a safe level. In general that level will be around -5000

> cfs, although when the Sacramento River is running around 50,000 cfs, additional cuts might be desirable. By comparison, the flow limitations imposed by the federal court limit negative OMR flows to a *maximum* of 5,000 cfs and provide that they may be reduced to as little as -750 cfs. The Manly statistical analysis shows that such a limitation is unnecessary to minimize the take of smelt at the Project pumps.

Similarly, consider Figure 2. This is another set of parametric curves using the same Manly correlation. Now, however, Sacramento flows are allowed to vary. Again, the key observation from previous years – that there is little risk of salvage at Sacramento flows below about 25,000 cfs is borne out. This is true even when Old and Middle River flows are highly negative. However, as average Sacramento flow rises above 40,000 cfs, the correlation shows that Old and Middle River flows need to be scaled downward in order to reduce salvage to low levels.



Based upon Dr. Manly's work, the State Water Contractors are increasingly confident that adult smelt salvage can be managed at relatively low water cost. Additional work is continuing to study the problem of juvenile smelt salvage. Our hope is that we can similarly operate around these problems as well.

The population effects of the flows analyzed by Dr. Manly can also be evaluated with a population model that incorporates the equations developed by Dr. Manly as a result of his evaluation of the relationship between Delta smelt salvage, abundance and flow. Dr. Manly evaluated associations of adult delta smelt salvage with abundance and flows during December-January and February-March at the Skinner and Tracy fish facilities. He also evaluated April-June entrainment risks for larval and juvenile delta smelt in terms of the percent of the population occurring in the southeastern delta. His results are being used to quantify effects of exports and other variables in a delta smelt population model.

The Delta Smelt Entrainment model, or DSE, has been developed by Dr. Philip Unger and Dr. Richard Sitts to evaluate population effects of take at the SWP and CVP pumps. DSE is based on concepts in Dr. William Bennett's 2005 paper, "Critical Assessment of the Delta Smelt Population in the San Francisco Estuary, California," in San Francisco Estuary and Watershed Science. DSE development also included analyses of all four of the existing Delta smelt datasets. The evaluations of Drs, Unger and Sitts involved estimating Delta smelt abundances by mm length class by survey, and using these estimates to estimate survival rates from one life stage to the next for use in the model. The model provides predictions of the Delta smelt population effect of different levels of adult, larvae and juvenile delta smelt take at the pumps. Take estimates are specified or can be functions of various flow or pumping rates. The core of the model estimates abundances of the four successive life stages within a year, over one or more several years. DSE will be developed further based on ongoing evaluations.

The salvage and entrainment equations developed for the DSE by Dr. Manly allow prediction of Delta smelt losses at the pumps through the year as a function of Old and Middle River flows, Sacramento flows, San Joaquin flows, overall abundance, and other parameters. DSE adjusts predicted losses at the pumps by the survival rate for the specific life stage to account for those fish lost that would have been lost to the population anyway out in the Delta due to other factors. DSE takes the adjusted losses and subtracts them from the population at the time to determine the population level effect of the given flow regime. Thus, DSE can be used to define efficient operations that provide high levels of smelt protection at the lowest possible water costs, as well as to compare operations. For example, DSE has been used to compare historic losses given upper and lower Old and Middle rivers flow specified for winter/spring 2008.

WORKSHOP ISSUE NO. 6 – RECOMMENDATIONS FOR SHORT TERM AND LONG TERM ACTIONS BY THE STATE BOARD TO IMPROVE HABITAT CONDITIONS FOR PELAGIC SPECIES

The State Contractors expect that some of the parties to the Workshop will bring to the State Board new requests for regulation of the SWP and CVP beyond the limitations that already exist as a result of D-1641 and the recently adopted Remedial Order of the federal court. We expect, for example, that the State Board will hear statements concerning a proposal that an X-2 objective be established in the fall months on the theory that there is a correlation between fall outflows and the following year's Delta smelt abundance. We recommend, however, that the Board *not* attempt to deal with pelagic organism issues by requiring Delta outflow increases that attempt to position X-2 during the fall months. Such a proposal was the subject of considerable testimony during the trial in *NRDC v. Kempthorne* and was firmly rejected by the federal court.

There were several reasons for this outcome. The first was that the testimony established the Delta Smelt Working Group ("DSWG") had already considered, and rejected, a measure to control fall salinity that involved placement of X-2 in a similar manner. (Tr. 444:23-445:5;

1207:15-25; 1208-1-14).[5] The DSWG declined to do so because the increased outflow would not be enough to detectably change physical habitat quality or quantity; nor would it change overbite clam distribution. Tr. 1208:10-14. Second, the testimony presented to the federal court showed there is considerable disagreement among scientists about the benefits of such a measure for pelagic species. The testimony showed, for example, that *none* of the scientific articles or correlations advanced by proponents of a fall X-2 measure demonstrated a causal relationship between fall salinity and the following year's Delta smelt abundance. Tr. 952:18-21; 995:6-11. To the contrary, one of the articles presented to the Court for the purpose of attempting to support the measure actually demonstrated there is no statistically significant relationship between environmental quality and effects on Delta smelt of positioning X-2 near kilometer 80 (measured from the Golden Gate Bridge) as the plaintiffs in the litigation had proposed. Tr. 1011:1-4. The same article expressly *declined* to support the use of its analysis of X-2 for purposes of conducting management actions for the SWP and CVP. Tr. 952:22-24.

Similarly, a study created by Guerin of the Contra Costa Water District was offered during the trial by the advocates of a fall X-2 measure to show a correlation between fall salinity and smelt abundance the following year. However, the correlation was based on limited data generated over a limited number of years and, when data for more recent years was used, the correlation was no longer statistically significant. See Decl. of David Fullerton, SWC Exh. Q, in *NRDC v. Kempthorne*, pp. 4-7. (A copy of the Fullerton Declaration is attached as Exh. 7)[6].

Moreover, there is no evidence to suggest that reduced fall salinity "causes" reduced population abundance for the Delta smelt – or any other pelagic species. As explained by Fullerton, the correlations that have been offered by advocates of a fall X-2 measure depend upon few data points generated during the extended drought of 1987 to 1994 and a few data points with higher smelt populations generated during the extended wet period that occurred in the latter half of the 1990s. Exh. 6, pp. 9-10. Simply because extended droughts are bad for smelt (and, likely for other pelagic species) and extended wet periods are good for smelt, it does not follow that artificially boosting outflow for a few months in dry years – at enormous cost to other beneficial uses dependent upon scarce fresh water supplies – will reproduce the complex conditions necessary to generate the benefits associated with wet years.

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5 The reference provided are the citations to the page and line of the official hearing transcript of proceedings before the federal court in *NRDC v. Kempthorne*. Because of the size of the transcript, it is not attached hereto. Upon request, however, the transcript – or excerpts therefrom – will be provided.

6 A second correlation, by Feyrer, was also offered, but served to explain very little of the variation in summer smelt population abundance. *Id.* Moreover, as explained in Exhibit 8 attached hereto, Feyrer's implicit assumption that recent higher fall salinities are primarily caused by increases in SWP and CVP exports, is inconsistent with the data. To the contrary, the data show that the predominant reason for a decline in Delta outflow is a reduction in Delta inflow, not an increase in Project exports. The data further show that a reduction in Sacramento Valley Accretions is the largest single factor accounting for a reduction in inflow, with the primary cause of the change attributable to reduced Sacramento Valley precipitation in more recent years, followed by lesser causes such as increases in irrigation use and changed water management practices for crop irrigation. *Id*. Other factors contributing to the decline in Delta inflow are reduced imports from the Trinity River attributable to increased downstream Trinity River flows and reduced variations in Feather River flow releases from Oroville Dam resulting from compliance with a 1983 DFG fish agreement adopted for the protection of salmon spawning downstream of the dam. *Id*.

Consistent with the foregoing conclusion, the USFWS testified during the trial that using outflow to position X-2 in the fall would not necessarily provide benefits, because the biology underlying the action is uncertain. Tr. 669:8-24. Among other things, habitat does not appear to be a limiting factor. Tr. 953:2-12. Further, because of the existing Delta outflow requirements already included in D-1641 for the protection of Delta municipal and agricultural uses, fall salinity in the location where X-2 was proposed to be positioned is expected to be about 3 to 4 ppt in any event – a level well within the tolerance of the Delta smelt. Tr. 1013:4-11. Finally, the volume of water required to move X-2 in the fall is so large that attempting to do so could deplete the cold water pools in upstream reservoirs that are needed to protect winter-run salmon, steelhead and other listed anadromous fish species. Tr. 669:18-24; 670:8-672:12; 1022:1-1024:19; 1486:19-1488:22; 1489:7-23; 1490:18-1492:16.

It thus was not surprising that the federal court rejected efforts to impose a fall X-2 measure on the SWP and CVP. According to the Court:

> Plaintiffs' proposed fall action to maintain Delta outflow at a minimum of 7,500 cfs or maintain X-2 as a fourteen day running average at downstream of 80 km, whichever requires less fresh water outflow was not support by a preponderance of evidence because: (1) not supported by peer-reviewed analysis; (2) the Delta Smelt Working Group declined to support similar actions put before them; and (3) there is material uncertainty among scientists about the benefit of this action for the Delta smelt in the fact of its requirement of a large commitment of water to uses in times of summer heat.
>
> The significant quality of water that would be required for proposed fall actions, approaching 500,000 acre feet ("A.F.") in an average water year, in light of the scientific dispute and other scientists' rejection of such a plan; the scientific uncertainty; and the low risk-reward benefit analysis does not justify imposition of a fall remedial measure.

Exhibit 2, pp. 21-22.

This conclusion is compatible with the report of the Suisun Ecological Workgroup previously presented to the State Board in November 2001. The Workgroup was convened by DWR at the direction of the State Board to evaluate the technical basis of the Suisun Marsh water quality objectives and their effects on beneficial uses. After finding that water quality issues in the Marsh were "inextricably connected" to the timing and volume of Delta outflows, the Workgroup reported the recommendations of its Aquatic Habitat Subcommittee. The Subcommittee's recommendations included the following:

> The subcommittee does not believe that current WQCP operations in the fall provide any particular benefit for native fish populations. In fact, there is information that suggests low salinities during the

> fall period may support the establishment of introduced fish species (Moyle and Herbold 1983; Moyle and Herbold 1986).

Suisun Workgroup Final Report, p. 3.

Thus, a fall X-2 measure is incompatible with the findings and Order of the federal court that dealt with this precise issue. It is also inconsistent with the Final Report of the Suisun Ecological Workgroup previously convened at the direction of the State Board. Together, the findings of the federal Court and the Final Report of the Suisun Workgroup show that a fall X-2 measure not only fails to produce a benefit for pelagic species; it will, instead, enhance the conditions for introduced species at the expense of native species.

While a fall X-2 measure has already been examined and rejected, there *is* a fall operational measure that warrants the Board's attention. Development in the early 1900s effectively eliminated more than 52,000 acres of brackish habitat in Suisun Marsh that once served as a valuable nursery area for juvenile smelt and other pelagic species. In earlier water quality control plans, the State Board established low salinity objectives in Suisun Marsh to support managed, diked wetlands. These objectives were established in furtherance of the now-discredited belief that depressed salinities in the Marsh are necessary for the production of sufficient food for migrating waterfowl. As the Final Report of the Suisun Ecological Workgroup states:

> Salinity standards for Suisun Marsh, adopted by SWRCB in 1978 in Decision 1485, were based principally on the Department of Fish and Game's (DFG) recommendations … DFG's recommendations to SWRCB were based principally on ecological studies conducted by Mall (1969) and Rollins (1973). These two studies examined: (1) the relative value of marsh plants as duck food; (2) the influence of soil salinity and other factors on distribution and growth of marsh plants; and (3) the relationships between channel water salinity and soil salinity….Results from the study by Mall (1969) identified alkali bulrush, brass buttons, fat hen, and cultivated barley as the foods eaten most frequently by migrating waterfowl. However, DFG recently noted that the methods used in this study, while state of the art at the time, may not accurately reflect which foods are most frequently consumed by waterfowl.

Suisun Workgroup Final Report, p. 10.

Indeed, the Suisun Workgroup found that the plant species used by waterfowl as food are found "in abundance" in tidal and diked wetlands in "other" parts of the estuary (Final Report, p. 28) and that the artificial reduction of channel water salinity through operation of the SMSCG actually causes some plant species – including rare and endangered native plants – to progressively decline. *Id*., p. 37. Thus, not only have 52,000 acres of potential pelagic species nursery been lost, they have been lost in pursuit of a DFG theory of waterfowl food abundance that is based upon an inaccurate assessment of the foods consumed by waterfowl and whose implementation is resulting in the destruction of rare and endangered native plant species.

The artificially low Suisun Marsh salinity objectives, particularly in the fall, are now met in large part through operation of the Suisun Marsh Salinity Control Gates ("SMSCG"). The Salinity Control Gates function by tidally diverting fresher flows from the Sacramento River at Collinsville into Montezuma Slough while blocking tidal return flows from the Slough. While operation of the SMSCG does reduce salinity in Suisun Marsh for the benefit of plant production for waterfowl, the operation may also have adverse impacts to pelagic species. Flows in the main channel of the Sacramento River downstream of Collinsville are reduced, resulting in higher salinities from Port Chicago to Emmaton and Jersey Point. The increase can be as much as 2,000 umhos/cm. electro conductivity. Operation of the salinity gates can also divert smelt and other pelagic species from the Sacramento River into Montezuma Slough, where they can be prevented from later upstream migration for spawning, due to continued operation of the gates. The salinity gates also cut off the tidal exchange of nutrients and organisms between Suisun Bay and its marsh. Thus, reconsideration of the need for the Suisun Marsh salinity objectives and modification of the Suisun Marsh gate operations represents an important "knob" that the State Board may consider turning for the benefit of pelagic species.

The State Board did not implement the recommendations of the Suisun Ecological Workgroup in its 2006 Water Quality Control Plan; however, it did provide for conditional implementation of water quality objectives at Stations S-97 and S-35. The 2006 WQCP also deferred further consideration of the Suisun Marsh standards pending development of a programmatic EIR/EIS for the Habitat Management, Preservation and Restoration Plan for Suisun Marsh (Suisun Plan). Before committing already scarce SWP and CVP water supplies to the support of yet another faulty theory involving the fall positioning of X-2, the State Contractors suggest it would be of more value to pelagic species to investigate the value of continuing to pursue the isolation of more than 52,000 acres of once brackish Suisun Marsh aquatic habitat. Accordingly, given the potential for adverse impacts to pelagic species from continued operations to meet Suisun Marsh water quality objectives, the State Contractors believe the Board should engage early in the development of the Suisun Plan. We also recommend the Board hold a workshop in the first half of 2008 on the impacts of the Suisun Marsh Salinity Control Gate operation on pelagic fishes and the direction being taken in the development of the Suisun Plan.

CONCLUSION

Because vast resources are needed to effectively evaluate and regulate the multiple causes of the pelagic species decline, the State Board must be selective in its approach to the issue. Furthermore, because the State Water Project and Central Valley Project are already subject to intense regulatory scrutiny and control through Water Right Decision 1641 and the Interim Remedial Order recently issued by the federal district court in *NRDC v. Kempthorne*, it does not make much sense to attempt to impose even more controls upon the Projects that serve as the source of water supply for the large majority of California's population. Doing so would simply invite inconsistency with the administrative and judicial measures that have already been imposed on the SWP and CVP by this Board and the courts.

However, given the regulatory imbalance that currently exists, there is much the Board can – and should – do to evaluate and, where appropriate, assert control over the *other* factors that are contributing to the decline of pelagic species but have escaped regulatory consideration. Thus, while the State Board *should* continue to closely monitor ongoing Project-related efforts such as the ESA reconsultations and the BDCP process, both of which are now underway and are focusing upon near and long-term changes in the operations of the SWP and CVP, it is *also* important that the Board focus its administrative efforts on in-Delta toxic discharges, the other 2,000 in-Delta diversions (many of which are unscreened), the operations of the Suisun Marsh Control gates, predatory non-native species such as striped, small-mouth, and large-mouth bass, and similar topics that have been too long ignored. More specifically, the State Contractors recommend the Board undertake the following on a high priority basis:

1. Compilation and assessment of available data on contaminants and toxicity to determine the extent to which contaminants are contributing to the POD;

2. Development and implementation of a Delta-wide toxicity monitoring program to provide data on the character and sources of contaminants in Delta sediments, water and aquatic organisms;

3. An investigation of (1) the link between sediment contamination and possible effects on pelagic organisms either through food web transfers or through re-suspension of sediments during storm or wind events, (2) the effects of metals and other contaminants on the olfactory response of Delta pelagic species, and (3) the concentrations of endocrine disrupting chemicals in the Delta as well as of the impacts of these chemicals on pelagic species;

4. Development and implementation of a program of monitoring pollutant discharges from Delta islands;

5. Immediately require wastewater treatment plants in or upstream of the Delta seeking to increase their treatment capacities, to evaluate the effect of their expansion on pelagic species;

6. Initiation of screening studies of the potential inhibition of primary productivity and toxicity to fish associated with ammonia concentrations in the Delta and the sources of such discharges and implement appropriate controls to protect fishery beneficial uses;

7. Development and implementation of a standardized monitoring program to better understand blue-green algal blooms;

8. Initiation of a State Board proceeding to evaluate and mitigate the impact of in-Delta municipal, industrial and agricultural diversions that are not already subject to the terms of Water Right Decision 1641;

9. Initiation and pursuit of discussions with the Department of Fish and Game to integrate or add to their normal monitoring activities, sensitive and statistically valid fishery survey protocols that are relevant to pelagic species and more accurately reflect the distribution and abundance of such species in a statistically valid manner;

10. Scheduling of a workshop within the next three months to receive updated information on: (1) the impacts of Montezuma Slough Salinity Control Gate operations on the POD and (2) an update of the Suisun Marsh Habitat Management Preservation and Restoration Program, including what measures the program includes to address the need for existing water quality objectives and the POD impacts of those objectives;

11. Scheduling of a workshop within the next three months to evaluate programs conducted by the Department of Fish and Game to protect and promote non-native, predatory species such as striped bass and small mouth and large mouth bass, including a determination of the extent to which those programs are a threat to listed species, whether they contribute to the POD and whether they are compatible with the requirements of the public trust;

12. Development and implementation of regulatory controls, in coordination with the SLC and USEPA, to address the introduction of invasive species from ballast water discharges;

13. Increase State Board monitoring of the Bay-Delta Conservation Plan process, including attendance at technical meetings relating to proposals to improve environmental conditions for POD species.

14. Scheduling of a workshop within the next six months to receive information regarding the Delta Vision process and the Bay-Delta Conservation Plan. Such a workshop will provide the Board with information on the process being pursued to develop the BDCP, its regulatory framework, the schedule for its development and implementation and the likely interaction of the BDCP with State Board processes.

15. Scheduling of a workshop for the latter half of 2008 to receive a status report regarding development by the United States Fish and Wildlife Service of the Biological Opinion for the revised Operations Criteria and Plan for operation of the Central Valley Project and State Water Project, including the measures being considered by the USFWS for protection of endangered and threatened species. The workshop should include a review of the different approaches being advocated to manage water project entrainment of pelagic species, including the emerging correlations developed by Dr. Bryan Manly;

16. We also recommend that the State Board *not* attempt to deal with pelagic organism issues by requiring Delta outflow increases that seek to position X-2 during the fall months.

Respectfully submitted,

Terry L. Erlewine
General Manager
STATE WATER CONTRACTORS

Enclosures

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EXHIBIT 1

UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF CALIFORNIA

NATURAL RESOURCES DEFENSE COUNCIL, et al., Plaintiffs, v. DIRK KEMPTHORNE, in his official capacity as Secretary of the Interior, et al., Defendants. CALIFORNIA DEPARTMENT OF WATER RESOURCES, Defendant-Intervenor, STATE WATER CONTRACTORS, Defendant-Intervenor, SAN LUIS & DELTA-MENDOTA WATER AUTHORITY, et al., Defendant-Intervenors.	)	1:05-cv-1207 OWW GSA INTERIM REMEDIAL ORDER FOLLOWING SUMMARY JUDGMENT AND EVIDENTIARY HEARING

Following the Court's May 25, 2007, Order Granting In Part and Denying In Part Plaintiffs' Motion for Summary Judgment, finding the Long-Term Central Valley Project Operations Criteria And Plan ("OCAP") Biological Opinion ("BiOp") unlawful and inadequate, as well as the accompanying Delta Smelt Risk Assessment Matrix ("DSRAM") adopted to implement the 2005 OCAP BiOp, in violation of the Administrative Procedure Act, 5 U.S.C. § 705 et seq. (Doc. 323), a seven-day evidentiary hearing was held on August 21-24 and 29-31, 2007, to determine what interim remedies to impose. Based on the contemporaneous Findings of Fact and Conclusions of Law, after review of all the evidence, seven days of testimony, the parties' memoranda of law, and fully considering all the parties' oral arguments and proposed interim remedies, the Court enters the following:

I. INTERIM REMEDIAL ORDER

A. REMAND

1. Completion of New Biological Opinion

The Court orders the 2005 OCAP BiOp on the effects of the coordinated Central Valley Project ("CVP") and State Water Project ("SWP") operations on the Delta smelt, REMANDED to the United States Fish & Wildlife Service ("FWS") for further consideration consistent with this Court's orders and the requirements of law. This remand shall conclude not later than September 15, 2008, at which time FWS shall issue a new Biological Opinion ("BiOp") to the U.S. Department of the Interior, U.S. Bureau of Reclamation ("Reclamation"), and the California Department of Water Resources ("DWR"), as an applicant and joint operator, on the effects of the operation of the CVP and SWP upon the Delta smelt.

2. Vacatur

To avoid the potentially draconian consequences of operating the CVP and SWP without incidental take authority, this remand is made WITHOUT VACATUR. The operation of the CVP and SWP by Interior, Reclamation, and DWR, respectively, during this interim period, shall not violate the additional conditions set forth below.

B. <u>INTERIM INJUNCTIVE RELIEF</u>

Based on the previous findings of the imminent peril to the survival of the Delta smelt and adverse effects on its critical habitat, a preliminary injunction shall issue restraining Interior, Reclamation, and DWR, their officers, employees, agents, and all those acting in concert with them in those parties' operation of the CVP and SWP, respectively from taking any actions that are contrary to, inconsistent with, or that violate the following interim remedial measures to prevent the extinction of the Delta smelt, a threatened species, or that would destroy or adversely modify its critical habitat. This preliminary injunction shall remain in effect until the remand of and reconsultation on the BiOp is completed and a new BiOp is issued by FWS, on or before September 15, 2008, or further order of the Court, whichever shall first occur.

1. <u>Surveys And Monitoring</u>

a. <u>Delta Smelt Surveys</u>

Reclamation, DWR, and any other party shall take no action to prevent the full implementation of surveys for the Delta smelt which have been conducted by the California Department of Fish &

Game ("CDFG") including, but not limited to, the Fall Midwater Trawl ("FMWT"), Summer Townet, Spring Kodiak Trawl, and 20mm surveys.

2. Frequency of Sampling for Delta Smelt

Reclamation shall increase the frequency of sampling for Delta smelt that may be entrained at the Jones Pumping Plant to a minimum of twenty-five percent (25%) of the time, at regular intervals, whenever the Jones Pumping Plant is diverting water into the Delta-Mendota Canal.

a. Sampling Triggers

Sampling at this frequency shall commence upon either: (1) an increase in the average daily flow of the Sacramento River at Freeport to 25,000 cubic feet per second ("cfs"); or (2) when there is an increase in the average daily flow of the San Joaquin River at Vernalis by ten percent (10%) over three consecutive days after December 25; (3) survey data from the FMWT or Kodiak Survey indicate Delta smelt have moved to and are moving upstream of the confluence of the Sacramento and San Joaquin Rivers and into the Delta or January 15.

b. Larval Delta Smelt Monitoring

(1) Monitoring Triggers

Reclamation and DWR shall each monitor for the presence of larval or juvenile Delta smelt, that are less than twenty (20) millimeters (mm) in length, by Reclamation at the Jones Pumping Plant and by DWR at the Banks Pumping Plant. Such monitoring shall occur when the pumping plants are diverting water into the Delta-Mendota Canal or the California Aqueduct, respectively. Such monitoring shall provide for sampling at least once every six (6) hours during periods in which the pumping plants are operating.

(2) Timing of Monitoring

Monitoring for the presence of larval or sub-twenty mm juvenile Delta smelt shall begin at the onset of spawning by Delta smelt as shown by: (1) the presence of spent female Delta smelt in the Spring Kodiak Trawl survey or at either export plant's salvage facility; or (2) when water temperatures in the Delta reach 12°C as determined by the average of the daily water temperatures at the Mossdale, Antioch, and Rio Vista Monitoring Stations; or (3) when larval Delta smelt are detected in the 20mm survey, whichever occurs first.

(3) Termination of Monitoring

Such monitoring shall end June 15 or a minimum of 5 consecutive days without detection of larval or juvenile Delta smelt at the CVP or SWP facilities, whichever comes last.

3. Flow Restrictions

a. Winter Pulse Flows

(1) If the triggering conditions set forth below in subparagraph I.B.3.a.(2) are met, Reclamation and DWR shall modify the operations of the CVP and SWP to achieve an average net upstream flow in Old and Middle Rivers ("OMR") not to exceed

2,000 cfs over the implementation period described in subparagraph (3).

(2) The action described in subparagraph (1) shall be initiated within three (3) calendar days after December 25 when the average daily water turbidity exceeds twelve (12) nephelometric turbidity units ("NTU") at Prisoner's Point, Holland Tract, or Victoria Canal, unless, at that time, the three-day average of flow in the Sacramento River at Freeport exceeds 80,000 cfs.

(3) This action shall end after a period of ten (10) days or when one of the following terminating conditions is met, whichever occurs first: (1) the three-day average of flow in the Sacramento River at Freeport exceeds 80,000 cfs; (2) the onset of spawning by Delta smelt occurs as shown by the presence of spent female Delta smelt in the Spring Kodiak Trawl survey or at either export plant's salvage facilities; (3) when larval Delta smelt are detected in the 20mm survey or at either export Plant's salvage facility; or when water temperature in the Delta reach 12°C determined by the average of the daily water temperatures at the Mossdale, Antioch, and Rio-Vista Monitoring stations.

b. <u>Pre-Spawning Adults</u>

(1) Reclamation and DWR shall operate the CVP and SWP to achieve a daily average net upstream (reverse) flow in the OMR not to exceed 5,000 cfs on a seven-day running average. In the event that the three-day average of flows in the Sacramento River is in excess of 80,000 cfs, when this action would otherwise commence, the action is not required to be undertaken until such

time as the three-day average of flow in the Sacramento River at Freeport falls below 80,000 cfs.

(2) This action shall commence immediately following the conclusion of the action described in subparagraph I.B.3.a., above, or on January 15, whichever is earlier.

(3) This action concludes at the onset of the spawning by Delta smelt as shown by: (1) the presence of spent female Delta smelt in the Spring Kodiak Trawl survey or at either export plant's salvage facility; (2) when larval Delta smelt are detected in the 20mm survey or at either export pumping plant's salvage facility; or (3) when water temperature in the Delta reaches 12°C determined by the average of the daily water temperatures at the Mossdale, Antioch and Rio Vista monitoring stations.

4. <u>Larval And Juvenile Delta Smelt</u>

a. Reclamation and DWR shall operate the CVP and SWP to achieve a daily average net upstream flow in OMR of between 750 and 5,000 cfs on a seven-day running average. The specific biological flow objective within this range shall be set by FWS, in consultation with Reclamation and DWR, to be determined on a weekly basis and based upon the best available scientific and commercial information concerning the distribution and status of the Delta smelt.

b. This action shall commence immediately upon the onset of spawning of Delta smelt as shown by: (1) the presence of spent female Delta smelt in the Spring Kodiak Trawl survey or at either export plant's salvage facility; (2) the larval Delta smelt are

detected in the 20mm survey or at either export plant's salvage facility; (3) when water temperature in the Delta reaches 12°C determined by the average of the daily water temperatures at the Mossdale, Antioch and Rio Vista monitoring stations.

c. This action shall continue at each facility until, when in the reasonable discretion of the Bureau, FWS, and DWR, the entrainment risk at each facility is abated, or June 20, whichever occurs first.

5. Vernalis Adaptive Management Plan

a. Reclamation and DWR shall continue to implement the Vernalis Adaptive Management Plan ("VAMP"), San Joaquin River flow enhancement and CVP and SWP export curtailment as specified under the VAMP experimental design.

b. This action shall commence on a date decided upon by the VAMP Steering Committee, but not later than May 1 and shall continue for thirty-one (31) calendar days after its initiation.

c. The requirement set forth in subparagraph I.B.4.a. shall not apply during the period in which the VAMP action is being implemented.

6. Barriers

a. Head of Old River Barrier

The installation of the spring Head of Old River Barrier by either DWR or Reclamation is prohibited until the end of VAMP action implementation.

b. Agricultural Barriers

Reclamation and DWR shall ensure that the tidal effects of the three south Delta agricultural barriers are minimized or avoided by tying open all flap gates on the barriers, from the time of their installation until the end of VAMP action implementation.

C. <u>ADMINISTRATIVE DISCRETION</u>

Nothing in this Order is otherwise intended to usurp or interfere with the exercise of Interior's, Reclamation's, FWS's, and DWR's discretion and expertise in their operation and management of the Projects, protection of the Delta smelt, and the implementation of the terms and conditions of this Interim Remedial Order.

It is the intent of this Interim Remedial Order that its terms and conditions be implemented to protect the interests of all parties and their constituents under the law and to achieve the minimum disruption and damage to their respective interests.

D. <u>FEDERAL DEFENDANTS' ADDITIONAL MEASURES PENDING THE NEW BIOLOGICAL OPINION</u>

Federal Defendants in their opening brief on injunctive relief identified measures that they committed to implement as necessary to prevent an irreversible or irretrievable commitment of resources under ESA Section 7(d) pending completion of a new Biological Opinion. [Fed. Def. Brief, Doc. 396 at pp. 19-20]. Federal Defendants committed, as of July 9, 2007, that:

a. The Bureau will not execute any long-term water service contracts with CVP contractors until the new Biological

Opinion is completed;

b. The Bureau will not implement new construction activities and long-term projects in the Delta until the new Biological Opinion is completed, including the South Delta Improvement Project, the Delta Mendota Canal/California Aqueduct Intertie Program, the Lower American River Flow Standards, and the Long Term Environmental Water Accounts;

c. The Bureau will "not increase exports from the south Delta and will operate Jones Pumping Plant within recent historical limits;" and

d. The Bureau has committed resources and staff to the continuing study of pelagic organism decline in the Delta.

These measures shall be implemented during the duration of this Order as Federal Defendants admit the measures are necessary to preserve the Delta smelt and its critical habitat.

E. PUBLIC HEALTH AND SAFETY EXCEPTION

This Interim Remedial Order shall not prevent Interior, Reclamation, or DWR from taking any action in operating the Projects that is reasonably necessary to protect human health or safety of the public, including, but not limited to, any act or omission reasonably necessary to protect the structural integrity of any CVP and SWP facility.

F. DURATION OF THIS ORDER

This Order shall take effect on the date it is filed and shall continue in effect until completion of the reconsultation on the OCAP and issuance of a new OCAP Biological Opinion, entry of final judgment in this case, or further order of this Court; whichever first occurs.

G. STATUS REPORT

FWS shall provide the court and parties a status report on the progress of the Biological Opinion. FWS's status report shall be filed April 30, 2008.

IT IS SO ORDERED.

Dated: December 14, 2007 **/s/ Oliver W. Wanger**
UNITED STATES DISTRICT JUDGE

EXHIBIT 2

UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF CALIFORNIA

NATURAL RESOURCES DEFENSE COUNCIL, et al., Plaintiffs, v. DIRK KEMPTHORNE, in his official capacity as Secretary of the Interior, et al., Defendants. CALIFORNIA DEPARTMENT OF WATER RESOURCES, Defendant-Intervenor, STATE WATER CONTRACTORS, Defendant-Intervenor, SAN LUIS & DELTA-MENDOTA WATER AUTHORITY, et al., Defendant-Intervenors.	)	1:05-cv-1207 OWW GSA FINDINGS OF FACT AND CONCLUSIONS OF LAW RE INTERIM REMEDIES RE: DELTA SMELT ESA REMAND AND RECONSULTATION

I. BACKGROUND

On May 25, 2007, the Court, in a Memorandum Decision and Order addressing Plaintiff's challenge to the 2005 Long-Term Central Valley Operations Criteria and Plan ("OCAP") Biological

Opinion ("BiOp"), held that the "2005 OCAP BiOp is unlawful and inadequate," in part because "[t]he Delta Smelt Risk Assessment Matrix ("DSRAM"), as currently structured, does not provide a reasonable degree of certainty that mitigation measures will take place." The Court found that existing take limits established by the BiOp, without further restrictions on the operations of the Central Valley Project ("CVP") and State Water Project ("SWP") (collectively "Projects"), are inadequate to protect the species; that the DSRAM must be made more certain and enforceable; that the BiOp did not use the best available science; that the BiOp failed to adequately find and address the impacts of joint Project operations on the continued survival of the Delta smelt; and failed to adequately consider impacts to the smelt's critical habitat. The Court found that the Biop's no jeopardy finding was arbitrary, capricious, and without rational connection to the status of the species.

The parties then submitted legal memoranda addressing proposed interim remedies. On August 30, 2007, the Court granted Plaintiffs' Motion to Supplement Their Complaint, adding claims that the United States Bureau of Reclamation ("Reclamation") had violated Section 7(a)(2) of the Endangered Species Act, 16 U.S.C. § 1536(a)(2)("ESA") because its operation of the CVP in coordination with the State of California Department of Water Resources' ("DWR"), SWP threatens to jeopardize the continued existence and recovery of the Delta smelt and is adversely affecting the Delta smelt's designated critical habitat. [Doc. No. 495].

After taking evidence, considering all the written

submissions of the parties, and hearing oral argument, including the parties' written proposals identifying the interim relief, if any, that should be imposed on Reclamation's and DWR's operations of the CVP and SWP until such time as the remand of the 2005 BiOp is completed; [Fed. Def. Ex. 3 (Ex. 2 in evidence); Pl. Ex. 11 (App. 2); Pl. Ex. 4]; on August 31, 2007, the Court issued its oral statement of decision granting a preliminary injunction and remedial order to protect the species pending completion of a new BiOp.

Following the summary judgment order, all parties recognized that an interim remedies hearing was required because the BiOp and Incidental Take Statement as well as the DSRAM were invalidated. Federal Defendants, U.S. Department of the Interior ("Interior"); United States Fish & Wildlife Service ("FWS"); Reclamation; and all Intervenors, DWR; State Water Contractors ("SWC"); San Luis & Delta-Mendota Water Users Authority; Westlands Water District; et al., Defendant-Intervenors, have argued that the 2005 BiOp and Incidental Take Statement should remain in place without vacatur.

Plaintiffs' proposed remedial actions commence with fall actions by September 1, 2007, for the upcoming 2007-2008 water year. By reason of the opinions of scientists and other experts who testified at the evidentiary hearing, the Court has determined that interim remedies should commence by December 25, 2007.

The species was first listed as threatened March 5, 1993. The original BiOp for the OCAP was issued July 30, 2004, and amended February 16, 2005. Both BiOps found no jeopardy to the

Delta smelt and its critical habitat. These Biological Opinions concluded the Projects' combined operations did not jeopardize the smelt's survival or cause adverse modification of the smelt's critical habitat. The Delta smelt species has been intensively studied for 12 years. In July 2006, before a ruling on the legality of the 2005 OCAP BiOp was issued, FWS reinitiated consultation on the Delta smelt respecting the 2005 BiOp, implicitly recognizing its legal insufficiency and inadequacy of the No Jeopardy BiOps.

II. <u>FINDINGS OF FACT</u>

A. <u>CURRENT STATUS OF THE DELTA SMELT</u>

1. The Delta smelt *(Hypomesus transpacificus)* was listed as a "threatened" species under the ESA by the FWS on March 5, 1993. 58 Fed. Reg. 12,863 (March 5, 1993). The FWS designated critical habitat for the Delta smelt on December 19, 1994, which includes all waters and submerged lands within the Delta, including the CVP and SWP pumping facilities. 59 Fed. Reg. 65,256 (Dec. 19, 1994).

2. The FWS recently reviewed the listing status of the Delta smelt and, on March 31, 2004, concluded the species still faces a "high degree of threat" and should remain listed under the ESA. [Pl. Ex. 13].

3. Based on the results of recent surveys, scientists believe that the Delta smelt is at one of the lowest levels of abundance on record. [Fed. Def. Ex. 3 ¶2; Tr. 615:22-618:8; Tr. 617:18-21; Pl. Ex. 6].

4. It is undisputed that the current status of the Delta

smelt is serious. [Tr. 72:19-20] [Tr. 620:4-10]. Some scientists believe that the Delta smelt faces an imminent risk of extinction in the near future. [Tr. 266:16-17].

5. Many scientists opine that the decline of Delta smelt is the result of multiple factors. [Tr. 73:4-16]; [Tr. 299:16-22]. Those factors include: (a) the presence of toxic materials (such as pesticides) in the Delta; (b) an overall reduction in the abundance of the zooplankton that are the food of the Delta smelt; (c) introduction and propagation of invasive species including the Asian Overbite Clam, Corbula (a filter feeder which feeds on some of the same zooplankton that the Delta smelt feeds on); [Tr. 98:22-99:14; 104:16-105:2; 299:16-301:18; 1015:8-17; 1016-1017], another fresh water clam, Corbicula, may also have an adverse impact on food supply; [Tr. 149:11-22; 196:8-17]; the invasive Inland Silverside may prey upon larval Delta smelt. [Tr. 533:20-25]; (d) other unscreened agricultural diversions in the Delta; [Tr. 618:3; 803:17-23; 1005:8-17]; (e) power plant diversions, including for consumptive use and for cooling water that affect turbidity, [Tr. 618:4, 803:17-23]; and (f) modifications to the hydrology of the San Joaquin-Sacramento Delta and Estuary. [Tr. 151:3-9; 299:23-25; 534:6-14; 617:22-618:6; 628:9-19; 701:3-12; 803:17-23].

6. Scientists believe that the decline of the Delta smelt is caused in part by the operations of the CVP and SWP (as well as other water diversions within the Delta) because each Project’s operations result in the direct entrainment of Delta smelt at the CVP and SWP export facilities (the Pumps) which they do not survive. [Tr. 82:11-12; 338:19; 628:1-6]. The Projects’

operations cause changes in the hydrology of the Delta that adversely affect the Delta smelt. [Tr. 84:6-8; 628:9-12; 73:4-16; 299:16-301:18; 618:24-618:26; Pl. Ex. 13 at p. 21-29; DWR Ex. D ¶2].

7. The full effects of these factors on the Delta smelt, however, are not fully understood, and there is scientific uncertainty regarding the relative magnitude of the effects. [Tr. 52:3-20; 244:14-19; 303:25-304:3; 819:23-820:5]. In addition, despite research efforts, there is still scientific uncertainty regarding the cause of the recent, serious decline of the Delta smelt, which continues to not be fully understood. [Tr. 805:2-8].

8. A preponderance of the evidence supports the conclusion that the Delta smelt is presently being adversely affected by several environmental factors, including the operations of the CVP and SWP. [Tr. 1682:25-1683:2]. The evidence does not establish that there is a single efficient proximate cause that is solely responsible for the decline of the Delta smelt. [Tr. 1682:14-24].

B. <u>BIOLOGY, LIFE STAGES, AND MOVEMENT OF THE DELTA SMELT</u>

9. The Delta smelt begins its life cycle as an egg. [Tr. 67:21-25]. Most Delta smelt are spawned, as eggs, in the northern Delta, although they are widely distributed throughout the Delta. [Tr. 67:21-25]. Smelt hatch between March and May. [Tr. 312:22-313:7]. After hatching, the larvae of the Delta smelt are carried downstream by rivers and tides, to the confluence of the Sacramento and San Joaquin Rivers and beyond,

often as far as Suisun Bay. [Tr. 67:25-68:6; 312:22-313:7]. The Delta smelt spend 6 to 9 months downstream of the Delta, and then gradually begin to migrate upstream again for spawning. [Tr. 68:7-9; 70:6-8; 313:5-7].

10. Even when larval Delta smelt are not detected in surveys or at the CVP and SWP export facility, their presence may be inferred from other factors. [DWR Ex. D ¶5]. The most successful Delta smelt spawning occurs when water temperatures are in the range of 12°C to 18°C. [DWR Ex. D ¶5]. When water temperatures in the Delta have risen to 12°C, the presence of larval Delta smelt may be inferred. [Tr. 396:2-5; DWR Ex. D ¶5]. In addition, the presence of "spent" Delta smelt females in surveys also indicates that spawning has occurred. [Tr. 396:1-2].

C. <u>STATUS OF THE DELTA SMELT</u>

11. The threatened Delta smelt "is undisputedly in jeopardy as to survival and recovery." [SJ Order at 119:2-3]. Experts in fish biology testified that the Delta smelt is in jeopardy. Plaintiffs' experts Dr. Peter B. Moyle and Dr. Christina Swanson, Federal Defendants' expert Ms. Cay Collette Goude, and Defendant Intervenor State Water Contractor's expert Dr. Charles H. Hanson, all agree that the species is in a critical state at present. [Tr. 72:19-73:1; 85:11-14; 266:16-269:17; 270:6-271:10; 613:23-614:3; 617:18-21; 622:14-623:4; 889:20-890:11; 945:3-10]. San Luis' expert, Dr. Miller, agreed.

12. Population abundance indices have been at record low levels for the past three years. [Tr. 270:25-271:10]. Some

experts opined that the species' condition is so precarious that it could become extinct within the year. [Tr. 802:17-23; 1031:5-1032:13].

13. Dr. Miller's 2002 work opining the Delta smelt species had recovered, was substantially criticized by peers. He was accused of using selective data to achieve result-oriented opinions. Dr. Miller offered the absolutely unsupportable and erroneous opinion that within the last five years the Delta smelt species had "recovered."

14. The studies Dr. Miller submitted and the opinions provided in his declarations are unduly limited, do not consider the real life ramifications of conditions in the Delta, and the actual condition of the Delta smelt.

15. On the witness stand, Dr. Miller admitted the critical decline in the species and that it is on the verge of extinction. Dr. Miller now acknowledges that major actions have to be taken. He opined that an immediate food supply study needed to be conducted. He further opined that more than one refuge population should be established to attempt to save the species. The locations of these preserves would be designed to protect against single-event catastrophic elimination of the species.

16. The Court does not find Dr. Miller's opinions on the species persuasive or reliable.

17. The critical habitat of the Delta smelt includes the Sacramento-San Joaquin Delta waters at the confluence of those rivers, as they approach San Francisco Bay, including the Central and Northwest portions of the Delta.

18. The evidence is undisputable that the CVP, operated by

the Bureau and the SWP operated by DWR, cause the entrainment and salvage of unknown numbers of Delta smelt through the operation of their respective pumping facilities located in the south Delta pursuant to operations conducted under the 2004 Operations Criteria and Plan ("OCAP"). [Tr. 82:6-84:5; 694:24-695:3]. The number of Delta smelt killed at the pumping facilities is unknown in part because smelt smaller than 20mm in length are not counted and samples of fish larger than 20mm counted in existing surveys are limited. [Tr. 84:24-85:6; 85:19-25; 340:20-341:25; 342:22-343:4; 695:9-20; 696:22-25].

19. Pumping kills Delta smelt by sucking them directly into the pumps; by drawing them into fish "salvage" facilities which collect fish diverted from entering the pumps, a process that kills the smelt; and drawing smelt into the SWP's Clifton Court Forebay from which the fish cannot escape and where they will die even if they are not drawn into the salvage facilities or the pumps. [Tr. 86:11-22; 87:16-25; 337:3-341:11; 628:22-629:6; 1147:18-1148:4]. These losses result from the combination of the Delta smelt's natural migrations up and down the Delta during the smelt's annual life cycle and flow conditions within the Central and South Delta caused in part by the operation of the CVP and SWP pumps. [Tr. 84:6-18]. Pumping-induced negative flows not only pull smelt to the pumps, where they are either killed by the pumps or by the salvage process, the smelt are also drawn into unfavorable habitat where they and their offspring do not survive. [Tr. 82:10-84:20; 95:7-96:3; 97:18-24; 317:10-20; 628:1-6; 631:7-15].

20. The Projects' (CVP and SWP) operations are one of the

causes of the Delta smelt's decline. [Tr. 82:6-9; 103:12-16; 104:10-13; 244:16-245:1; 299:16-22; 303:17-24; 354:21-356:6; 617:22-618:3; 685:5-10; 695:4-8; 766:22-767:1; 941:16-21].

21. Delta smelt are more likely to be entrained at the Projects' pumping facilities when smelt are in the general vicinity of those facilities (for example in the Central or South Delta). [Tr. 631:11-15; DWR Ex. D ¶6]. Delta smelt face less risk of entrainment at the Projects' pumping facilities when they are farther away from those facilities. [Tr. 631:7-10].

D. SURVEYS AND MONITORING FOR DELTA SMELT

22. Scientists rely on surveys conducted in the Delta to monitor the abundance of the Delta smelt. [Pl. Ex. 11 ¶3]. Those surveys include the Summer Townet, Fall Midwater Trawl, Spring Kodiak Trawl, and 20-Millimeter surveys (collectively "surveys"). [Pl. Ex. 11 ¶3]. The results of these Surveys are critical to assessing the status of the Delta smelt. [Tr. 73:23-74:8; 297:14-21; 651:15-18].

23. The operators of the CVP and SWP export facilities also monitor for Delta smelt that are entrained in the pumps at those facilities (known as "salvage"). [Tr. 629:7-13]. They do so by taking samples at regular intervals during their operations and counting the number of Delta smelt larger than 20mm found in those samples. [Tr. 629:7-13]. They then estimate the total number of Delta smelt entrained in the pumps by multiplying the number found in the samples by an "expansion" factor. Delta smelt do not survive the salvage or entrainment process. [Tr. 86:11-22; 87:16-25; 337:3-341:11; 628:22-629:6].

24. It is disputed whether the surveys described above and the monitoring conducted at the CVP and SWP export facilities are insufficient in light of the current low abundance of the Delta smelt. [Tr. 1576:18-22].

E. DATA INADEQUACIES.

25. All parties agree that there is no firm and reliable total population estimate for the Delta smelt and there never has been.

26. No scientist was able to explain how, despite the marshaling of federal, state and private resources, over ten testifying experts presented in this case, and over ten years of study, what is necessary and how long it will take to produce a reliable total population estimate for Delta smelt.

27. Sampling data goes back over twenty-five years. The data is presented in the form of indices. Regression analyses are performed, which produce population "trends."

28. It is unfeasible and imprudent to delay further "study" and gathering of information, since studies have been intensively conducted for the past twelve years. Additionally, the information gathering and analysis process concerning the existence, survival, recovery, and viability of the smelt population has redoubled since the filing of this lawsuit and over 1,500 pages of scientific and engineering analysis of water Projects' operations, water costs, physical resource costs, monetary costs, and other burdens that will be required by the granting of interim protection, were presented for this remedies hearing.

F. MONITORING FREQUENCY

29. At their present lower levels of abundance, an increase in the frequency of the monitoring at the CVP and SWP export facilities will help to ensure that Delta smelt are detected when they are present. [Pl. Ex. 11 ¶34]. Currently, the monitoring programs at the CVP and SWP export facilities only detect Delta smelt that are 20mm in length or larger. Expanding these monitoring programs to detect Delta smelt smaller than 20mm in length will help to confirm the presence of Delta smelt larvae at the export facilities although their presence may also be inferred from other factors. [Tr. 387:21-24; 427:16-18; 431:23-423:2].

30. Reclamation and DWR will be required to overcome certain technical obstacles to detect Delta smelt between 5mm and 20mm in length at the CVP and SWP export facilities including the acquisition of new equipment to conduct this monitoring and the training of personnel to distinguish between Delta smelt larvae and the larvae of other fish species. [Tr. 653:17-656:12]. It appears fine mesh nets may need to be acquired for this purpose.

31. It is feasible to implement a monitoring program to protect larval Delta smelt. [Tr. 1686:16-22]. The need for larval monitoring was demonstrated by the testimony of Dr. Peter Moyle, who testified that large numbers of larval smelt may be taken at the Projects' pumps to reduce the smelt population significantly, especially when, as now, smelt numbers are critically low. [Tr. 82:20-83:1; 85:4-14]. Dr. Swanson explained that, "given the new science which suggests that, in fact, one of the more important impacts of water project

operations may be lethal entrainment of those very small life history stages, I felt it was essential that monitoring for those life stages of Delta smelt at the facilities be implemented." [Tr. 386:23-387:3].

32. Reclamation currently monitors for Delta smelt at the CVP pumping facilities only approximately 8% of the time. [Tr. 385:23-386:1]. More frequent monitoring at regular intervals to detect the presence of Delta smelt will help to gauge more accurately the abundance of smelt near the CVP pumps and the numbers of smelt taken at those facilities. [Pl. Ex. 11 ¶34; Tr. 386:2-15].

G. PROPOSED INCREASED MONITORING

33. Plaintiffs Recommended Interim Remedial Action Numbers 2 and 3 respectively propose an increase in frequency of sampling for entrainment of fish at the CVP pumping facilities to a minimum of 25% of the time at intervals evenly spaced throughout the day. [Pl. Ex. 4 Appendix]. Remedial Action #3 proposes monitoring for larval Delta smelt (less than 20mm in length) in the vicinity of the CVP and SWP pumping facilities a minimum of 4 times a day, evenly spaced through each 24-hour period, during early winter to late spring. [Pl. Ex. 4 Appendix]. That monitoring action is proposed to begin when Delta smelt spawning begins as indicated by (1) spring Kodiak survey data on the maturation stage of the Delta smelt or the presence of spent females in the survey or salvage samples; (2) when water temperatures reach 12°C at any Delta monitoring station; or (3) when larval Delta smelt are detected in the 20mm Survey or at the

CVP or SWP fish salvage facilities, whichever comes first. Plaintiffs propose the action would end June 15, or a minimum of five days after the last detection of larval or juvenile Delta smelt at either the CVP or SWP facilities, whichever comes last. This monitoring shall cease on June 15 or a minimum of five (5) days after the last detection of larval and juvenile Delta smelt at either the CVP or SWP protective facilities by either the salvage or larval monitoring program, whichever comes last.

34. Remedial action #2 would commence when (1) there is an increase in Sacramento River flow at Freeport at 25,000 cfs; or (2) there is an increase in San Joaquin River outflow by greater than 10% over 3 days; or (3) Fall Midwater Trawl or Spring Kodiak survey data indicate that Delta smelt are moving upstream of the Sacramento-San Joaquin Confluence and into the Delta; or (4) by January 15, whichever occurs first. Plaintiffs propose the action would end June 15, or a minimum of five days after the last detection of larval or juvenile Delta smelt at either of the CVP area facilities, whichever comes last. [Tr. 1686:7-14, 21-22]. Plaintiffs propose the action would end June 15, or a minimum of five days after the last detection of larval or juvenile Delta smelt at either the CVP or SWP facilities, whichever comes last. This monitoring shall cease on June 15 or a minimum of five (5) days after the last detection of larval and juvenile Delta smelt at either the CVP or SWP protective facilities by either the salvage or larval monitoring program, whichever comes last.

35. Dr. Swanson provided two reasons for increased monitoring: (1) the salvage sampling program at the CVP is less

efficient than the SWP sampling program; and (2) the Delta smelt population abundance is currently so low there is a risk of error by infrequent sampling, which misses fish that are actually there by only sampling for a very limited period of time. [Tr. 386:4-12; 385:23-386:1 (documenting existing sampling frequencies at the CVP facilities)]. Dr. Moyle opined that more frequent sampling at the federal pumping facility is essential. [Tr. 82:15-19]. Ms. Goude testified in support of this proposed increased sampling: "There is a concern that some of the surveys are not as robust because of the low numbers of smelt" and "I think [Plaintiff's action 2] would be useful." [Tr. 651:2-24; 652:11].

H. NEGATIVE FLOWS ON OLD AND MIDDLE RIVERS AND ENTRAINMENT EFFECTS

36. The Old and Middle Rivers ("OMR") are tributaries of the San Joaquin River that flow through the South Delta and pass by the Project's pumping facilities. OMR flows are strongly influenced by inflows from the San Joaquin River and by the magnitude of water diversions at the Projects' pumping facilities. [Tr. 491:23-491:15; 316:18-25; Fed. Def. Ex. ¶4; Pl. Ex. 11 ¶9 n.1.]. These flows are also influenced by tides, the operation of the Head of Old River Barrier and certain agricultural barriers in the South Delta and other water diversions in the South Delta. [Tr. 492:7-9; 631:16-632:5; Fed. Def. Ex. 1 ¶4; Fed. Def. Ex. 4 ¶12]. When OMR flows are upstream, when the flow is in the direction of the Project's pumping facilities (and away from the Confluence of the

Sacramento and San Joaquin Rivers), such flows are commonly described as "negative" or "reverse." [DWR Ex. D ¶4]. Export pumping at the CVP and SWP facilities to south of Delta users, cause flows to be negative on the OMR. Plaintiffs' expert opined the pumps' operations are the chief cause of this impact. [Tr. 84:14-18].

37. Delta smelt are poor swimmers and, when negative flows on the OMR are high, Delta smelt located in the Central and Southern Delta may be captured by those flows and drawn toward the CVP and SWP export facilities, where they are entrained. [Tr. 337:3-11; 351:25-352:5; Pl. Ex. 11 ¶28]. High negative flows on the OMR may increase the risk that Delta smelt will be entrained at the CVP and SWP export facilities. [Tr. 630:18-22; DWR Ex. D ¶4].

38. Scientists have demonstrated an approximately linear relationship between negative flows on the OMR and the number of Delta smelt entrained at the CVP and SWP export facilities (although the exact levels of entrainment also depend on other factors, such as the abundance of the Delta smelt). [Tr. 483:14-15; 727:18-22; DWR Ex. D ¶4, Ex. 1; Pl. Ex. 11 (Fig. 7), at 12]. As the average combined flows on the OMR become more negative, the number of Delta smelt within the zone of confluence of the Projects entrained at the CVP and SWP export facilities increases. [Tr. 566:17-567:2]. The data on the exact mathematical relationship between negative flows and the number of Delta smelt entrained is limited. [Tr. 348:11-16; 406:8-15; 566:20-22]. From available data it also appears that the number of Delta smelt entrained at the CVP and SWP export facilities

begins to rise significantly when negative flows on the OMR exceed approximately -5,000 cfs. [Tr. 641:14-642:5; 725:16-17; DWR Ex. D ¶4; DWR Ex. G ¶34; SWC Ex. N].

39. Dr. Miller, the San Luis Intervenors' expert's testimony on 2002 smelt abundance figures have been materially questioned in the scientific peer community and the Court finds Dr. Miller's analysis to be unpersuasive. The statistical analysis by Dr. Miller does not prove his opinion that the projects have insignificant influence on the abundance of Delta smelt.

40. Negative OMR flows are lessened by reducing diversions at the Projects' pumping facilities, by increasing releases to the San Joaquin River from the CVP facilities upstream, or by a combination of these. Under certain conditions (including dry conditions, when inflows to the San Joaquin River are low), even stopping all diversions at the CVP and SWP export facilities may not be sufficient to eliminate negative OMR flows. [Tr. 1555:18-23; 1566:11-22]. In such a case, the negative OMR flows can only be eliminated by releasing additional water to the San Joaquin River or by asking other diverters in the South Delta to curtail pumping. [Tr. 1567:4-19]. There is no evidence that any Defendant or Intervenor in this case has any control over other South Delta diverters.

41. Flows on the OMR are strongly influenced by inflows from the San Joaquin River and the magnitude of diversions at the CVP and SWP export facilities. [Tr. 491:23-492:15; 316:18-25; Fed. Def. Ex. 1 ¶4; Pl. Ex. 11 ¶9 n.1]. Negative flows on the OMR may be reduced by reducing diversions at the CVP and SWP

export facilities or by increasing releases to the San Joaquin River from the CVP facilities upstream (or by a combination of such reductions in releases).

I. PROPOSED OMR FLOW RESTRICTIONS TO REDUCE ENTRAINMENT

42. Scientists have concluded that the number of Delta smelt entrained at the Projects' pumping facilities often increases after a winter "pulse flow," i.e., when the combined winter flows on the Sacramento and San Joaquin Rivers increase to about 30,000 cfs, and the Delta smelt begin to move upstream to spawn and pass through the Central Delta, within the hydrological influence of the Projects' pumps. [DWR Ex. D ¶3; Tr. 368:23-369:8]. Scientists hypothesize that the movement of the Delta smelt may be triggered by the increased turbidity that results from these winter pulse flow events. Turbidity is a useful indicator of the subsequent entrainment of adult Delta smelt. [DWR Ex. D ¶3]. A restriction on negative OMR flows during a winter pulse flow event is expected to help to minimize the movement of Delta smelt into the South Delta and thus result in a distribution of the Delta smelt population that reduces the risk of entrainment at the Projects' pumping facilities. [DWR Ex. D ¶3]. FWS's witness, Ms. Goude, testified that a restriction limiting negative OMR flows to -2,000 cfs during a winter pulse flow event is expected to be protective of the Delta smelt. [Tr. 638:24-639:15; 720:12-14]. Ms. Goude further testified that such a restriction is not necessary during a wet year when high water flows would themselves move the Delta smelt away from the influence of the pumps. [Tr. 639:24-640:13].

43. After a winter pulse flow event, and in those years when no pulse flow occurs, further restrictions on negative OMR flows during the winter are expected to minimize the number of pre-spawning adult Delta smelt entrained at the Projects' pumping facilities and to reduce spawning in the South Delta (where larval Delta smelt are more likely to be entrained at the Projects' pumping facilities). [DWR Ex. 4 ¶4; Tr. 638:20-23].

44. During the spring and early summer, larval and juvenile smelt again pass through the Central Delta, within the hydrological influence of the Projects' pumps, as they move downstream to their rearing areas, beyond the Confluence of the Sacramento and San Joaquin Rivers and in Suisun Bay. [DWR Ex. ¶6]. Scientific studies suggest that smelt have benefitted from pumping curtailments implemented under the Vernalis Adaptive Management Plan ("VAMP") from mid-April to mid-May of each year. [Tr. 304:22-305:11]. Restrictions on negative OMR flows during the spring and early summer are expected to minimize the entrainment of larval and juvenile Delta smelt at the CVP and SWP export facilities. [Tr. 389:2-9; 390:15-20; 391:5-10; 391:22-392:3; 395:9-20; 641:16-19; DWR Ex. D ¶¶5, 6; Pl. Ex. 11 ¶35]. Such restrictions also help to facilitate the movement of larval and juvenile Delta smelt downstream. [Tr. 395:13-20].

45. In general, Delta smelt face a greater risk of entrainment at CVP and SWP facilities when they are located near those facilities (for example, in the Central or Southern Delta) than when they are located farther away (such as when they are in the Suisun Bay). [Tr. 631:7-10; 631:11-15; 642:22-23; DWR Ex. D ¶6]. For that reason, it is appropriate to identify specific

target flow for the OMR (within a certain range) at the time when the restriction is to come into effect, based on the best scientific data available at that time, including, but not limited to, survey results, salvage information, results of the "particle tracking model" developed by the DWR, and information on the actual hydrology occurring at the time, which also affects smelt movements.

46. The Delta is a dynamic aquatic environment and flows on the OMR may be affected by the tides and unpredictable natural factors such as high winds, rain events, storm surge, and other meteorological conditions. [Tr. 1494:6-1496:6; Fed. Def. Ex. 2 ¶41; DWR Ex. G ¶33]. Some variability in flows on the OMR cannot be avoided, and to allow for that variability, any restriction on those flows should be expressed as a seven-day running average. There is conflict in the testimony regarding the value of use of a shorter averaging period. [Tr. 1499:5-18; 1500:3-19; DWR Ex. J ¶¶30, 32].

J. RESTRICTIONS ON INSTALLATION OF BARRIERS IN DELTA

47. The Head of Old River Barrier, when installed, directs flows on the San Joaquin River away from the Old River into the Central Delta. [DWR Ex. D ¶8]. The purpose of the Head of Old River Barrier is to benefit migrating salmon. [Tr. 134:3-12]. This measure tends to increase negative OMR flows which may increase the risk that Delta smelt will be entrained at the Projects' pumping facilities. [Tr. 134:3-12; 400:14-18; 649:7-16; DWR Ex. D ¶8]. A restriction prohibiting the installation of the head of Old River Barrier until June 15 will allow the San

Joaquin River to contribute to more positive OMR flows and minimize the risk that Delta smelt will be entrained at the Projects' pumping facilities. [Tr. 402:20-23; 408:25-409:7; Pl. Ex. 4 Appendix]. The Barrier diverts salmon away from the pumps; it does not improve flows for them. [Tr. 134:3-12].

48. There are agricultural barriers that when in operation, retain more water in the South Delta (to facilitate agricultural diversions) by using "flap gates." [DWR Ex. D ¶8]. The flap gates allow water to pass through the barriers on the incoming tide, but prevent it from draining away when the tide ebbs. [DWR Ex. D ¶8]. In this way, these barriers also tend to increase negative OMR flows. A restriction requiring the flap gates on these agricultural barriers to be tied open will allow this water to contribute to more positive OMR flows. [DWR Ex. D ¶8]. Plaintiffs' proposed actions 8 and 9 prohibiting the installation of these agricultural barriers until the end of the VAMP measure as prescribed in the Interim Remedial Order.

K. <u>FALL ACTIONS</u>

49. Plaintiffs' proposed fall action to maintain Delta outflow at a minimum of 7,500 cfs or maintain X-2 (or as a fourteen day running average at downstream of 80km, whichever requires less fresh water outflow was not supported by a preponderance of the evidence because: (1) not supported by peer-reviewed analysis; (2) the Delta Smelt Working Group declined to support similar actions put before them; and (3) there is material uncertainty among scientists about the benefit of this action for the Delta smelt in the face of its requirement of a

large commitment of water to users in times of summer heat. [Tr. 1691:19-1692:11].

49. The significant quantity of water that would be required for proposed fall actions, approaching 500,000 acre feet ("AF") in an average water year, in light of the scientific dispute and other scientists' rejection of such a plan; the scientific uncertainty; and the low risk reward benefit analysis does not justify imposition of a fall remedial measure.

L. OTHER NEGATIVE EFFECTS ON DELTA SMELT

51. The evidence preponderates to show that the Projects' operations adversely modify the Delta smelt's designated critical habitat, the South and Central Delta waters, by rendering the designated habitat in the South Delta unsafe to use for spawning or migration because of the risk of pumping entrainment at different times to all life stages of the species. [Tr. 89:11-90:11; 94:6-95:3; 589:11-591:8; 686:4-10]. The South Delta represents roughly one-third of the Delta smelt's critical habitat. [Tr. 589:21-25; 591:5-8].

52. The full range of causes of the Delta smelt's current record low population abundance and the relative roles various causes have played in the species are not fully understood. [Tr. 73:4-16; 299:16-300:1; 301:1-18; 303:25-304:3; 617:22-618:6]. However, substantial evidence proves by more than a preponderance that Delta smelt mortality is caused by the Projects' operations. The evidence does not establish that the primary cause of the Delta smelt's decline is lack of adequate food supply, a position advanced by Dr. William J. Miller. [Tr. 1682:3-17].

53. Additional causes, not directly effectuated by CVP and SWP operations, include, but are not limited to, toxicity resulting from pesticides and other toxics in the species' habitat; invasive predatory species, including the Asian Overbite Clam; actions of other diverters in the Delta; and reduction of the food supply of the species, are contributing to its decline.

M. INADEQUACY OF TAKE LIMITS

54. The 2005 BiOp identifies limits on the number of Delta smelt that may be taken at the CVP and SWP export facilities before consultation with FWS must be reinitiated under the ESA. The existing take limits are unrealistically high and may approach the current population numbers of the species as a whole. [Tr. 776:2-777:19; 1213:16-1215:22; 1679:15-18]. The incidental take limits set in the 2005 BiOp are arbitrary and capricious because, in setting those limits based on historical take, FWS did not take into account the most recent uncontested data about record-low Delta smelt abundance. [SJ Order at 92:19-93:1; Tr. 358:4-359:4]. The even higher incidental take limits set in the out-dated 1995 BiOp on the Projects' operations may exceed the species' current population. [Tr. 633:12-644:12; 777:2-3; 1679:15-18].

55. The take limits set out in the 2005 BiOp are significantly more restrictive (allowing the taking of fewer Delta smelt) than the take limits that were identified in the previous biological opinion (issued in 1995). [Tr. 777:10-19]. The latter-issued take limits are not sufficient by themselves in the absence of interim and injunctive relief, to protect the

Delta smelt.

N. INADEQUACY OF DSRAM PROCESS TO MITIGATE EFFECTS OF PROJECTS' OPERATIONS

56. The BiOp attempted to remediate the Projects' negative impacts to the jeopardized Delta smelt through the implementation of the DSRAM, a mitigation process that is the central remedial plan for the 2005 BiOp. [Tr. 1681:14-21]. The DSRAM process has been found arbitrary and capricious because it did not provide the reasonable certainty required by the ESA that necessary mitigation measures will be implemented, nor the reasonable assurance the ESA requires that OCAP operations will not jeopardize the Delta smelt nor adversely modify its critical habitat. [SL Order at 58:12-59:4].

57. Ronald Milligan, manager of Reclamation's CVP Office, testified that the Delta smelt has declined in population abundance in recent years, despite the agency's use of the DSRAM in the last several years attempting to address the Projects' impacts on the species. [Tr. 1559:9-1560:6]. The Water Operations Management Team ("WOMT") which includes representatives from Reclamation and DWR, has declined at times although presented with incontrovertible evidence, to take actions to protect the smelt, that were recommended pursuant to the DSRAM by the Delta Smelt Working Group ("DSWG"), a team of Delta smelt scientists from the Project agencies and the Wildlife Protection Agencies. [Tr. 1552:21-1554:21; 1557:8-23]. Reclamation's and DWR's reliance on the DSRAM process has been unsuccessful, as demonstrated by the record low population

abundance indices for the Delta smelt in the past three years. [Tr. 270:25-271:10; 273:24-274:2; 1581:4-1580:2].

O. <u>OTHER MEASURES NECESSARY FOR FEDERAL DEFENDANTS' TO TAKE PENDING THE NEW BIOP</u>

58. Federal Defendants in their opening brief on injunctive relief identified measures that they committed to implement, as necessary to prevent an irreversible or irretrievable commitment of resources under ESA Section 7(d) pending completion of a new biological opinion. [Fed. Def. Brief, Doc. 396 at pp. 19-20]. Federal Defendants committed, as of July 9, 2007, that:

1) The Bureau will not execute any long-term water service contracts with CVP contractors until the new BiOp is completed;

2) The Bureau will not implement construction activities and long-term projects in the Delta until the new BiOp is completed, including the South Delta Improvement Project, the Delta Mendota Canal/California Aqueduct Intertie Program, the Lower American River Flow Standards, and the Long Term Environmental Water Account;

3) The Bureau will "not increase exports from the South Delta and will operate Jones Pumping Plant within recent historic limits;" and

4) The Bureau committed resources and staff to the continuing study of pelagic organism decline in the Delta.

59. These measures shall be implemented during the reconsultation period as Federal Defendants admit the measures are necessary to preserve the Delta smelt and its critical

habitat.

P. PUBLIC HEALTH, SAFETY AND THE HUMAN ENVIRONMENT

60. Plaintiffs' proposed restrictions on the operations of the CVP and SWP have the ability to deleteriously affect public health, safety, and the human environment in many ways. The Court recognizes it has limited ability to control the impact of its ruling under ESA jurisprudence, particularly economic impacts. Plaintiffs proposed an exception to the implementation of interim injunctive relief and remedial actions where such requirements would threaten public health and safety. The Plaintiffs propose that this limitation be defined by Reclamation's "M&I Shortage Policy," which provides that a public health and safety problem exists "when there is a severely low water supply with the sharing of water supplies for purposes of interior residential, sanitation and fire protection."

61. Although the ESA does not expressly recognize an exception for human health and safety, Plaintiffs have offered and it is prudent to apply a human health and safety exception as part of the relief granted in this case. Risks that will be created by implementation of the interim remedial actions to be imposed, include, but are not limited to:

a. Adverse impacts affecting deliveries of water necessary for water service districts, emergency water supplies, municipal water supplies, and industrial power and related energy sources;

b. Adverse effects on agriculture including, but not limited to, loss of jobs, increased groundwater pumping, fallowed land, and land subsidence.

c. Air pollution resulting from heavier reliance on groundwater pumping and decrease in surface irrigation; and

d. Damage to the structural integrity of CVP or SWP facilities including reservoirs or dams, causing, for example, significant damage to the earthen walls of the San Luis Reservoir, if that reservoir is drawn down too rapidly.

[Tr. 1412:24-1413:3; 1414:6-17; 1414:1-5; 1482:15-1483:2].

62. Diversions from CVP and SWP export facilities are also necessary to meet health and safety demands of certain contractors on the upper reach of the Delta-Mendota Canal, where such contractors have few or no alternative sources of water. [Fed. Def. Ex. 4 ¶5].

III. CONCLUSIONS OF LAW

A. JURISDICTION

1. Jurisdiction in this case exists under 28 U.S.C. § 1331 (Federal Question); 16 U.S.C. § 1536 et seq. (the ESA); and 5 U.S.C. § 702 et seq. (the Administrative Procedure Act).

2. All other Defendant-Intervenors have voluntarily submitted themselves to the Court's jurisdiction by intervening and fully participating in the litigation. The DWR, by its intervention and full participation throughout the pleading phase, dispositive motion proceedings, temporary restraining order proceedings, evidentiary hearing on remedies and by presenting evidence, proposing interim remedies, and providing oral and written arguments as well as additional written legal authorities on the merits of all issues, claims and remedies,

that address DWR's joint operation with Reclamation of the CVP and SWP, have waived any jurisdictional objection to the imposition of the interim remedial orders on the DWR. DWR and other parties have reserved the right to address motions to the issues of jurisdiction and efficacy of the most recent supplements to Plaintiffs' complaint.

3. On August 30, 2007, Plaintiffs' motion to supplement their complaint was granted adding claims that Reclamation violated §7(a)(2) of the Endangered Species Act, 16 U.S.C. § 1536(a)(2). The supplemental complaint claims that Reclamation's and DWR's operation of the CVP and SWP is causing decline in the smelt population and threatens extinction of the species and is causing adverse effects on the Delta smelt's designated critical habitat.

4. Defendant Intervenors reserve the right to challenge the Court's jurisdiction over the new ESA claim. Plaintiffs assert a further claim for violation of §7(d) for irretrievable or irreversible commitments of resources during §7 consultation.

5. The summary judgment proceedings and evidentiary hearing were conducted with full participation of DWR (the State of California, and the State Water Contractors, who offered evidence, legal briefing and argument). This conduct also amounts to judicial estoppel against DWR and SWC. The principles of Fed. R. Civ. P. 15(b) apply to permit amendment of pleadings, if necessary, to conform to the proof offered by DWR and the SWC.

6. The Federal Defendants, by initiating reconsultation, have acknowledged the invalidity of the 2005 BiOp. They have,

pursuant to Court direction, proposed interim remedial measures. The Federal Defendants have agreed to implement stand-by measures that will prevent the irreversible or irretrievable commitment of resources pending completion of a lawful biological opinion. These commitments are listed at Finding of Fact 57., p. 24:15-25:5, and are incorporated into the accompanying Interim Remedial Order.

B. Judicial Non-Intervention

7. The Court will not substitute its judgment for that of any administrative agency. The Court lacks the expertise or background in fish biology, hydrology, hydraulic engineering, water project operations, and related scientific and technical disciplines that are essential to determining how the State and Federal Water Projects should be operated to protect and benefit the public and the species.

C. IMPERILED STATUS OF SPECIES

8. There is general agreement among the biologists and environmental experts who testified as to the current critical condition of the Delta smelt, which is at a historic low and could go extinct within one year, with or without all proposed remedial measures. There is considerable difference of expert opinion as to whether and what remedial proposals are biologically necessary in the interim pending completion of a lawful biological opinion, which are all reasonably supported by available scientific data and information.

9. Jarry Johns, DWR's Deputy Director who is also a member

of the Water Operations Management Team, has testified before a Congressional Oversight Committee: "It is DFG's position that actions must be taken to protect as many individual smelt as can be through manipulation of the water projects. Each reproducing organism is important to the survival of the species."

10. Mr. Johns' declaration ¶ 58 explains: The "dramatic drop in juvenile smelt was a great concern to DFG and USFWS this year and highlighted their concern about any further impacts to the reduced population this year."

11. The Delta Smelt Working Group recognized in spring of 2007 that the Delta smelt was "critically imperiled" and that the Projects should seek to achieve "no further entrainment of Delta smelt." Swanson Dec. ¶ 16.

12. The evidence clearly establishes by more than a preponderance that the condition of the Delta smelt has worsened in recent years and that the species is currently in a critical state. Some experts have opined that there may be no way to prevent the extinction of the species. There is a dispute whether the operations of the CVP and SWP export facilities are the principal cause of the decline in the Delta smelt or whether other factors beyond the control of the Projects are the principal cause. Nonetheless, there is no dispute that Project operations are taking Delta smelt through entrainment, salvage, and alteration of Delta hydrology, principally reversal of natural flows.

13. Under the doctrine of concurrent causes, the impact from Project operations is at least a concurrent cause which jeopardizes the existence of the Delta smelt and endangers its

survival and its critical habitat, which necessitates remedial action. The Court is under a legal and equitable duty to formulate remedial action.

14. The interim remedial order has taken into account all evidence and opinions provided by the multitude of experts who have testified about the scientific issues and made the remedial proposals. This is legally justified by the ESA requirement that the best scientific and commercial data available be brought to bear on the issues presented.

15. Continued operation of the Projects' pumps in the interim period without imposition of a remedial order would not provide the necessary level of protection to prevent further risk to the survival of the Delta smelt.

16. The interim remedial order must be and is based upon the best scientific and commercial data presented by the parties over an extended evidentiary hearing and in extensive written submissions, after oral argument. The interim remedial order is narrowly tailored to impose burdens no greater than reasonably necessary to comply with the ESA. *Nat'l Wildlife Fed'n v. NMFS*, 422 F.3d 782, 799-800 (9th Cir. 2005).

17. A Plaintiff must still demonstrate a likelihood of success on the merits as well as "reasonable likelihood" of irreparable harm for ESA injunctive relief. *National Wildlife Fed'n v. Burlington Northern R.R.*, 23 F.3d 1508, 1511 (9th Cir. 1994); *Nat'l Wildlife Fed. v. Nat'l Marine Fisheries Serv.*, 442 F.3d 782, 793-94 (9th Cir. 2005).

18. The extinction of a species and adverse effect on its critical habitat constitute irreparable injury.

19. The Plaintiffs have prevailed in this action to the extent that the BiOp under which Reclamation and DWR are operating the CVP and SWP, the DSRAM, and Incidental Take Limits are unlawful.

20. The evidence described in the Findings of Fact establishes by a preponderance of the evidence that the current operations of the CVP and SWP could result "in irreparable harm" by imminently threatening the continued existence of the Delta smelt and adversely modifying its designated critical habitat.

D. <u>STANDARDS FOR APA INJUNCTIVE RELIEF</u>

21. Agency decisions are reviewed under the Administrative Procedure Act, 5 U.S.C. § 706(2)(A) and should be set aside only if the decision is arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law. *Sierra Club v. Marsh*, 816 F.2d 1376, 1384 (9th Cir. 1987). To prove an APA violation, the Plaintiff must show irreparable harm or a balance of hardships tipping in the Plaintiff's favor. For a NEPA claim, a Plaintiff is required to make a traditional showing for injunctive relief. Establishing a procedural violation of NEPA does not compel the issuance of a preliminary injunction. *Fund Animals v. Lujan*, 962 F.2d 1391, 1400 (9th Cir. 1992).

22. "Environmental injury, by its nature, can seldom be adequately remedied by money damages and is often permanent or at least of long duration, i.e., irreparable. If such injury is sufficiently likely, therefore, the balance of harms will usually favor the issuance of an injunction to protect the environment." *Amoco Prod. Co. v. Village of Gambell, AK*, 480 U.S. 531, 545

(1987). Here, all experts agree that the status of the Delta smelt species is critical and the species could be extinct within one year. Experts have also testified that the species could go extinct with or without any action by the parties.

23. Injunctive relief is intended to be the least intrusive and is not intended to limit the lawful exercise of Agency discretion, competence, and expertise to operate the Projects in compliance with APA and ESA requirements.

E. ESA INJUNCTIVE RELIEF REQUIREMENTS

24. ESA Section 7(a)(2) prohibits agency action that is "likely to jeopardize the continued existence of any listed species or to result in the destruction or adverse modification of its critical habitat. 16 U.S.C. § 1536(a)(2).

25. Agency regulations interpret § 7(a)(2) to prohibit any agency action "that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild." 50 C.F.R. § 402.02; *National Wildlife Federation v. National Marine Fisheries Service*, 481 F.3d 1224, 1235 (9th Cir. 2007).

26. *Gifford Pinchot Task Force v. United States Fish & Wildlife Service*, 378 F.3d 1059, 1070 (9th Cir. 2004), requires that recovery as well as survival impacts be considered in evaluating adverse modification of critical habitat. Here, the critical habitat for the Delta smelt is the Sacramento-San Joaquin Delta, confluence of the Sacramento and San Joaquin Rivers as they approach the San Francisco Bay, and the tributary system that is contiguous to the North and Central Delta areas

where the smelt spawn and through which the species moves to the Suisun Bay where the species remains until the spawning season.

27. The Endangered Species Act mandates that federal agencies take no action that will result in "destruction or adverse modification" of designated critical habitat. 16 U.S.C. § 1536(a)(2). "Destruction or adverse modification" is defined as follows:

> A direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining habitat to be critical.

50 C.F.R. § 402.02.

F. <u>ESA Injunctive Relief Jurisprudence</u>.

28. The remedy for an ESA substantial procedural violation, i.e., a violation that is not technical or de minimis, is an injunction pending compliance with the ESA. *Washington Toxics Coalition v. EPA*, 413 F.3d 1024, 1034 (9th Cir. 2005).

29. After initiation of consultation required under § 7(a)(2) of the ESA, the Federal agency shall not make any irreversible or irretrievable commitment of resources with respect to the agency action which has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures which would not violate § 7(a)(2). *Washington Toxics*, 413 F.3d at 1034. ESA consultation was reinitiated on the OCAP BiOp July 6, 2006.

30. Section 7(d) of the ESA was enacted to ensure the status quo is maintained during the consultation process to

prevent agencies from sinking resources into a project to ensure its completion regardless of impacts on endangered species. *Pac. Rivers Council v. Thomas*, 936 F.Supp. 738, 745 (D. Idaho 1996). Non-jeopardizing agency actions may continue during the ESA consultation process. *Sierra Club v. Marsh*, 816 F.2d 1376, 1389.

31. In *TVA v. Hill*, 437 U.S. 153, 173, 193-95, 98 S.Ct. 2279, 2291, 2301-02 (1978), the Supreme Court held that Congress explicitly foreclosed a court's exercise of traditional equitable discretion when faced with a violation of § 7 of the ESA. *Sierra Club v. Marsh*, 816 F.2d 1376, 1383 (9th Cir. 1987). The obligation of Federal agencies is to "ensure that any action . . . is not likely to jeopardize the continued existence of any endangered species." Section 7(a)(2). "Congress has spoken in the plainest of words, making it abundantly clear that the balance has been struck in favor of affording endangered species the highest of priorities, thereby adopting a policy which it described as 'institutionalized caution.'" *Sierra Club*, 816 F.2d at 1383.

32. In *TVA v. Hill*, where the threat to the snail darter resulted in injunctive relief against operation of the 100 million dollar Tennessee Valley Authority Dam, the Supreme Court stated: "Our individual appraisal of the wisdom or unwisdom of a particular course consciously selected by the Congress is to be put aside in the process of interpreting a statute. Once the meaning of enactment is discerned and its constitutionality determined, judicial process comes to an end." *TVA*, 437 U.S. at 194-195. Having determined an irreconcilable conflict between CVP and SWP operations and the explicit provisions of § 7 of the

Endangered Species Act to fashion a remedy, the words of the Supreme Court provide guidance:

> **"Our system of government is, after all, a tripartite one, with each branch having certain defined functions delegated to it by the Constitution. While "[i]t is emphatically the province and duty of the judicial department to say what the law is," *Marbury v. Madison*, 1 Cranch 137, 177, 2 L.Ed. 60 (1803), it is equally - and emphatically - the exclusive province of the Congress not only to formulate legislative policies and mandate programs and projects, but also to establish their relative priority for the Nation. Once Congress, exercising its delegated powers, has decided the order of priorities in a given area, it is for the Executive to administer the laws and for the courts to enforce them when enforcement is sought."**
>
> **Here, we are urged to view the Endangered Species Act "reasonably," and hence, shape a remedy "that accords with some modicum of common sense and the public weal." *Post*, at 302. But is that our function? We have no expert knowledge on the subject of endangered species, much less do we have a mandate from the People to strike a balance of equities on the side of the Teleco Dam. Congress has spoken in the plainest of words, making it abundantly clear that the balancing has been struck in favor of affording endangered species the highest of priorities, thereby adopting a policy which it describes as "institutionalized caution."**

33. "In our Constitutional system, the commitment to the separation of powers is too fundamental for us to preempt Congressional action by judicially decreeing what accords with common sense and the public weal." Our Constitution vests such responsibilities in the political branches. *TVA v. Hill*, 437 U.S. at 195.

34. The language, history and structure of the ESA indicates beyond doubt that Congress intended "endangered species be afforded the highest of priorities." *TVA v. Hill*, 437 U.S. at 174. "In Congress's view, projects that jeopardized the continued existence of endangered species threatened incalculable

harm: accordingly, it decided that the balance of hardships in the public interest tip heavily in favor of endangered species." *TVA v. Hill*, at 187-88, 194-95; *Sierra Club v. Marsh*, 816 F.2d at 1383; *Biodiversity Legal Foundation v. Badgley*, 309 F.3d 1116, 1177 (9th Cir. 2002). The Ninth Circuit has said, "We may not use equities' scales to strike a different balance." *Sierra Club v. Marsh*, 816 F.2d at 1383. In the context of the ESA, "Congress [has] foreclosed the exercise of the usual discretion possessed by a court of equity." *Amoco Prod. Co. v. Village of Gambell, Alaska*, 480 U.S. 531, 543 n.9, 544-45, 107 S.Ct. 1396 (1987), cited in *Biodiversity Legal Foundation*, 309 F.3d at 1178.

G. EVIDENCE OF ESA VIOLATIONS

35. Direct evidence has established that CVP and SWP pumping and water conveyance operations cause flows in the Old and Middle Sacramento Rivers and easterly of the confluence of the Sacramento and San Joaquin Rivers to flow in opposite directions, which confuses the smelt and causes the fish to be entrained or salvaged at the pumps. Evidence further establishes that export operations from the pumps caused a reduction of flows through the Central Delta westward from the confluence of the Sacramento and San Joaquin Rivers into the Suisun Bay which affects the salinity of the water.

36. D-1641 establishes salinity standards applicable February through June as a establish a benchmark for the isohaline referred to as X2, salinity measured as two parts per thousand, prescribing that X2 be maintained at not more than two parts per thousand at a point a certain number of kilometers from

the Golden Gate Bridge and eastward. Evidence has shown that the smelt's tolerance to water salinity declines substantially above the four to five parts per thousand level. Increases in exports from the Bay Delta through the pumps southward cause increasing salinity in the Bay Delta waters and estuary by virtue of lowered volumes of fresh water after export. Only one expert, Dr. Miller, disagreed and his trial opinions ignored that water temperature, water quality, salinity, turbidity, and Project operations, have a direct effect on survival and recovery of the Delta smelt. For reasons stated above, the Court does not find Dr. Miller's analysis sufficiently credible and relevant to cast doubt that Project operations are an actual cause of the decline and potential extinction to the Delta smelt species.

37. Section 7(d) of the ESA prohibits an agency from making any irreversible and irretrievable commitment of resources that would foreclose the formulation or implementation of any reasonable and prudent alternative measures to avoid jeopardy to a listed species or adverse modification of its critical habitat pending completion of a valid biological opinion. 16 U.S.C. § 1536(d).

38. The Delta smelt is listed as a threatened species. 58 Fed. Reg. 12,863 (Mar. 5, 1993).

39. The ESA implementation regulations provide that Section 7(a)(2)'s "no jeopardy" requirement prohibits any Federal agency action "that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." 50

C.F.R. § 402.02.

40. The ESA implementation regulations define Section 7(a)(2)'s requirement that prohibits actions that would destroy or adversely modify the listed species' critical habitat: "*Destructive or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species.*" 50 C.F.R. § 402.02 (emphasis in original).

41. The Ninth Circuit rule is that an action that "adversely modifies" a listed species' critical habitat is one that would "threaten a species' recovery even if there remains sufficient critical habitat for the species' survival." *Gifford Pinchot Task Force v. U.S. Fish & Wildlife Service*, 378 F.3d 1059, 1070 (9th Cir. 2004).

42. Operations of the CVP and SWP under the existing OCAP, among other causes, are both increasing risk to the survival and recovery of the Delta smelt and adversely modifying its critical habitat.

43. The Court's Summary Judgment Order found that the 2005 BiOp that covers day-to-day coordinated operations of the CVP and the SWP was unlawful, arbitrary, and capricious. [SJ Order at 118:10-119:27].

44. The DSRAM measures adopted as part of the 2005 BiOp and the take limit have been found insufficient to satisfy ESA requirements. [SJ Order at 58:12-59:4; 92:19-93:1].

45. The existing take limits without remedial measures will not prevent the risk of extinction of the species within the period of time a new lawful biological opinion can be completed.

Any injunctive relief should be narrowly tailored to remedy the specific ESA violation. *Nat'l Wildlife Fed'n v. NMFS*, 2005 U.S. Dist. LEXIS 39509, Op. at 8 (D. Or. 2005), aff'd, 481 F.3d 1224 (9th Cir. 2007).

46. To comply with ESA Sections 7(a)(2) there is no requirement that Reclamation or FWS pick the best alternative or the one that would most effectively protect the Delta smelt from jeopardy. *Southwest Center for Biological Diversity v. Bureau of Reclamation*, 143 F.3d 515, 523, fn.5 (9th Cir. 1998). However, it is not required that an inflexible flow regime be imposed that will expel precious, scarce water resources that will flow out to the Pacific Ocean and cannot be recovered.

47. Because evidence overwhelmingly establishes that Project operations are a cause of the decline of the species, Project operations must be addressed as mandated by the law to protect against extinction of the species and adverse modification of its habitat.

H. Authority for Remand

48. The District Court has broad latitude in fashioning equitable relief when necessary to remedy an established wrong. *NWF v. NMFS*, 481 F.3d at 1242, citing *Alaska Ctr. for the Envt. v. Browner*, 20 F.3d 981, 986 (9th Cir. 1994).

49. Requirements of regular status reports during a remand are permissible. *NWF v. NMFS*, 481 F.3d at 1242; *Telecomms. Research & Action Ctr. v. FCC*, 750 F.2d 70, 81 (D.C. Cir. 1984). A status report shall be produced by FWS.

50. The District Court has the discretionary authority to

impose a deadline for remand proceedings. *Nat'l Org. of Veterans' Advocates v. Sec'y of Veterans' Affairs*, 260 F.3d 1365, 1381 (Fed. Cir. 2001); *NWF v. NMFS*, 481 F.3d at 1242. A deadline for the remand shall be imposed.

51. A court has the power to direct efforts that ensure that the agency complies with the ESA's mandate that agencies "use the best scientific and commercial data available" in their decision-making. 16 U.S.C. § 1536(a)(2). Monitoring will be increased as described in the remedies order.

I. <u>Congressional Intent</u>

52. The plain intent of Congress in enacting the Endangered Species Act was to halt and reverse the trend toward species' extinction, whatever the cost. *TVA*, 437 U.S. at 184. Section 7 reveals an explicit Congressional decision "to require agencies to afford first priority to the declared national policy of saving endangered species." *TVA* at 185. As the Court in *TVA* expressly stated:

> One might dispute the applicability of these examples to the Teleco Dam by saying that in this case the burden on the public through the loss of millions of unrecoverable dollars would greatly outweigh the loss of the Snail Darter. But neither the Endangered Species Act nor Article III of the Constitution provides Federal Courts with authority to make such fine utilitarian calculations.

53. On the contrary, the plain language of the Act, buttressed by its legislative history shows clearly that Congress viewed the value of endangered species as "incalculable." Quite obviously, it would be difficult for a court to balance the loss of a sum certain, even $100 million, against a Congressionally

declared "incalculable" value, even assuming we had the power to engage in such a weighing process, which we emphatically do not." *TVA* 437 U.S. at 187-188. As the Supreme Court requires, it is not for the Court to substitute its judgment for that of Congress or the Executive Branch, the Department of the Interior, and the Bureau of Reclamation. The Court has no such scientific competence nor the legal authority. Once the actions of an administrative agency in operating the CVP and a voluntarily appearing State Agency in operating the SWP, violate the ESA by endangering the species to the point where, as the undisputed evidence shows, it is critically imperiled and in imminent threat of extinction, the Court cannot balance hardships nor does it have any discretion, except to apply the mandate of Congress prescribed by the ESA.

54. It is Congress that struck the balance in favor of affording endangered species the highest of priorities. It is up to the political branches of government, not the court, to solve the dilemma and dislocation created by the required application of the law.

J. NARROWLY TAILORED RELIEF

55. A court may make narrowly tailored orders to an agency to take specific steps, subject to the overriding principal that the substance and manner of achieving ESA compliance is ultimately the responsibility and within the jurisdiction of the administrative agencies, subject to the Court's equitable and interstitial role to fashion a remedy for agencies' dereliction of their statutory duties. *NWF v. NMFS*, 481 F.3d at 1243; *FPC v.*

Transcontinental Gas Pipeline Corp., 423 U.S. 326, 333, 96 S.Ct. 579 (1976).

K. Adequacy of Remedy.

56. Any interim remedial prescriptions must (1) not cause jeopardy, i.e., not take action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species. 50 C.F.R. § 402.02; to the Delta smelt; (2) adversely modify its critical habitat; or (3) irreversibly or irretrievably commit resources during the pendency of the reconsultation on and issuance of the BiOp.

L. PUBLIC HEALTH AND SAFETY EXCEPTION

57. It is recognized that any interim remedial order has the potential to create risk to human health and safety. This requires that a discretionary exception be included in the interim remedial order that authorizes and grants discretion to the Federal and State agencies having responsibility for operation of the Projects, to take such measures, in good faith, as are reasonably necessary and appropriate for protection of human health and safety and the environment in accordance with the requirements of law and equity.

58. This exception includes, but is not limited to, supply for emergency water services, and industrial water service for domestic and emergency use.

59. Plaintiffs have expressly offered and recognize that

any reduction in water deliveries should be effectuated in accordance with the operating Agencies' standard practice for allocating water during shortages, which recognizes the priority of critical municipal and industrial (M&I) uses.

60. Critical human health and safety needs will receive priority protection. The Plaintiffs have offered and the Court specifically authorizes the Bureau and DWR to implement operational measures different from those required to protect Delta smelt for the purpose of meeting public health and safety needs. The Bureau and DWR have similar definitions of "public health and safety" for water supply delivery and priority of use, including but not limited to, interior residential use, sanitation, and fire protection.

M. LIMITS ON COURT'S AUTHORITY

61. The Court recognizes its own limitations in approaching the scientific and technical issues presented, some of which are fraught with uncertainty. The Court lacks the expertise and authority to take over operation of the Projects, or to supervise or second-guess the decisions of the biological, and other expert staff of the USFWS and DWR and the hydrologists and engineers of the Bureau of Reclamation. It is appropriate for the Court to defer to the expertise of the Projects' operators and Federal Defendants in highly technical operational issues as they concern protection of human health and safety and the environment. The court's role is limited to see that compliance with the requirements of law is achieved.

N. STATUS REPORT AND DEADLINE

62. FWS shall provide the court and parties with a status report on the progress of the biological opinion. FWS's status report shall be filed April 30, 2008.

63. FWS shall complete its consultation and issue its new biological opinion on or before September 12, 2008.

IV. CONCLUSION

To the extent any finding of Fact may be interpreted as a Conclusion of Law or the converse, it is so intended. Based upon these Findings of Fact and Conclusions of Law, the accompanying Interim Remedial Order shall issue.

IT IS SO ORDERED.

Dated: December 14, 2007 **/s/ Oliver W. Wanger**
UNITED STATES DISTRICT JUDGE

June 28, 2007

L. Ryan Broddrick
Director
California Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, California 95814

Steve P. Thompson
Manager, California-Nevada Operations
U.S. Fish & Wildlife Service
2800 Cottage Way, Room W2606
Sacramento, California 95825

Re: Impacts of In-Delta Diversions and Other Factors on Protected Delta Smelt and Its Critical Habitat

Dear Messrs. Broddrick and Thompson:

This letter is written to you on behalf of the State Water Contractors ("State Contractors") and the San Luis & Delta-Mendota Water Authority ("Authority"). The State Contractors are comprised of 27 public agencies located throughout California that hold contracts for water from the California State Water Project ("SWP"). Collectively, these agencies provide much needed water to about two-thirds of California's population and to about 750,000 acres of its most productive farmland.Similarly, the Authority consists of 32 member public agencies, each of which holds a contract for a supply of Central Valley Project ("CVP") water. The Authority's member agencies supply CVP water to approximately 1,200,000 acres of highly productive agricultural lands within the western San Joaquin Valley, San Benito County, and Santa Clara County. The Authority's member agencies also supply CVP water for municipal and industrial uses, including to the Silicon Valley, and to waterfowl and wildlife habitat in the San Joaquin Valley.

It is no secret that the SWP and the CVP are facing unprecedented challenges as pelagic species issues continue to unfold in the San Francisco Bay/Sacramento-San Joaquin Delta, especially as those issues pertain to the delta smelt. Both the SWP and the CVP recently operated at greatly reduced pumping levels and were limited, for a short period, to exporting only enough water to satisfy the health and safety needs of the hundreds of thousands of people reliant upon the SWP and CVP upstream of San Luis Reservoir. During these unprecedented pumping cutbacks, other SWP and CVP water municipal water users and thousands of acres of agricultural lands relied principally on water previously stored at San Luis Reservoir. Those supplies may not be available in the future—particularly if the SWP and CVP pumps continue to be the only focus of your agencies' efforts to deal with the decline of pelagic species.

Surveys of adult smelt population abundance undertaken in January and February 2007 showed levels somewhat higher than the prior year's surveys. However, surveys of juvenile smelt in April and May of this year showed that the juvenile population abundance had declined precipitously compared to prior years. Based upon the 20 mm surveys of juvenile smelt conducted by DFG through June, the estimate of juvenile smelt abundance is about 10% of the equivalent population in 2006 – a drop of 90 % in one year. This decline of juvenile smelt occurred in spite of intensive water management actions intended to move smelt to spawning sites in the vicinity of the Sacramento River. The one-year decline also occurred at a time when the take of delta smelt at the CVP and SWP export pumps was minimal – only 60 smelt were taken during the entire period from May 2006 to April 2007. Since April, the total salvage of juvenile smelt at both Projects has been less than 1,500 fish. These numbers strongly indicate that stressors *other* than the SWP and CVP are the probable cause of the most recent smelt decline. The best evidence suggests, in fact, that nearly an entire year class of delta smelt were killed in the northern Delta in the past year from toxic runoff, unmonitored in-Delta diversions or other factors.

The State Contractors and the Authority share the interests and concerns of the California Department of Fish and Game ("DFG") and the U.S. Fish & Wildlife Service ("FWS") in getting to the bottom of the causes of the smelt decline. We believe the health and well being of all Californians, as well as the health of the smelt, require that the cause of the smelt decline be ascertained as expeditiously as possible. To this end, the State Contractors and the Authority believe it to be imperative that your agencies take the necessary steps to better understand the role of other stressors in the decline of pelagic species throughout the Delta. The impact of these other stressors on the survival of the delta smelt should be at the forefront of this effort.

Recently, the Director of the California Department of Water Resources, Lester Snow, urged action by all responsible parties and agencies to address the non-SWP/CVP related issues of toxics, invasive species, and other Delta diversions that adversely affect delta smelt and their critical habitat. (DWR Press Release, June 8, 2007.) The State Contractors and the Authority support this call to action. More than ever before, it is time to acknowledge that factors *other than* SWP and CVP operations are impacting the smelt population. The experience of Winter 2006-07 showed that controlling export operations, while effective in moving adult smelt to areas of the delta away from direct export impacts, did not protect these fish from other apparently overwhelmingly adverse factors outside the control of the CVP and SWP. A more holistic approach is needed to provide meaningful protection for delta smelt and other pelagic fish species in the Delta. Simply taking the easy path of turning the knob tighter on the pumping plants of the SWP and CVP, which are already the subject of intense scrutiny by the state and federal courts and fishery agencies, is not the answer.[1]

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[1] See, e.g., *Natural Resources Defense Council v. Kempthorne, et al.*, United States District Court for the Eastern District of California Case No. 1:05-CV-01207; *Pacific Coast Federation of Fishermen's Association v. Gutierrez, et al.*, United States District Court for the Eastern District of California Case No. 1:05-CV-1207; *Watershed Enforcers v. California Department of Water Resources, et al.*, Alameda County Superior Court Case No. RG06292124 [California Appellate Court, First Appellate District Case Nos. A11750, A11715]; *Watershed Enforcers v. Broddrick, et al.*, Alameda County Superior Court Case No. RG07326290. Under its current schedule, the United States District Court will hear argument in the case of *Natural Resources Defense Counsel v. Kempthorne, et.al.*, Case No. 1:05-CV-01207, on August 21, 2007 regarding proposed interim operations of the

Instead, the State Contractors and the Authority urge you and your agencies to undertake the monitoring, analysis and corrective action regarding other stressors that is needed to bring the smelt back to health. The State Contractors and the Authority believe the best available science supports the conclusion that the decline of pelagic species in the Sacramento-San Joaquin River Delta, including the delta smelt, is due in significant part to toxic point and non-point discharges from lands within the Delta, to in-Delta diversions unrelated to the SWP and CVP, and to imported exotic species and predation by competitive species such as striped, small mouth and large mouth bass which, until recently, were considered by your agencies as "indicator species" of Delta health. The State Contractors and the Authority submit that your agencies have done little to determine the sources and impacts of *any* of these other stressors. As part of the State Water Resources Control Board D-1641 process, it was recognized that non-Project diversions in the Delta number in the *thousands.* At times, they collectively divert Delta water at a level equivalent to the CVP's Jones Pumping Plant. Remarkably, however, nearly all of these diversions are unscreened. What efforts have been undertaken for comprehensive monitoring to determine the take of pelagic species by in-Delta diverters other than the SWP and CVP? What evaluations are there on in-delta diversions effects upon smelt habitat? By contrast, the salvage impacts of SWP and CVP operations on delta smelt are the subject of microscopic concern, even though the low levels of salvage attributable to the SWP and CVP in 2006 and early 2007 played a minor role in the overall decline in smelt population. The State Contractors and the Authority believe there is an absolute legal obligation for your agencies to undertake an investigation of these numerous, unscreened non-Project diversions .

Earlier this month, the SWP and CVP significantly limited their use of Delta facilities to convey water through the Delta. This is an event that is unprecedented in the several decades of SWP and CVP operations. Meanwhile, other non-SWP/CVP, in-Delta diversions continue unchecked, irrespective of whether they are screened and irrespective of their effect on flows in Old and Middle rivers or other Delta channels of importance to pelagic species. Operating the SWP and CVP at minimum levels while others in the Delta continue to divert without limitation and without regard to the needs of pelagic species is fundamentally inconsistent with the concept of reasonable use and with the obligation that all water users endure some inconvenience or incur reasonable expense to make the water resources of the State available for the increasing needs of *all* the people. It is also contrary to the take prohibitions of the federal and state Endangered Species Acts that your agencies are statutorily directed to enforce.

The State Contractors, the Authority, and many others throughout the State, are looking to DFG and FWS for much needed leadership at this critical time in our State's history. The focus on your agencies is likely to become much more intense as the full impact of curtailing

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SWP and CVP pending completion of re-consultation with FWS pursuant to Section 7 of the federal Endangered Species Act concerning the delta smelt and its critical habitat. The argument will allow the court to determine whether the SWP and CVP operations proposed by DWR and the Bureau of Reclamation pending re-consultation are sufficient to prevent SWP and CVP operations from jeopardizing the continued existence of delta smelt.

SWP and CVP operations reaches more and more areas of the State. While the State Contractors and the Authority understand that ensuring the protection of delta smelt and other protected species from in-Delta diversions and discharges is going to require extensive efforts over the long-term, we believe your agencies have the legal obligation to undertake these efforts. The State Contractors and the Authority also believe there is useful information that can be provided and key steps that can be taken by your agencies in the immediate term. The State Contractors and the Authority thus request that DFG and FWS publish or otherwise make available the documentation, monitoring data, and other relevant information your agencies have pertaining to the take of delta smelt incident to non-Project, in-Delta diversions. To the extent such data have not been collected or are not otherwise available to your agencies, we request DFG and FWS to immediately implement a monitoring and reporting program to allow the collection of such information so that the effects these diversions have on delta smelt and their habitat can be shown more precisely.

The State Contractors and the Authority also request that DFG and FWS publish or otherwise make available the documentation, monitoring data and other relevant information you have pertaining to the impact of toxic, in-Delta discharges on delta smelt. Again, to the extent these data have not been collected or are not otherwise available to your agencies, the State Contractors and the Authority request DFG and FWS to immediately implement a monitoring and reporting program to collect such information so that it is possible to determine more precisely the sources of these discharges and the effects they are having on delta smelt and their habitat. Not only are these data crucial to species survival and recovery, they will serve as a baseline for fishery resource management in the Delta.

Finally, and particularly in light of the most current information regarding declines in delta smelt abundance, the State Contractors and the Authority request that DFG and FWS exercise their jurisdiction to ensure that *all* non-Project, in-Delta diversions and discharges resulting in the take of delta smelt are carried out in full compliance with the California and federal Endangered Species Acts.

The State Contractors and the Authority look forward to working with you in these important matters. Should you have any questions or concerns with regard to the foregoing, we remain available to meet with you to discuss them, and how the actions would proceed.

Sincerely,

Terry Erlewine
General Manager
State Water Contractors

Daniel Nelson
Executive Director
San Luis & Delta-Mendota Water Authority

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RVPUB\734380.1

Banks Daily Salvage of Delta Smelt in December and January Related to River Flows and Other Variables

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Introduction

This report describes an investigation into the extent to which daily salvage numbers of delta smelt can be predicted at the Banks Pumping Plant in December and January based on flow and other variables measured in the Sacramento-San Joaquin Delta. It represents an extension of work reported earlier (Manly, 2007a, 2007b, 2007c), where in each of these reports the estimated abundance of delta smelt on November 1 is also used as an explanatory variable.

Here more variables than before are considered, where these variables are defined in the next section of this report. A change has also been made in the dependent variables used. Before the salvage numbers were related to flow and other variables measured on the same day as the salvage and to moving averages of variable values up to and including the values on the day of salvage. However, in the current report the salvage numbers on a day are estimated using the values of the explanatory variables up to and including the day before the salvage day. For example, to estimate the salvage numbers on day i the explanatory variables measured on day i - 1 are used when there is no averaging, while if there is 14 day averaging then the explanatory variables are averaged for 14 days up to and including day i - 1 are used.

It turns out that making this change to the dependent variable so that salvage numbers are predicted in advance does not reduce the prediction ability. If equations are fitted using values of the explanatory variables up to and including the salvage day, with days with any missing data values removed, then the best fitting model accounts for 82.95% of the variation in Banks salvage numbers, and on average all the models considered account for 70.74% of the variation. By comparison, if the values of the explanatory variables are used only up to the day before the salvage day then the best fitting model accounts for 84.45% of the variation in Banks salvage numbers, and on average all the models considered account for 71.42% of the variation. Apparently, therefore, it is better not to use the explanatory variable values on the salvage day to predict the salvage.

The Variables

The variables considered for the prediction of daily salvage numbers in December and January are as described in Table 1 below. For use with model fitting each of these variables other than LnNov1 were standardized to have a mean of zero and a standard deviation of one for all available daily data values for the period from January 1, 1991 to April 30, 2007. The standardization therefore involved replacing each observed value x by $x' = (x - \bar{x})/s$, where $\bar{x}$ is the mean and s is the standard deviation of x for this period. Table 2 gives a summary of the distributions of the variables for the full period.

Table 1. Variables considered as predictors of the daily salvage in December and January at the Banks Pumping Plant.

LnNov1	The natural logarithm of the November 1 abundance of preadult and adult delta smelt, as supplied by Rick Sitts on October 12, 2007.
COMRF	The combined old and middle river flow (cfs).
RIO	The flow of the Sacramento River at Rio Vista (cfs) from the DAYFLOW database.
SJR	The flow of the San Joaquin River at Vernalis (cfs) from the DAYFLOW database.
XGEO	The Delta Cross Channel and Georgiana Slough flow estimate (cfs) from the DAYFLOW database.
CCET	The Clifton Court Forebay entrance turbidity (NTU) as supplied by Rick Sitts on November 9, 2007.
CCETM	The Clifton Court forebay entrance turbidity (NTU) as supplied by Rick Sitts on November 9, 2007, but measured three days before CCET.
WEST	The San Joaquin flow estimate (cfs) at Jersey Point from the DAYFLOW database.
SSDSac	The suspended sediment load (tons/day) for the Sacramento River, as supplied by Rick Sitts on October 24, 2007.
SSDSJ	The suspended sediment load (tons/day) for the San Joaquin River, as supplied by Rick Sitts on October 24, 2007.

Table 2. Summary of the distributions of the river flow and related variables being considered for the period from January 1, 1991 to April 30, 2007 (O & M = Old and Middle, Sac = Sacramento, SJ = San Joaquin).

	Combined O & M River Flows COMRF	Sac River at Rio Vista Flow RIO	SJ River flow at Vernalis SJR	From DAYFLOW XGEO	Clifton Court Turbidity CCET	Turbidity 3 Days Earlier CCETM	From DAYFLOW WEST	Suspended Sediment Load Sac River SSDSac	Suspended Sediment Load SJ River SSDSJ
n	5660	5752	5752	5752	4880	4877	5752	5752	5752
Mean	-4086.8	23982.7	4643.2	6106.7	17.7	17.7	4456.5	5494.4	995.0
SD	5321.9	36408.4	6185.6	2428.2	27.6	27.6	11560.0	10347.9	1647.3
Min	-27079	674	390	1406	1	1	-35068	35	16
Max	30146	495492	54300	15858	690	690	97377	122000	45600

The daily salvage numbers at both the Banks and Jones Pumping Plants appear to be related to all of the variables, with the highest values for salvage occurring with middle values of lnNov1 and XGEO, and with low values of COMRF, RIO, SJR, CCET, CCETM, WEST, SSDSac and SSDSJ (Figure 1).

Some of the variables are highly correlated, as shown in Table 3. The correlations increase with the amount of averaging done with the variables, with the number of correlations of 0.80 or more increasing from 5 out of 36 with no averaging up to 14 out of 36 with 14 day averaging. The high correlation between CCET and CCETM is of course particularly expected as a result of averaging as the values of CCETM are the same as the values of CCET three days later.

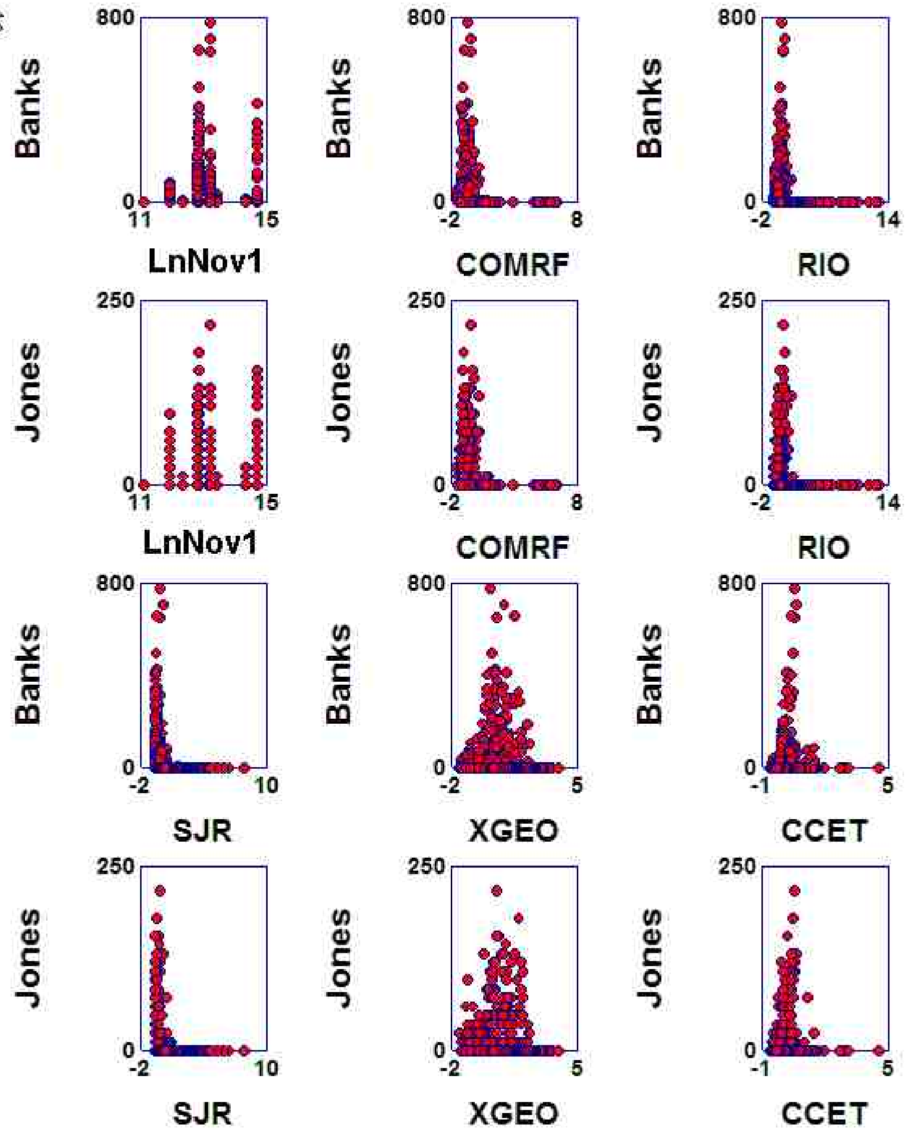

Figure 1 Banks and Jones daily salvage numbers plotted against LnNov1 and standardized values of the other variables defined in Table 1.

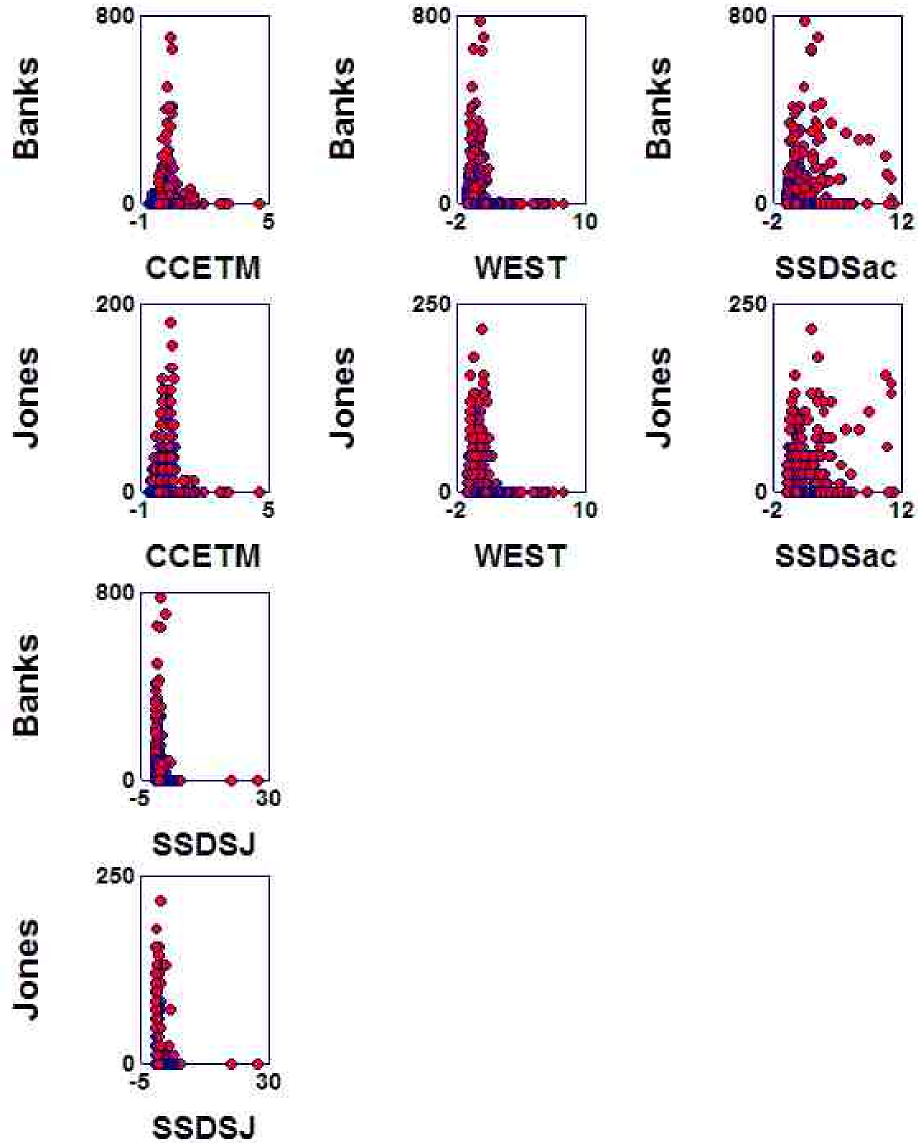

Figure 1, continued

Table 3. Correlations between variables with moving averages (MA) between 1 (no averaging) and 14 (averaging for 14 days). The number of high (0.80 or more) correlations is shown, with these high correlations in bold.

MA	High		COMRF	RIO	SJR	XGEO	CCET	CCETM	WEST	SSDSac	SSDSJ
1	5	COMRF	1.00								
		RIO	0.59	1.00							
		SJR	**0.87**	0.79	1.00						
		XGEO	0.55	0.72	0.69	1.00					
		CCET	0.57	0.64	0.74	0.54	1.00				
		CCETM	0.53	0.47	0.62	0.44	0.76	1.00			
		WEST	**0.85**	**0.82**	**0.92**	0.77	0.63	0.46	1.00		
		SSDSac	0.46	**0.81**	0.64	0.78	0.58	0.39	0.72	1.00	
		SSDSJ	0.50	0.75	0.76	0.56	0.57	0.34	0.71	0.70	1.00
2	6	COMRF	1.00								
		RIO	0.60	1.00							
		SJR	**0.87**	**0.80**	1.00						
		XGEO	0.56	0.73	0.69	1.00					
		CCET	0.58	0.65	0.75	0.55	1.00				
		CCETM	0.54	0.47	0.63	0.45	0.79	1.00			
		WEST	**0.85**	**0.82**	**0.92**	0.78	0.64	0.47	1.00		
		SSDSac	0.47	**0.82**	0.65	0.79	0.59	0.40	0.73	1.00	
		SSDSJ	0.52	0.79	0.78	0.60	0.62	0.36	0.74	0.73	1.00
3	10	COMRF	1.00								
		RIO	0.60	1.00							
		SJR	**0.88**	**0.81**	1.00						
		XGEO	0.56	0.73	0.69	1.00					
		CCET	0.58	0.66	0.75	0.56	1.00				
		CCETM	0.54	0.48	0.64	0.45	**0.82**	1.00			
		WEST	**0.86**	**0.82**	**0.93**	0.78	0.64	0.48	1.00		
		SSDSac	0.47	**0.82**	0.66	**0.80**	0.61	0.42	0.74	1.00	
		SSDSJ	0.55	**0.82**	**0.81**	0.63	0.66	0.39	0.78	0.76	1.00
4	11	COMRF	1.00								
		RIO	0.61	1.00							
		SJR	**0.88**	**0.81**	1.00						
		XGEO	0.56	0.74	0.70	1.00					
		CCET	0.57	0.67	0.75	0.56	1.00				
		CCETM	0.54	0.50	0.64	0.46	**0.85**	1.00			
		WEST	**0.86**	**0.83**	**0.93**	0.78	0.64	0.49	1.00		
		SSDSac	0.48	**0.83**	0.67	**0.82**	0.63	0.44	0.74	1.00	
		SSDSJ	0.57	**0.84**	**0.82**	0.65	0.69	0.42	**0.81**	0.77	1.00
5	11	COMRF	1.00								
		RIO	0.61	1.00							
		SJR	**0.88**	**0.82**	1.00						
		XGEO	0.56	0.75	0.70	1.00					
		CCET	0.57	0.68	0.75	0.57	1.00				
		CCETM	0.53	0.51	0.65	0.47	**0.88**	1.00			
		WEST	**0.86**	**0.83**	**0.93**	0.78	0.64	0.50	1.00		
		SSDSac	0.49	**0.84**	0.68	**0.83**	0.65	0.47	0.75	1.00	
		SSDSJ	0.58	**0.86**	**0.84**	0.67	0.70	0.45	**0.83**	0.78	1.00

Table 3, Continued.

MA	High		COMRF	RIO	SJR	XGEO	CCET	CCETM	WEST	SSDSac	SSDSJ
6	11	COMRF	1.00								
		RIO	0.62	1.00							
		SJR	**0.88**	**0.83**	1.00						
		XGEO	0.56	0.75	0.70	1.00					
		CCET	0.57	0.69	0.75	0.58	1.00				
		CCETM	0.53	0.52	0.66	0.48	**0.90**	1.00			
		WEST	**0.86**	**0.83**	**0.94**	0.79	0.64	0.51	1.00		
		SSDSac	0.50	**0.84**	0.68	**0.84**	0.66	0.49	0.75	1.00	
		SSDSJ	0.60	**0.87**	**0.85**	0.68	0.71	0.49	**0.84**	0.78	1.00
7	11	COMRF	1.00								
		RIO	0.62	1.00							
		SJR	**0.88**	**0.83**	1.00						
		XGEO	0.56	0.76	0.71	1.00					
		CCET	0.56	0.69	0.75	0.58	1.00				
		CCETM	0.53	0.54	0.66	0.48	**0.92**	1.00			
		WEST	**0.87**	**0.84**	**0.94**	0.79	0.64	0.52	1.00		
		SSDSac	0.50	**0.85**	0.69	**0.85**	0.67	0.51	0.75	1.00	
		SSDSJ	0.61	**0.88**	**0.86**	0.70	0.72	0.51	**0.85**	0.78	1.00
8	11	COMRF	1.00								
		RIO	0.63	1.00							
		SJR	**0.88**	**0.84**	1.00						
		XGEO	0.56	0.77	0.71	1.00					
		CCET	0.55	0.69	0.74	0.59	1.00				
		CCETM	0.53	0.56	0.67	0.49	**0.93**	1.00			
		WEST	**0.87**	**0.84**	**0.94**	0.79	0.64	0.53	1.00		
		SSDSac	0.50	**0.85**	0.70	**0.85**	0.68	0.53	0.75	1.00	
		SSDSJ	0.62	**0.88**	**0.87**	0.71	0.72	0.54	**0.86**	0.78	1.00
9	11	COMRF	1.00								
		RIO	0.63	1.00							
		SJR	**0.88**	**0.84**	1.00						
		XGEO	0.56	0.78	0.72	1.00					
		CCET	0.55	0.70	0.74	0.59	1.00				
		CCETM	0.53	0.57	0.67	0.50	**0.94**	1.00			
		WEST	**0.87**	**0.84**	**0.95**	0.79	0.64	0.54	1.00		
		SSDSac	0.51	**0.86**	0.70	**0.86**	0.68	0.55	0.76	1.00	
		SSDSJ	0.63	**0.88**	**0.87**	0.72	0.72	0.56	**0.86**	0.79	1.00
10	11	COMRF	1.00								
		RIO	0.64	1.00							
		SJR	**0.88**	**0.85**	1.00						
		XGEO	0.56	0.78	0.72	1.00					
		CCET	0.54	0.70	0.74	0.60	1.00				
		CCETM	0.52	0.58	0.67	0.50	**0.95**	1.00			
		WEST	**0.87**	**0.85**	**0.95**	0.79	0.64	0.55	1.00		
		SSDSac	0.51	**0.86**	0.71	**0.86**	0.69	0.57	0.76	1.00	
		SSDSJ	0.63	**0.88**	**0.88**	0.73	0.72	0.57	**0.87**	0.79	1.00

Table 3, Continued.

MA	High	COMRF	RIO	SJR	XGEO	CCET	CCETM	WEST	SSDSac	SSDSJ
11	11 COMRF	1.00								
	RIO	0.64	1.00							
	SJR	**0.88**	**0.85**	1.00						
	XGEO	0.56	0.79	0.72	1.00					
	CCET	0.54	0.70	0.74	0.60	1.00				
	CCETM	0.52	0.59	0.67	0.51	**0.96**	1.00			
	WEST	**0.87**	**0.85**	**0.95**	0.79	0.64	0.55	1.00		
	SSDSac	0.52	**0.87**	0.72	**0.87**	0.69	0.58	0.77	1.00	
	SSDSJ	0.64	**0.89**	**0.89**	0.73	0.72	0.58	**0.87**	0.79	1.00
12	12 COMRF	1.00								
	RIO	0.65	1.00							
	SJR	**0.88**	**0.86**	1.00						
	XGEO	0.56	0.79	0.73	1.00					
	CCET	0.53	0.70	0.73	0.60	1.00				
	CCETM	0.51	0.59	0.67	0.51	**0.96**	1.00			
	WEST	**0.88**	**0.86**	**0.95**	0.79	0.64	0.55	1.00		
	SSDSac	0.52	**0.87**	0.72	**0.87**	0.70	0.58	0.77	1.00	
	SSDSJ	0.65	**0.89**	**0.89**	0.74	0.72	0.59	**0.88**	**0.80**	1.00
13	14 COMRF	1.00								
	RIO	0.66	1.00							
	SJR	**0.88**	**0.86**	1.00						
	XGEO	0.56	**0.80**	0.73	1.00					
	CCET	0.53	0.70	0.73	0.61	1.00				
	CCETM	0.49	0.57	0.65	0.50	**0.96**	1.00			
	WEST	**0.88**	**0.86**	**0.95**	**0.80**	0.64	0.54	1.00		
	SSDSac	0.53	**0.88**	0.73	**0.87**	0.70	0.57	0.77	1.00	
	SSDSJ	0.65	**0.89**	**0.90**	0.75	0.72	0.58	**0.89**	**0.80**	1.00
14	14 COMRF	1.00								
	RIO	0.66	1.00							
	SJR	**0.88**	**0.87**	1.00						
	XGEO	0.56	**0.81**	0.74	1.00					
	CCET	0.52	0.69	0.72	0.61	1.00				
	CCETM	0.47	0.55	0.62	0.48	**0.95**	1.00			
	WEST	**0.88**	**0.87**	**0.96**	**0.80**	0.64	0.52	1.00		
	SSDSac	0.53	**0.88**	0.74	**0.87**	0.70	0.56	0.77	1.00	
	SSDSJ	0.66	**0.89**	**0.90**	0.75	0.72	0.56	**0.89**	**0.80**	1.00

Equations for the Prediction of Banks Salvage

A total of 392 equations were examined for the prediction of the Banks daily delta smelt salvage numbers in December and January. This consisted of 28 equations for each of the 14 averaging period from one day (no averaging) to 14 days averaging. All equations included the abundance variable LnNov1 and the combined Old and Middle River flow variable COMRF. The other eight variables RIO, SJR, XGEO, CCET, CCETM, WEST, SSDSac and SSDSJ were then considered two at a time for inclusion in the prediction equation. This gave 28 equations for each moving period as this is the number of combinations of eight variables taken two at a time.

All of the fitted equations had the daily Banks salvage numbers as the dependent variable, with the expected value of this variable assumed to take the form

$$E(\text{Salvage}) = \text{Exp}(\beta_0 + \beta_1\text{LnNov1} + \beta_2X_1 + \beta_3X_2 + \beta_4X_3 + \beta_5X_1^2 + \beta_6X_2^2 + \beta_7X_3^2 + \beta_8X_1X_2 + \beta_9X_1X_3 + \beta_{10}X_2X_3)$$

where X_1 denotes a moving average of standardized values of COMRF, X_2 denotes a moving average of one of the eight other variables, and X_3 denotes a moving average of another of the eight other variables. The argument of the exponential function is then a constant term, a measure of delta abundance for the water year being considered, and a general quadratic function of X_1, X_2 and X_3.

Only salvage days in December and January with values for all of the explanatory variables were considered for model fitting. This resulted in 589 daily observations of salvage to be accounted for by each of the 392 models considered. The models were estimated by the standard quasi-maximum likelihood method (McCullagh and Nelder, 1989) using a specially written computer program.

Appendix A shows the outcome of fitting the 392 models. The percentage of variation in daily salvage numbers accounted for is taken as the measure of the goodness of fit of a model, where this is actually the percentage of the model deviance accounted for, which is analogous the percentage of the total sum of squares accounted for with a standard multiple linear regression.

For each moving average period (MA = 1 to 14) the best fitting model is highlighted in Appendix A. This shows that with no averaging (predicting salvage from the variable values the day before the salvage day) the best model accounts for 73.57% of the variation in salvage numbers and uses the variables LnNov1, COMRF, SJR and CCETM, while with two day averaging (predicting salvage from the average values of variables one and two days before the salvage day) the best fitting model accounts for 75.20% of the variation in salvage numbers using the variables LnNov1, COMRF, XGEO and CCETMM.

The model using LnNov1, COMRF, XGEO and CCETMM remains the best with from three day to ten day averages, with the percentage of the variation in salvage numbers accounted for increasing from 76.28% to 81.19%. Then for 11 to 14 day averaging the equation using LnNov1, COMRF, RIO and SSDSac accounts for slightly more of the variation in salvage numbers, increasing from 82.02% with 11 day averaging to 84.45% with 14 day averaging.

Some of the coefficients of standardized variables that are shown in Appendix A are very large positive or negative values, particularly with the longest averaging periods for the explanatory variables. This is most likely due to the very large correlations between some of the standardized variables as shown in Table 3, i.e. to multicollinearity that makes the separation of the effects of different variables difficult.

Reduced Equations

In some cases it is possible to simplify equations by removing some of the terms in the equations, without changing the predictive ability of the equations very much. This was therefore investigated for the best fitting equation for each of the moving average periods. The approach used was to first remove any squared or product terms in the equation that are not significant at about the 5% level ($p < 0.07$), one by one. Linear terms were then removed if they were not significant or nearly significant and were not part of other significant terms. For example X_3 would not be removed if it was not significant but the effect of X_1X_3 was significant. Table 4 gives a summary of the results obtained when equations were simplified in this way. There are still some very large coefficients for the equations with high averaging of the explanatory variables.

Further Examination of the Best Fitting Model for Predicting Banks Salvage

The equation shown in Appendix A that gives the highest explained percentage of the variation in Banks daily salvage numbers involves the three variables COMRF (the combined Old and Middle River flow), RIO (the Sacramento River flow at Rio Vista) and SSDSac (the suspended sediment load for the Sacramento River). This accounts for 84.5% of the variation but has large coefficients associated with RIO, RIO^2 and RIO.SSDSac. Although there are these large coefficients the predicted salvage numbers for the equation appear to be quite reasonable, as shown in Figure 2.

Table 4. Estimates of regression coefficients (Est) with standard errors (SE) and significance levels (Sig) for full and reduced models, where the full models are the ones accounting for most variation for each moving average (MA) period. In some cases the model cannot be reduced. The percentage of the variation in salvage numbers accounted for is shown for all models.

		Full Model			%	Reduced Model			%
MA		Est	SE	Sig	Explained	Est	SE	Sig	Explained
1	Constant	1.677	1.119		73.6	1.808	1.092		73.6
	lnNov1	-0.069	0.080	0.387		-0.068	0.080	0.391	
	COMRF	-2.365	0.479	0.000		-2.170	0.362	0.000	
	SJR	-3.910	0.745	0.000		-3.806	0.716	0.000	
	CCETM	8.623	0.652	0.000		8.376	0.517	0.000	
	$COMRF^2$	-2.409	0.455	0.000		-2.506	0.429	0.000	
	SJR^2	-2.194	0.924	0.018		-2.521	0.785	0.001	
	$CCETM^2$	-4.817	0.338	0.000		-4.821	0.344	0.000	
	COMRF.SJR	3.988	1.261	0.002		4.511	0.963	0.000	
	COMRF.CCETM	0.453	0.710	0.524					
	SJR.CCETM	4.528	0.903	0.000		4.743	0.842	0.000	
2	Constant	-4.069	0.998		75.2				
	lnNov1	0.329	0.068	0.000					
	COMRF	-6.027	0.776	0.000					
	XGEO	1.414	0.251	0.000					
	CCETM	5.813	0.555	0.000					
	$COMRF^2$	-2.085	0.399	0.000					
	$XGEO^2$	-0.229	0.047	0.000					
	$CCETM^2$	-2.802	0.287	0.000					
	COMRF.XGEO	0.870	0.266	0.001					
	COMRF.CCETM	2.033	0.603	0.001					
	XGEO.CCETM	0.587	0.192	0.002					
3	Constant	-5.339	1.048		76.3				
	lnNov1	0.415	0.070	0.000					
	COMRF	-6.000	0.756	0.000					
	XGEO	1.541	0.249	0.000					
	CCETM	5.629	0.559	0.000					
	$COMRF^2$	-1.894	0.370	0.000					
	$XGEO^2$	-0.196	0.046	0.000					
	$CCETM^2$	-2.673	0.290	0.000					
	COMRF.XGEO	1.010	0.266	0.000					
	COMRF.CCETM	1.894	0.620	0.002					
	XGEO.CCETM	0.616	0.185	0.001					
4	Constant	-6.326	1.077		77.3				
	lnNov1	0.493	0.072	0.000					
	COMRF	-5.862	0.702	0.000					
	XGEO	1.684	0.244	0.000					
	CCETM	5.282	0.541	0.000					
	$COMRF^2$	-1.799	0.347	0.000					
	$XGEO^2$	-0.190	0.046	0.000					
	$CCETM^2$	-2.637	0.296	0.000					
	COMRF.XGEO	1.130	0.259	0.000					
	COMRF.CCETM	1.455	0.611	0.018					
	XGEO.CCETM	0.530	0.176	0.003					

Table 4, Continued.

MA		Full Model Est	SE	Sig	% Explained	Reduced Model Est	SE	Sig	% Explained
5	Constant	-7.370	1.091		78.7				
	lnNov1	0.557	0.073	0.000					
	COMRF	-6.274	0.704	0.000					
	XGEO	1.937	0.247	0.000					
	CCETM	4.931	0.529	0.000					
	$COMRF^2$	-2.014	0.359	0.000					
	$XGEO^2$	-0.193	0.046	0.000					
	$CCETM^2$	-2.480	0.296	0.000					
	COMRF.XGEO	1.386	0.264	0.000					
	COMRF.CCETM	1.117	0.614	0.069					
	XGEO.CCETM	0.554	0.169	0.001					
6	Constant	-7.968	1.091		79.8	-7.781	1.079		79.7
	lnNov1	0.603	0.073	0.000		0.608	0.074	0.000	
	COMRF	-6.293	0.691	0.000		-5.961	0.632	0.000	
	XGEO	2.028	0.251	0.000		2.035	0.245	0.000	
	CCETM	4.663	0.522	0.000		4.029	0.263	0.000	
	$COMRF^2$	-2.047	0.363	0.000		-2.035	0.374	0.000	
	$XGEO^2$	-0.196	0.047	0.000		-0.202	0.047	0.000	
	$CCETM^2$	-2.404	0.300	0.000		-2.417	0.300	0.000	
	COMRF.XGEO	1.444	0.271	0.000		1.449	0.264	0.000	
	COMRF.CCETM	0.877	0.616	0.155					
	XGEO.CCETM	0.535	0.165	0.001		0.548	0.165	0.001	
7	Constant	-8.183	1.080		80.5	-8.076	1.074		80.4
	lnNov1	0.627	0.074	0.000		0.631	0.074	0.000	
	COMRF	-6.224	0.680	0.000		-6.028	0.645	0.000	
	XGEO	2.040	0.253	0.000		2.056	0.248	0.000	
	CCETM	4.431	0.521	0.000		3.967	0.262	0.000	
	$COMRF^2$	-2.100	0.375	0.000		-2.118	0.389	0.000	
	$XGEO^2$	-0.190	0.049	0.000		-0.196	0.049	0.000	
	$CCETM^2$	-2.406	0.304	0.000		-2.418	0.305	0.000	
	COMRF.XGEO	1.416	0.276	0.000		1.429	0.271	0.000	
	COMRF.CCETM	0.654	0.629	0.299					
	XGEO.CCETM	0.499	0.164	0.002		0.503	0.165	0.002	
8	Constant	-8.099	1.064		80.9	-8.042	1.060		80.9
	lnNov1	0.634	0.074	0.000		0.637	0.074	0.000	
	COMRF	-5.905	0.660	0.000		-5.804	0.644	0.000	
	XGEO	1.928	0.251	0.000		1.946	0.247	0.000	
	CCETM	4.223	0.520	0.000		3.915	0.260	0.000	
	$COMRF^2$	-2.004	0.383	0.000		-2.032	0.397	0.000	
	$XGEO^2$	-0.173	0.052	0.001		-0.178	0.052	0.001	
	$CCETM^2$	-2.424	0.304	0.000		-2.434	0.305	0.000	
	COMRF.XGEO	1.250	0.277	0.000		1.265	0.273	0.000	
	COMRF.CCETM	0.440	0.639	0.492					
	XGEO.CCETM	0.496	0.165	0.003		0.495	0.165	0.003	

Table 4, Continued.

MA		Full Model Est	SE	Sig	% Explained	Reduced Model Est	SE	Sig	% Explained
9	Constant	-7.797	1.055		81.1	-7.778	1.052		81.1
	lnNov1	0.630	0.074	0.000		0.631	0.074	0.000	
	COMRF	-5.371	0.638	0.000		-5.341	0.622	0.000	
	XGEO	1.723	0.249	0.000		1.735	0.244	0.000	
	CCETM	4.003	0.521	0.000		3.873	0.259	0.000	
	$COMRF^2$	-1.786	0.394	0.000		-1.803	0.390	0.000	
	$XGEO^2$	-0.150	0.055	0.007		-0.152	0.055	0.006	
	$CCETM^2$	-2.439	0.304	0.000		-2.444	0.303	0.000	
	COMRF.XGEO	0.967	0.277	0.001		0.978	0.272	0.000	
	COMRF.CCETM	0.188	0.653	0.774					
	XGEO.CCETM	0.511	0.168	0.002		0.508	0.167	0.003	
10	Constant	-7.481	1.051		81.2	-7.480	1.049		81.2
	lnNov1	0.621	0.075	0.000		0.621	0.075	0.000	
	COMRF	-4.856	0.619	0.000		-4.855	0.616	0.000	
	XGEO	1.496	0.248	0.000		1.497	0.241	0.000	
	CCETM	3.827	0.530	0.000		3.818	0.257	0.000	
	$COMRF^2$	-1.520	0.408	0.000		-1.522	0.398	0.000	
	$XGEO^2$	-0.122	0.058	0.038		-0.122	0.058	0.037	
	$CCETM^2$	-2.414	0.302	0.000		-2.414	0.301	0.000	
	COMRF.XGEO	0.656	0.279	0.019		0.657	0.273	0.016	
	COMRF.CCETM	0.013	0.674	0.984					
	XGEO.CCETM	0.566	0.173	0.001		0.566	0.172	0.001	
11	Constant	-2.858	1.230		82.0	-3.116	1.130		82.0
	lnNov1	0.294	0.086	0.001		0.297	0.084	0.000	
	COMRF	-5.332	0.740	0.000		-5.668	0.659	0.000	
	RIO	9.119	1.526	0.000		7.902	0.599	0.000	
	SSDSac	-3.192	0.693	0.000		-2.533	0.293	0.000	
	$COMRF^2$	-2.275	0.536	0.000		-2.372	0.543	0.000	
	RIO^2	-16.157	1.407	0.000		-16.117	1.388	0.000	
	$SSDSac^2$	-0.745	0.186	0.000		-0.823	0.172	0.000	
	COMRF.RIO	1.175	1.531	0.443					
	COMRF.SSDSac	-0.620	0.623	0.320					
	RIO.SSDSac	8.784	0.908	0.000		8.908	0.900	0.000	
12	Constant	-2.637	1.218		83.1	-3.291	1.144		83.0
	lnNov1	0.288	0.086	0.001		0.309	0.085	0.000	
	COMRF	-5.043	0.701	0.000		-5.625	0.673	0.000	
	RIO	9.097	1.588	0.000		8.044	0.651	0.000	
	SSDSac	-3.449	0.730	0.000		-2.665	0.329	0.000	
	$COMRF^2$	-2.113	0.539	0.000		-2.219	0.556	0.000	
	RIO^2	-18.231	1.533	0.000		-18.281	1.521	0.000	
	$SSDSac^2$	-0.882	0.210	0.000		-0.990	0.202	0.000	
	COMRF.RIO	0.817	1.619	0.614					
	COMRF.SSDSac	-0.673	0.664	0.312					
	RIO.SSDSac	10.145	1.013	0.000		10.314	1.014	0.000	

Table 4, Continued.

MA		Full Model Est	SE	Sig	% Explained	Reduced Model Est	SE	Sig	% Explained
13	Constant	-2.443	1.203		84.1	-3.358	1.155		83.9
	lnNov1	0.282	0.086	0.001		0.316	0.086	0.000	
	COMRF	-4.805	0.656	0.000		-5.469	0.671	0.000	
	XGEO	8.896	1.632	0.000		8.179	0.711	0.000	
	CCETM	-3.611	0.756	0.000		-2.820	0.371	0.000	
	$COMRF^2$	-1.965	0.542	0.000		-2.005	0.564	0.000	
	$XGEO^2$	-19.897	1.632	0.000		-20.032	1.619	0.000	
	$CCETM^2$	-0.964	0.239	0.000		-1.087	0.235	0.000	
	COMRF.XGEO	0.296	1.701	0.862					
	COMRF.CCETM	-0.622	0.700	0.375					
	XGEO.CCETM	11.205	1.109	0.000		11.400	1.116	0.000	
14	Constant	-2.616	1.212		84.5	-3.442	1.173		84.3
	lnNov1	0.295	0.087	0.001		0.330	0.087	0.000	
	COMRF	-4.838	0.689	0.000		-5.369	0.684	0.000	
	XGEO	7.760	1.707	0.000		8.152	0.773	0.000	
	CCETM	-3.077	0.779	0.000		-2.790	0.405	0.000	
	$COMRF^2$	-1.995	0.586	0.001		-1.997	0.585	0.001	
	$XGEO^2$	-20.928	1.749	0.000		-21.288	1.731	0.000	
	$CCETM^2$	-1.087	0.275	0.000		-1.183	0.273	0.000	
	COMRF.XGEO	-0.928	1.857	0.617					
	COMRF.CCETM	-0.107	0.764	0.889					
	XGEO.CCETM	11.864	1.237	0.000		12.113	1.240	0.000	

Although Figure 2 shows an apparently good fit of the model to the observed daily salvage numbers, there is a potential issue about this related to missing values in the data. The problem is that the values of CCET (The Clifton Court Forebay entrance turbidity) or CCETM (CCET measured three days earlier) are missing for 93 days in December and January between December 1, 1995 and January 31, 2006. These days were removed from the data before the 392 models listed in Appendix A were estimated. This might not matter, except that the days with missing values for CCET tended to be days when salvage occurred. Thus for the 589 days used to estimate the equations listed in Appendix A the average daily Banks delta smelt salvage was 21.1, with a maximum of 656, while for the 93 days with missing CCET values the average daily salvage was 109.2, with a maximum of 774.

To see whether this really seems to be an issue it is possible to use the equation fitted with the reduced data set to determine the expected salvage for all December and January days between December 1, 1995 and January 31, 2006. This is because CCET is the only variable with missing values for days within this time range. Figure 3 shows the results obtained from doing this. It has exactly the same format as Figure 2 but is for all days in the time range. Unfortunately, Figure 3 shows that the equation estimated from the reduced data set does not predict the period of high salvage numbers in 1995 (days 1 to

62) and under-estimated the high salvage numbers in 2001 (days 601 to 662) to some extent.

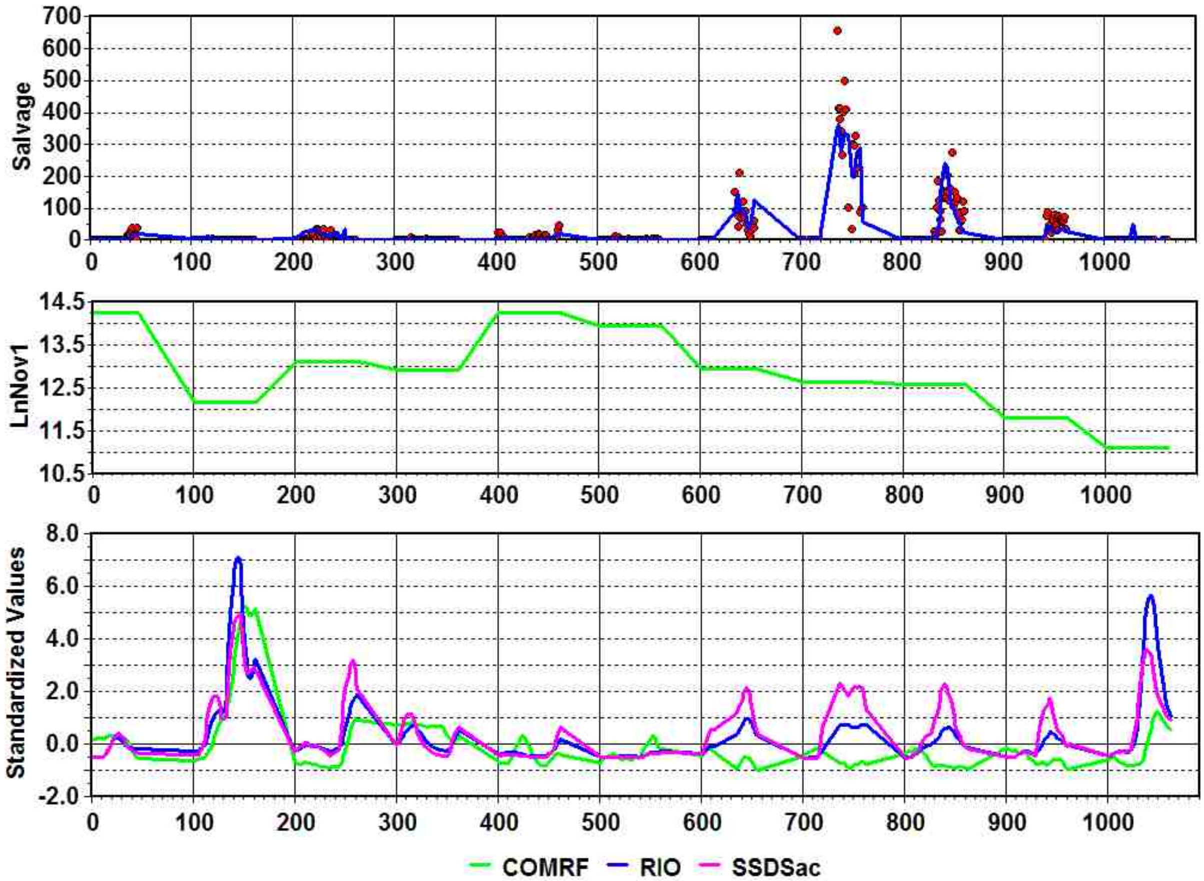

Figure 2 The fit of the best fitting model shown in Appendix A, with moving averages of 14 days for the three explanatory variables COMRF, RIO and SSDSAC. This equation accounts for 84.5% of the variation in Banks daily salvage numbers. The top graph shows the observed (!) and fitted (—) daily salvage numbers, the middle graph shows the values of LnNov1, the natural logarithm of the estimated delta smelt abundance on November 1 before the salvage day (horizontal plots), and the bottom graph shows standardized values for the three explanatory variables. The horizontal scale represents the day in the water year with December 1, 1995 starting at day 1, December 1, 1996 starting at day 101, and so on up to December 1, 2005 starting at day 1001.

Equations for the Prediction of Banks Salvage Excluding CCET and CCETM

Because it seems unsatisfactory to use the reduced data with the variables other than CCET and CCETM, the process of fitting all possible models including LnNov1, COMRF and two other variables was repeated using all of the daily data but excluding the variables CCET and CCETM. As before, the fitted equations take the form

$$E(\text{Salvage}) = \text{Exp}(\beta_0 + \beta_1\text{LnNov1} + \beta_2X_1 + \beta_3X_2 + \beta_4X_3 + \beta_5X_1^2 + \beta_6X_2^2 + \beta_7X_3^2 + \beta_8X_1X_2 + \beta_9X_1X_3 + \beta_{10}X_2X_3)$$

where X_1 is always COMRF while X_2 and X_3 are two of the other variables being considered (RIO, SJR, XGEO, WEST, SSDSac and SSDSJ).

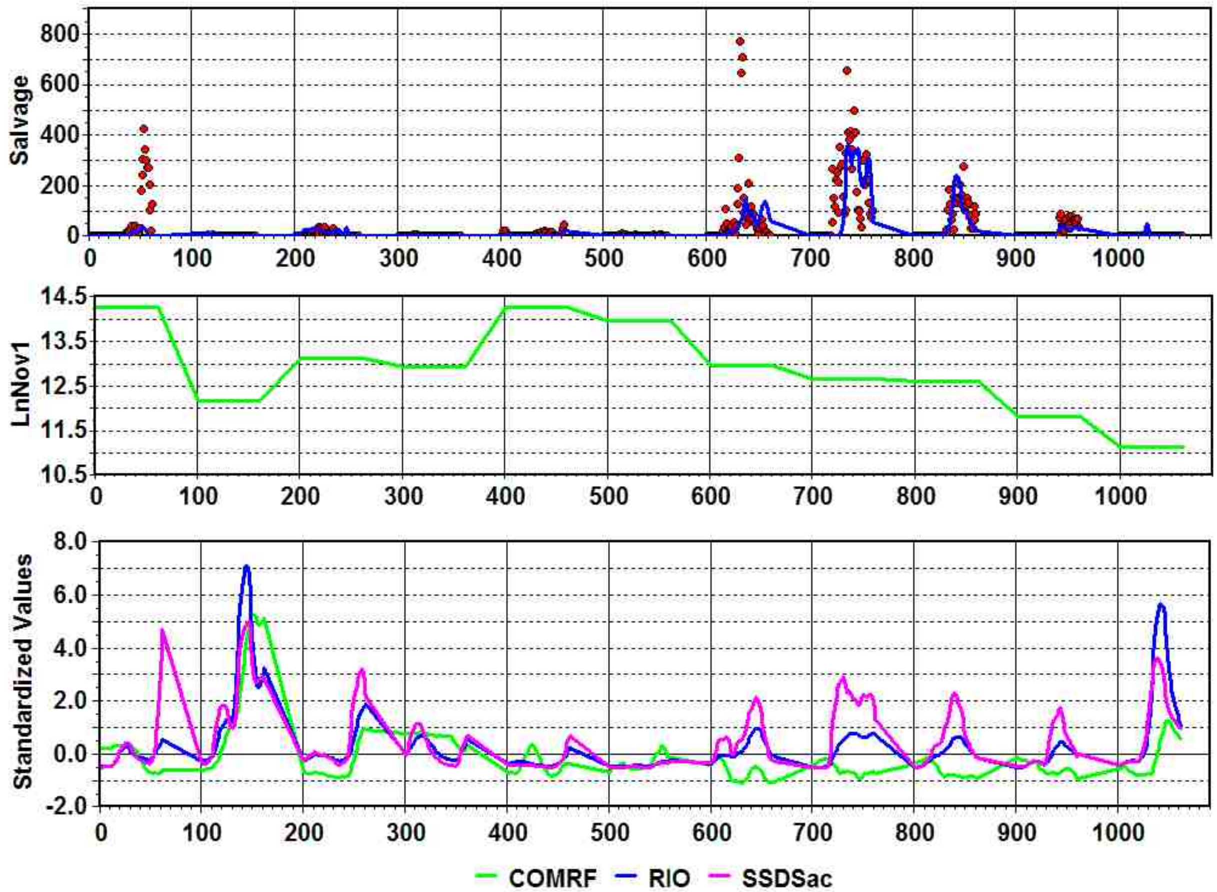

Figure 3 The top graph shows the observed (!) and predicted (—) Banks salvage numbers when the best fitting equation using the reduced data without missing values is used to estimate the salvage for every December and January day, the middle graph shows the logarithms of abundance estimates (horizontal lines), and the bottom graph shows the standardized values of the three explanatory variables used. The horizontal scale gives the day in the water year with December 1, 1995 starting at 1, December 1, 1996 starting at day 101, and so on up to December 1, 2005 starting at 1001.

There are 210 models altogether (the number of choices of two variables from six for X_2 and X_3) and the results obtained from estimating these are provided in Appendix B. The percentages of the variation accounted for by these models are generally less than what was obtained for the same models using the reduced data set without missing values for CCET and CCETM. For example, as noted above with the reduced data set the model with moving averages of 14 days and the three variables COMRF, RIO and SSDSac accounts for 84.5% of the variation in salvage numbers, but with the full data set this model accounts for only 73.3% of the variation. The lower percentages obtained with the full data set seem more realistic given that the missing data with CCET and CCETM tended to occur when salvage numbers were high.

From Appendix B it can be seen that the best fitting model with no averaging (MA = 1) contains the variables COMRF, RIO and WEST and accounts for 63.68% of the variation in salvage numbers. This remains the best model with from two to four day averaging (MA = 2 to 4), with the variation accounted for increasing to 68.63% with four day averaging. With averaging from five to eight days the best model contains the variables COMRF, RIO and SSDSac, with from 70.77% to 74.94% of the variation accounted for, then the best model contains COMRF, RIO and WEST again with from nine to 13 days averaging, with from 75.33% to 74.42% of the variation accounted for. Finally, with 14 day averaging the best model contains the variables COMRF, RIO and XGEO, with 73.74% of the variation accounted for.

Actually, the models containing COMRF and RIO plus any of the other variables always have about the same percentage of the variation in salvage numbers accounted for, with this variation increasing from about 62% with no averaging up to about 75% with ten day averaging, and then reducing to about 73% with 14 day averaging.

Figure 4 has the same format as Figures 2 and 3 but shows the results for the best fitting model from all of those listed in Appendix B, with ten day averaging and 75.4% of the variation in salvage numbers accounted for. It includes the variables COMRF, RIO and WEST.

Reduced Equations

The best fitting equation for each of the averaging periods has been examined to see whether it can be simplified by removing any terms not significant or close to significant at the 5% level. The results are shown in Table 5. For 11 of the equations some simplification is possible without making much difference to the percentage of the variation in daily salvage numbers accounted for.

Prediction of Banks Salvage Three Days Ahead

For all of the analyses considered so far the equations have been for the prediction of the daily salvage numbers one day after the other variables are measured. In practice a longer lead time may be needed, so equations have also been fitted for prediction three days in advance. This means that with no averaging of variables the daily salvage number is estimated based on the values of the explanatory variables three days before, while if there is averaging over d days for the variables then the averages will be for d days up to and including three days before the salvage day being considered.

Appendix C shows the result of fitting all possible models of the form

$$E(\text{Salvage}) = \text{Exp}(\beta_0 + \beta_1 \text{LnNov1} + \beta_2 X_1 + \beta_3 X_2 + \beta_4 X_3 + \beta_5 X_1^2 + \beta_6 X_2^2 + \beta_7 X_3^2 + \beta_8 X_1 X_2 + \beta_9 X_1 X_3 + \beta_{10} X_2 X_3)$$

where X_1 is always COMRF and X_2 and X_3 are two of the other variables being considered (RIO, SJR, XGEO, CCET, WEST, SSDSac and SSDSJ), averaging of variables is for up to 14 days, and the dependent variable is the salvage three days ahead. Because CCET is one of the variables being considered missing values for this variable led to the removal of the data for some December and January days.

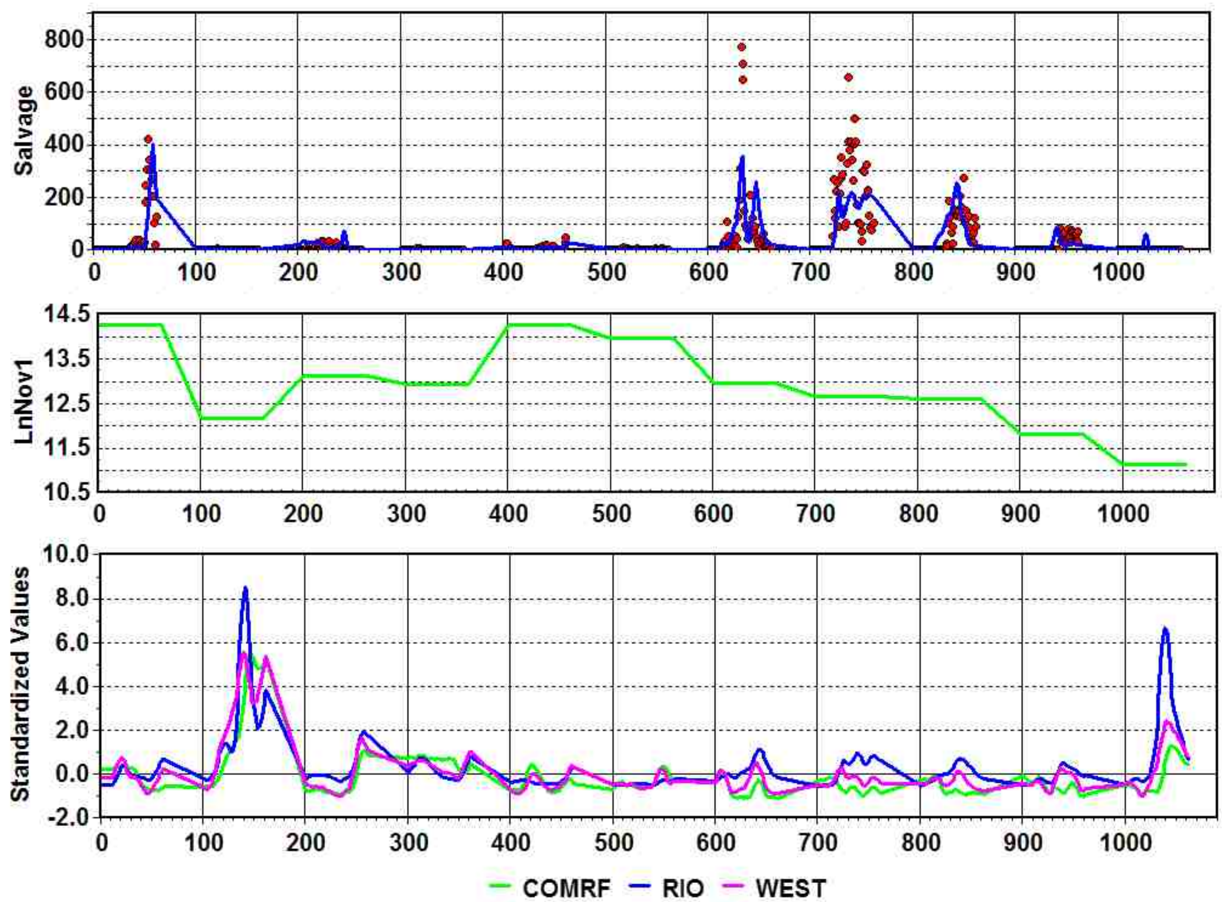

Figure 4 The top graph shows the observed (!) and predicted (—) Banks salvage numbers when the best fitting equation from those listed in Appendix B is used to estimate the salvage for every December and January day, the middle graph shows the logarithms of abundance estimates (horizontal lines), and the bottom graph shows the standardized values of the three explanatory variables used. The horizontal scale gives the day in the water year with December 1, 1995 starting at 1, December 1, 1996 starting at day 101, and so on up to December 1, 2005 starting at 1001. The variables used in the equation are ten day averages.

Table 5. Estimates of regression coefficients (Est) with standard errors (SE) and significance levels (Sig) for full and reduced models, where the full models are the ones accounting for most variation for each moving average (MA) period. In some cases the model cannot be reduced. The percentage of the variation in salvage numbers accounted for is shown for all models. This table is for models fitted with all December and January daily data, with the CCET and CCETM variables omitted because of missing values.

		Full Model			%	Reduced Model			%
MA		Est	SE	Sig	Explained	Est	SE	Sig	Explained
1	Constant	-2.764	0.894		63.7	-2.742	0.890		63.7
	lnNov1	0.302	0.064	0.000		0.301	0.063	0.000	
	COMRF	-4.017	0.679	0.000		-4.174	0.580	0.000	
	RIO	6.390	0.566	0.000		6.251	0.460	0.000	
	WEST	-1.166	0.616	0.059		-0.913	0.159	0.000	
	$COMRF^2$	-1.557	0.487	0.001		-1.739	0.336	0.000	
	RIO^2	-2.479	0.347	0.000		-2.454	0.242	0.000	
	$WEST^2$	-0.540	0.414	0.192		-0.670	0.237	0.005	
	COMRF.RIO	2.341	0.564	0.000		2.206	0.404	0.000	
	COMRF.WEST	-0.379	0.747	0.612					
	RIO.WEST	-0.054	0.660	0.935					
2	Constant	-3.596	0.913		64.8	-3.596	0.910		64.8
	lnNov1	0.354	0.064	0.000		0.354	0.064	0.000	
	COMRF	-4.341	0.758	0.000		-4.341	0.752	0.000	
	RIO	5.864	0.533	0.000		5.864	0.521	0.000	
	WEST	-0.940	0.630	0.136		-0.940	0.603	0.120	
	$COMRF^2$	-1.108	0.535	0.039		-1.108	0.510	0.030	
	RIO^2	-1.753	0.330	0.000		-1.753	0.322	0.000	
	$WEST^2$	-0.001	0.429	0.998					
	COMRF.RIO	3.090	0.578	0.000		3.090	0.507	0.000	
	COMRF.WEST	-1.414	0.799	0.077		-1.416	0.582	0.015	
	RIO.WEST	-1.405	0.654	0.032		-1.406	0.508	0.006	
3	Constant	-4.613	0.930		66.4	-4.483	0.906		66.3
	lnNov1	0.422	0.064	0.000		0.424	0.063	0.000	
	COMRF	-4.011	0.699	0.000		-3.662	0.290	0.000	
	RIO	5.747	0.511	0.000		5.660	0.501	0.000	
	WEST	-1.428	0.634	0.025		-1.498	0.479	0.002	
	$COMRF^2$	-0.149	0.410	0.717					
	RIO^2	-1.195	0.316	0.000		-1.349	0.282	0.000	
	$WEST^2$	0.582	0.425	0.172					
	COMRF.RIO	3.923	0.511	0.000		3.512	0.378	0.000	
	COMRF.WEST	-3.019	0.750	0.000		-2.619	0.452	0.000	
	RIO.WEST	-2.438	0.621	0.000		-1.800	0.454	0.000	
4	Constant	-5.703	0.952		68.6	-5.681	0.935		68.6
	lnNov1	0.474	0.063	0.000		0.474	0.063	0.000	
	COMRF	-4.671	0.782	0.000		-4.586	0.355	0.000	
	RIO	5.953	0.531	0.000		5.954	0.531	0.000	
	WEST	-1.847	0.678	0.007		-1.903	0.505	0.000	
	$COMRF^2$	-0.050	0.409	0.903					
	RIO^2	-0.875	0.333	0.009		-0.891	0.306	0.004	
	$WEST^2$	0.832	0.451	0.065		0.842	0.442	0.057	
	COMRF.RIO	4.766	0.569	0.000		4.731	0.497	0.000	
	COMRF.WEST	-4.079	0.803	0.000		-4.136	0.659	0.000	
	RIO.WEST	-2.972	0.660	0.000		-2.951	0.639	0.000	

Table 5, Continued.

MA		Full Model Est	SE	Sig	% Explained	Reduced Model Est	SE	Sig	% Explained
5	Constant	-7.414	1.008		70.8	-7.435	1.001		70.8
	lnNov1	0.585	0.067	0.000		0.587	0.066	0.000	
	COMRF	-6.766	0.792	0.000		-6.739	0.777	0.000	
	RIO	10.426	0.997	0.000		10.337	0.891	0.000	
	SSDSac	-2.221	0.377	0.000		-2.181	0.319	0.000	
	$COMRF^2$	-2.673	0.474	0.000		-2.647	0.454	0.000	
	RIO^2	-6.504	0.711	0.000		-6.503	0.709	0.000	
	$SSDSac^2$	0.003	0.017	0.841					
	COMRF.RIO	4.482	0.857	0.000		4.406	0.768	0.000	
	COMRF.SSDSac	-0.906	0.276	0.001		-0.875	0.230	0.000	
	RIO.SSDSac	2.054	0.290	0.000		2.059	0.288	0.000	
6	Constant	-8.505	1.028		72.7	-8.318	1.022		72.6
	lnNov1	0.654	0.067	0.000		0.639	0.067	0.000	
	COMRF	-7.099	0.847	0.000		-7.255	0.824	0.000	
	RIO	10.703	1.067	0.000		11.467	0.964	0.000	
	SSDSac	-2.226	0.396	0.000		-2.557	0.340	0.000	
	$COMRF^2$	-2.724	0.495	0.000		-2.886	0.479	0.000	
	RIO^2	-7.558	0.756	0.000		-7.523	0.756	0.000	
	$SSDSac^2$	-0.029	0.018	0.113					
	COMRF.RIO	4.417	0.942	0.000		5.103	0.839	0.000	
	COMRF.SSDSac	-0.784	0.307	0.011		-1.057	0.255	0.000	
	RIO.SSDSac	2.523	0.305	0.000		2.454	0.303	0.000	
7	Constant	-9.638	1.039		74.3				
	lnNov1	0.725	0.067	0.000					
	COMRF	-7.437	0.870	0.000					
	RIO	11.509	1.155	0.000					
	SSDSac	-2.429	0.423	0.000					
	$COMRF^2$	-2.786	0.508	0.000					
	RIO^2	-8.532	0.796	0.000					
	$SSDSac^2$	-0.057	0.021	0.008					
	COMRF.RIO	5.112	1.034	0.000					
	COMRF.SSDSac	-0.979	0.344	0.005					
	RIO.SSDSac	2.930	0.321	0.000					
8	Constant	-10.456	1.061		74.9				
	lnNov1	0.786	0.069	0.000					
	COMRF	-7.336	0.894	0.000					
	RIO	11.066	1.242	0.000					
	SSDSac	-2.191	0.461	0.000					
	$COMRF^2$	-2.628	0.527	0.000					
	RIO^2	-8.849	0.844	0.000					
	$SSDSac^2$	-0.101	0.027	0.000					
	COMRF.RIO	4.859	1.134	0.000					
	COMRF.SSDSac	-0.903	0.392	0.022					
	RIO.SSDSac	3.106	0.345	0.000					

Table 5, Continued.

MA		Full Model Est	SE	Sig	% Explained	Reduced Model Est	SE	Sig	% Explained
9	Constant	-8.166	0.930		75.3	-8.206	0.924		75.3
	lnNov1	0.632	0.061	0.000		0.626	0.060	0.000	
	COMRF	-4.581	0.795	0.000		-5.198	0.465	0.000	
	RIO	7.748	0.717	0.000		7.599	0.676	0.000	
	WEST	-3.733	0.958	0.000		-3.066	0.583	0.000	
	$COMRF^2$	0.517	0.502	0.304					
	RIO^2	-2.093	0.477	0.000		-2.004	0.303	0.000	
	$WEST^2$	-2.538	0.795	0.001		-2.826	0.457	0.000	
	COMRF.RIO	5.224	0.833	0.000		5.210	0.667	0.000	
	COMRF.WEST	-3.457	1.315	0.009		-2.510	0.780	0.001	
	RIO.WEST	-0.020	1.038	0.985					
10	Constant	-8.185	0.916		75.4	-8.296	0.913	0.000	75.3
	lnNov1	0.652	0.061	0.000		0.649	0.060	0.000	
	COMRF	-4.037	0.767	0.000		-5.011	0.456	0.000	
	RIO	7.754	0.739	0.000		7.390	0.685	0.000	
	WEST	-3.847	1.001	0.000		-2.719	0.585	0.000	
	$COMRF^2$	0.718	0.539	0.183					
	RIO^2	-2.401	0.518	0.000		-2.064	0.326	0.000	
	$WEST^2$	-3.174	0.883	0.000		-3.220	0.490	0.000	
	COMRF.RIO	4.791	0.887	0.000		5.011	0.685	0.000	
	COMRF.WEST	-2.950	1.442	0.041		-1.890	0.793	0.017	
	RIO.WEST	0.587	1.136	0.605					
11	Constant	-8.394	0.915		75.4	-8.481	0.908		75.3
	lnNov1	0.678	0.062	0.000		0.683	0.061	0.000	
	COMRF	-3.612	0.742	0.000		-3.798	0.701	0.000	
	RIO	7.783	0.765	0.000		7.649	0.733	0.000	
	WEST	-4.091	1.039	0.000		-3.889	0.988	0.000	
	$COMRF^2$	1.042	0.579	0.073		1.103	0.574	0.055	
	RIO^2	-2.594	0.555	0.000		-2.312	0.366	0.000	
	$WEST^2$	-3.462	0.965	0.000		-2.953	0.600	0.000	
	COMRF.RIO	4.639	0.951	0.000		5.076	0.703	0.000	
	COMRF.WEST	-3.007	1.571	0.056		-3.500	1.389	0.012	
	RIO.WEST	0.830	1.225	0.498					
12	Constant	-8.490	0.921		74.8	-8.587	0.914	0.000	74.8
	lnNov1	0.695	0.063	0.000		0.700	0.062	0.000	
	COMRF	-3.307	0.730	0.000		-3.495	0.701	0.000	
	RIO	8.003	0.804	0.000		7.862	0.773	0.000	
	WEST	-4.383	1.078	0.000		-4.185	1.035	0.000	
	$COMRF^2$	1.287	0.631	0.042		1.389	0.618	0.025	
	RIO^2	-2.861	0.597	0.000		-2.537	0.395	0.000	
	$WEST^2$	-3.595	1.054	0.001		-2.991	0.636	0.000	
	COMRF.RIO	4.758	1.032	0.000		5.269	0.756	0.000	
	COMRF.WEST	-3.260	1.714	0.058		-3.884	1.476	0.009	
	RIO.WEST	0.952	1.315	0.469					

Table 5, Continued.

MA		Full Model Est	SE	Sig	% Explained	Reduced Model Est	SE	Sig	% Explained
13	Constant	-8.660	0.930		74.4	-8.743	0.921	0.000	74.4
	lnNov1	0.712	0.064	0.000		0.716	0.063	0.000	
	COMRF	-2.956	0.730	0.000		-3.074	0.692	0.000	
	RIO	8.324	0.859	0.000		8.229	0.823	0.000	
	WEST	-4.989	1.126	0.000		-4.861	1.089	0.000	
	$COMRF^2$	1.792	0.714	0.012		1.935	0.660	0.003	
	RIO^2	-3.088	0.639	0.000		-2.807	0.421	0.000	
	$WEST^2$	-3.357	1.143	0.003		-2.818	0.668	0.000	
	COMRF.RIO	5.145	1.151	0.000		5.617	0.826	0.000	
	COMRF.WEST	-4.323	1.878	0.022		-4.929	1.567	0.002	
	RIO.WEST	0.818	1.401	0.560					
14	Constant	-11.123	1.150		73.7				
	lnNov1	0.959	0.082	0.000					
	COMRF	-4.833	0.823	0.000					
	RIO	3.620	1.025	0.000					
	XGEO	1.770	0.594	0.003					
	$COMRF^2$	-1.890	0.563	0.001					
	RIO^2	-8.318	0.894	0.000					
	$XGEO^2$	-1.256	0.238	0.000					
	COMRF.RIO	-2.891	1.321	0.029					
	COMRF.XGEO	2.894	0.714	0.000					
	RIO.XGEO	5.083	0.828	0.000					

The best model shown in Appendix C accounts for 80.90% of the variation in daily salvage numbers. It uses 13 day averaging and the variables COMRF, RIO and SSDSac. This equation does not include the variable CCET and there are the concerns noted earlier about the missing values with CCET tending to occur when there are high salvage numbers. Therefore, the model fitting process was repeated without the variable CCET and with no days excluded because of missing values of this variable. The results are shown in Appendix D. In this case the best model involves six day averaging of variables and accounts for 70.65% of the variation in daily salvage numbers and includes the variables COMRF, RIO and WEST.

With the full set of data the best model accounts for about 10% less of the variation than the best model with the reduced data set because of missing values. This is similar to what happened with the prediction of salvage numbers one day ahead, and is apparently due to the reduced data set not including some of the highest daily salvage numbers. The percentages of variation accounted for with all the daily data are therefore more believable than the percentages for the reduced data set.

Reduced Equations

Table 6 shows the reduced equations with non-significant terms removed for the prediction of salvage three days ahead using COMRF, RIO, SJR, XGEO, CCET, WEST, SSDSac and SSDSJ, with some days omitted because of missing values for CCET. Table 7 is similar but shows the reduced equations based on all of the daily data with the variable CCET not used in any of the equations.

Discussion

The best fitting equation shown in Appendix A (including CCET and CCETM as variables with days with missing values removed) includes the variables LnNov1, COMRF (the combined Old and Middle River flows), RIO (The Sacramento River flow at Rio Vista) and SSDSac (the suspended sediment load for the Sacramento River). It used averages of 14 days for the variables other than LnNov1, and accounts for 84.5% of the variation in Banks daily salvage numbers one day ahead.

Because this equation does not include the variable CCET with missing values it is better to estimate it using all of the daily data without days with missing values for CCET or CCETM removed. In that case the equation accounts 73.3% of the variation in daily salvage numbers, and is not the best fitting equation shown in Appendix B. The best fitting equation includes LnNov1, COMRF, RIO and WEST (the San Joaquin River flow at Jersey Point), uses ten day averaging, and accounts for 75.4% of the variation in daily salvage numbers. As shown in Table 5, this equation can be simplified by removing non-significant terms, resulting in the equation

$$
\begin{aligned}
E(\text{Salvage}) = \text{Exp}\{&-8.296 + 0.649(\text{LnNov1}) - 5.011(\text{COMRF}) + 7.390(\text{RIO}) \\
&-2.719(\text{WEST}) - 2.064(\text{RIO})^2 - 3.220(\text{WEST})^2 + 5.011(\text{COMRF.RIO}) \\
&- 1.890(\text{COMRF.WEST})\}, \qquad (1)
\end{aligned}
$$

which accounts for 75.3% of the variation in the daily salvage numbers, predicted one day ahead. Here the variables other than LnNov1 are standardized to have means of zero and standard deviations of one, with the means and standard deviations for the unstandardized variables as given in Table 2.

Some of the regression coefficients are quite large, suggesting that care is needed in using this equation for ranges of the variables not observed in the data. For the data the predictions of salvage are very nearly the same as the predictions from the model without any non-significant terms removed. This can be seen by comparing Figure 4 (the results from the model with all terms included) with Figure 5 (the results from the model with the non-significant terms COMRF^2 and RIO.WEST removed).

Table 6. Estimates of regression coefficients (Est) with standard errors (SE) and significance levels (Sig) for full and reduced models, where the full models are the ones accounting for most variation for each moving average (MA) period. In some cases the model cannot be reduced. The percentage of the variation in salvage numbers accounted for is shown for all models. This table is for models fitted with December and January daily data, with days with missing values for CCET omitted. With these models Banks salvage is predicted three days in advance.

		Full Model			%	Reduced Model			%
MA		Est	SE	Sig	Explained	Est	SE	Sig	Explained
1	Constant	-6.042	1.136		70.8	-5.928	1.095		70.6
	LnNov1	0.654	0.084	0.000		0.648	0.081	0.000	
	COMRF	-2.851	0.594	0.000		-2.596	0.354	0.000	
	CCET	8.806	0.608	0.000		9.021	0.560	0.000	
	WEST	-0.051	0.480	0.916		-0.430	0.147	0.003	
	$COMRF^2$	-0.695	0.478	0.147		-0.300	0.141	0.034	
	$CCET^2$	-5.867	0.493	0.000		-5.794	0.438	0.000	
	$WEST^2$	-2.433	0.282	0.000		-2.118	0.218	0.000	
	COMRF.CCET	3.332	0.636	0.000		3.968	0.519	0.000	
	COMRF.WEST	0.938	0.628	0.136					
	CCET.WEST	0.806	0.558	0.149					
2	Constant	-1.490	1.050		72.3				
	LnNov1	0.132	0.073	0.069					
	COMRF	-6.794	0.788	0.000					
	RIO	9.871	1.037	0.000					
	SSDSac	-2.587	0.422	0.000					
	$COMRF^2$	-3.076	0.479	0.000					
	RIO^2	-7.427	0.839	0.000					
	$SSDSac^2$	-0.274	0.077	0.000					
	COMRF.RIO	3.806	0.927	0.000					
	COMRF.SSDSac	-0.701	0.332	0.035					
	RIO.SSDSac	3.677	0.490	0.000					
3	Constant	-2.088	1.066		74.2				
	LnNov1	0.170	0.073	0.020					
	COMRF	-7.014	0.782	0.000					
	RIO	10.654	1.071	0.000					
	SSDSac	-2.876	0.436	0.000					
	$COMRF^2$	-3.149	0.468	0.000					
	RIO^2	-8.439	0.872	0.000					
	$SSDSac^2$	-0.246	0.071	0.001					
	COMRF.RIO	4.181	0.953	0.000					
	COMRF.SSDSac	-0.770	0.335	0.022					
	RIO.SSDSac	4.029	0.482	0.000					
4	Constant	-2.434	1.093		75.0	-2.408	1.100		74.9
	LnNov1	0.207	0.075	0.006		0.197	0.074	0.008	
	COMRF	-6.649	0.735	0.000		-6.830	0.769	0.000	
	RIO	10.366	1.050	0.000		8.853	0.555	0.000	
	SSDSac	-2.706	0.428	0.000		-2.058	0.212	0.000	
	$COMRF^2$	-2.885	0.429	0.000		-2.999	0.431	0.000	
	RIO^2	-9.292	0.916	0.000		-8.902	0.885	0.000	
	$SSDSac^2$	-0.255	0.072	0.000		-0.314	0.066	0.000	
	COMRF.RIO	3.662	0.941	0.000		2.227	0.438	0.000	
	COMRF.SSDSac	-0.584	0.331	0.078					
	RIO.SSDSac	4.317	0.489	0.000		4.295	0.492	0.000	

Table 6, Continued.

MA		Full Model Est	SE	Sig	% Explained	Reduced Model Est	SE	Sig	% Explained
5	Constant	-6.200	1.167		75.3	-5.963	1.133		75.2
	LnNov1	0.677	0.085	0.000		0.657	0.082	0.000	
	COMRF	-3.025	0.496	0.000		-3.166	0.498	0.000	
	CCET	9.118	0.596	0.000		9.187	0.589	0.000	
	WEST	0.411	0.516	0.427		0.588	0.506	0.246	
	$COMRF^2$	-0.906	0.303	0.003		-0.881	0.308	0.004	
	$CCET^2$	-6.069	0.440	0.000		-5.901	0.417	0.000	
	$WEST^2$	-3.752	0.350	0.000		-3.612	0.334	0.000	
	COMRF.CCET	3.863	0.683	0.000		4.479	0.587	0.000	
	COMRF.WEST	2.120	0.719	0.003		1.919	0.707	0.007	
	CCET.WEST	0.947	0.541	0.081					
6	Constant	-6.811	1.185		77.3	-6.680	1.163		77.2
	LnNov1	0.721	0.086	0.000		0.710	0.084	0.000	
	COMRF	-3.440	0.526	0.000		-3.536	0.527	0.000	
	CCET	8.889	0.576	0.000		8.966	0.568	0.000	
	WEST	1.033	0.546	0.059		1.144	0.540	0.034	
	$COMRF^2$	-1.288	0.338	0.000		-1.240	0.338	0.000	
	$CCET^2$	-5.794	0.411	0.000		-5.669	0.394	0.000	
	$WEST^2$	-4.609	0.382	0.000		-4.493	0.368	0.000	
	COMRF.CCET	3.873	0.677	0.000		4.393	0.571	0.000	
	COMRF.WEST	3.344	0.788	0.000		3.131	0.770	0.000	
	CCET.WEST	0.778	0.545	0.154					
7	Constant	-7.027	1.200		78.4	-7.004	1.190		78.4
	LnNov1	0.734	0.086	0.000		0.732	0.086	0.000	
	COMRF	-3.719	0.576	0.000		-3.757	0.565	0.000	
	CCET	8.727	0.567	0.000		8.786	0.558	0.000	
	WEST	1.381	0.589	0.019		1.428	0.579	0.014	
	$COMRF^2$	-1.479	0.391	0.000		-1.428	0.378	0.000	
	$CCET^2$	-5.544	0.395	0.000		-5.473	0.381	0.000	
	$WEST^2$	-5.161	0.408	0.000		-5.095	0.397	0.000	
	COMRF.CCET	4.085	0.679	0.000		4.409	0.566	0.000	
	COMRF.WEST	3.991	0.869	0.000		3.837	0.839	0.000	
	CCET.WEST	0.477	0.548	0.385					
8	Constant	-6.838	1.210		78.7	-6.849	1.204		78.7
	LnNov1	0.715	0.087	0.000		0.715	0.086	0.000	
	COMRF	-3.853	0.621	0.000		-3.865	0.609	0.000	
	CCET	8.605	0.572	0.000		8.643	0.563	0.000	
	WEST	1.475	0.631	0.020		1.492	0.622	0.017	
	$COMRF^2$	-1.513	0.437	0.001		-1.475	0.421	0.000	
	$CCET^2$	-5.357	0.390	0.000		-5.318	0.378	0.000	
	$WEST^2$	-5.442	0.432	0.000		-5.405	0.422	0.000	
	COMRF.CCET	4.302	0.694	0.000		4.486	0.578	0.000	
	COMRF.WEST	4.205	0.943	0.000		4.107	0.910	0.000	
	CCET.WEST	0.268	0.557	0.630					

Table 6, Continued.

MA		Full Model Est	SE	Sig	% Explained	Reduced Model Est	SE	Sig	% Explained
9	Constant	-6.580	1.218		78.9	-6.590	1.217		78.9
	LnNov1	0.690	0.086	0.000		0.691	0.086	0.000	
	COMRF	-3.836	0.657	0.000		-3.843	0.664	0.000	
	CCET	8.630	0.587	0.000		8.640	0.581	0.000	
	WEST	1.283	0.679	0.059		1.288	0.680	0.059	
	$COMRF^2$	-1.368	0.476	0.004		-1.357	0.473	0.004	
	$CCET^2$	-5.232	0.389	0.000		-5.217	0.379	0.000	
	$WEST^2$	-5.623	0.455	0.000		-5.609	0.446	0.000	
	COMRF.CCET	4.648	0.720	0.000		4.709	0.611	0.000	
	COMRF.WEST	4.021	1.019	0.000		3.984	0.996	0.000	
	CCET.WEST	0.096	0.563	0.865					
10	Constant	-6.580	1.242		79.0	-6.557	1.242		79.0
	LnNov1	0.685	0.087	0.000		0.683	0.087	0.000	
	COMRF	-3.811	0.722	0.000		-3.810	0.727	0.000	
	CCET	8.786	0.610	0.000		8.760	0.607	0.000	
	WEST	0.987	0.744	0.185		0.980	0.748	0.191	
	$COMRF^2$	-1.133	0.536	0.035		-1.164	0.534	0.030	
	$CCET^2$	-5.101	0.390	0.000		-5.126	0.383	0.000	
	$WEST^2$	-5.789	0.476	0.000		-5.816	0.470	0.000	
	COMRF.CCET	5.224	0.752	0.000		5.104	0.654	0.000	
	COMRF.WEST	3.624	1.107	0.001		3.694	1.093	0.001	
	CCET.WEST	-0.177	0.562	0.753					
11	Constant	-5.875	1.287		79.8	-5.280	1.184		79.7
	LnNov1	0.518	0.089	0.000		0.486	0.086	0.000	
	COMRF	-5.009	0.707	0.000		-4.598	0.603	0.000	
	RIO	7.706	1.451	0.000		5.839	0.604	0.000	
	SSDSac	-1.442	0.618	0.020		-0.875	0.285	0.002	
	$COMRF^2$	-1.808	0.500	0.000		-1.658	0.500	0.001	
	RIO^2	-15.589	1.420	0.000		-15.257	1.384	0.000	
	$SSDSac^2$	-1.091	0.177	0.000		-1.116	0.169	0.000	
	COMRF.RIO	2.168	1.446	0.134					
	COMRF.SSDSac	-0.643	0.561	0.252					
	RIO.SSDSac	8.398	0.900	0.000		8.379	0.887	0.000	
12	Constant	-5.962	1.298		80.6	-5.589	1.206		80.5
	LnNov1	0.533	0.090	0.000		0.510	0.087	0.000	
	COMRF	-5.118	0.723	0.000		-4.880	0.656	0.000	
	RIO	7.843	1.558	0.000		6.116	0.659	0.000	
	SSDSac	-1.621	0.665	0.015		-1.037	0.318	0.001	
	$COMRF^2$	-2.024	0.536	0.000		-1.908	0.543	0.000	
	RIO^2	-18.087	1.586	0.000		-17.769	1.548	0.000	
	$SSDSac^2$	-1.277	0.210	0.000		-1.298	0.204	0.000	
	COMRF.RIO	2.007	1.585	0.206					
	COMRF.SSDSac	-0.663	0.619	0.285					
	RIO.SSDSac	9.889	1.039	0.000		9.850	1.028	0.000	

Table 6, Continued.

MA		Full Model Est	SE	Sig	% Explained	Reduced Model Est	SE	Sig	% Explained
13	Constant	-5.966	1.323		80.9	-5.615	1.234		80.9
	LnNov1	0.538	0.093	0.000		0.520	0.090	0.000	
	COMRF	-4.674	0.684	0.000		-4.427	0.611	0.000	
	RIO	7.040	1.622	0.000		6.164	0.716	0.000	
	SSDSac	-1.350	0.687	0.050		-1.142	0.355	0.001	
	$COMRF^2$	-1.545	0.530	0.004		-1.456	0.521	0.005	
	RIO^2	-19.230	1.743	0.000		-18.985	1.701	0.000	
	$SSDSac^2$	-1.347	0.246	0.000		-1.335	0.242	0.000	
	COMRF.RIO	1.099	1.692	0.516					
	COMRF.SSDSac	-0.274	0.655	0.675					
	RIO.SSDSac	10.570	1.179	0.000		10.488	1.168	0.000	
14	Constant	-6.223	1.364		80.7	-5.795	1.271		80.6
	LnNov1	0.555	0.096	0.000		0.540	0.093	0.000	
	COMRF	-4.597	0.715	0.000		-4.344	0.615	0.000	
	RIO	5.966	1.728	0.001		6.333	0.775	0.000	
	SSDSac	-0.844	0.721	0.242		-1.220	0.386	0.002	
	$COMRF^2$	-1.382	0.571	0.016		-1.445	0.533	0.007	
	RIO^2	-18.702	1.870	0.000		-18.637	1.824	0.000	
	$SSDSac^2$	-1.182	0.278	0.000		-1.153	0.275	0.000	
	COMRF.RIO	-0.313	1.874	0.867					
	COMRF.SSDSac	0.396	0.724	0.585					
	RIO.SSDSac	9.881	1.298	0.000		9.822	1.286	0.000	

Table 7. Estimates of regression coefficients (Est) with standard errors (SE) and significance levels (Sig) for full and reduced models, where the full models are the ones accounting for most variation for each moving average (MA) period. In some cases the model cannot be reduced. The percentage of the variation in salvage numbers accounted for is shown for all models. This table is for models fitted with all December and January daily data, with the variable CCET omitted. With these models Banks salvage is predicted three days in advance.

		Full Model			%	Reduced Model			%
MA		Est	SE	Sig	Explained	Est	SE	Sig	Explained
1	Constant	-3.444	0.885		64.5	-3.318	0.865		64.4
	LnNov1	0.364	0.062	0.000		0.365	0.061	0.000	
	COMRF	-3.606	0.537	0.000		-3.309	0.249	0.000	
	RIO	4.809	0.414	0.000		4.747	0.408	0.000	
	WEST	-1.661	0.544	0.002		-1.805	0.461	0.000	
	$COMRF^2$	-0.169	0.281	0.548					
	RIO^2	-0.607	0.226	0.007		-0.709	0.204	0.001	
	$WEST^2$	0.370	0.315	0.241					
	COMRF.RIO	3.486	0.387	0.000		3.230	0.301	0.000	
	COMRF.WEST	-3.303	0.568	0.000		-3.225	0.458	0.000	
	RIO.WEST	-2.427	0.452	0.000		-2.046	0.366	0.000	
2	Constant	-4.694	0.910		67.6	-4.739	0.910		67.6
	LnNov1	0.399	0.060	0.000		0.400	0.060	0.000	
	COMRF	-5.269	0.750	0.000		-5.498	0.704	0.000	
	RIO	5.188	0.441	0.000		4.987	0.365	0.000	
	WEST	-1.694	0.579	0.004		-1.480	0.516	0.004	
	$COMRF^2$	-0.578	0.377	0.125		-0.703	0.348	0.044	
	RIO^2	-0.200	0.240	0.406					
	$WEST^2$	0.905	0.373	0.016		0.983	0.358	0.006	
	COMRF.RIO	4.838	0.483	0.000		4.946	0.465	0.000	
	COMRF.WEST	-4.246	0.661	0.000		-4.201	0.659	0.000	
	RIO.WEST	-3.394	0.522	0.000		-3.705	0.359	0.000	
3	Constant	-5.636	0.938		68.9	-5.538	0.885		68.7
	LnNov1	0.432	0.060	0.000		0.431	0.059	0.000	
	COMRF	-6.178	0.821	0.000		-6.460	0.642	0.000	
	RIO	5.620	0.488	0.000		5.169	0.339	0.000	
	WEST	-1.666	0.641	0.010		-1.113	0.536	0.038	
	$COMRF^2$	-0.815	0.395	0.040		-1.041	0.310	0.001	
	RIO^2	-0.240	0.261	0.358					
	$WEST^2$	0.451	0.416	0.279					
	COMRF.RIO	5.364	0.555	0.000		5.264	0.463	0.000	
	COMRF.WEST	-3.996	0.729	0.000		-3.325	0.591	0.000	
	RIO.WEST	-3.102	0.577	0.000		-3.192	0.263	0.000	
4	Constant	-6.863	0.978		69.9				
	LnNov1	0.553	0.065	0.000					
	COMRF	-6.200	0.715	0.000					
	RIO	9.389	0.864	0.000					
	SSDSac	-1.995	0.328	0.000					
	$COMRF^2$	-2.143	0.411	0.000					
	RIO^2	-6.687	0.634	0.000					
	$SSDSac^2$	-0.039	0.016	0.015					
	COMRF.RIO	3.958	0.723	0.000					
	COMRF.SSDSac	-0.654	0.220	0.003					
	RIO.SSDSac	2.420	0.260	0.000					

Table 7, Continued.

MA		Full Model Est	SE	Sig	% Explained	Reduced Model Est	SE	Sig	% Explained
5	Constant	-7.475	0.987		70.6				
	LnNov1	0.591	0.065	0.000					
	COMRF	-6.274	0.723	0.000					
	RIO	9.689	0.935	0.000					
	SSDSac	-1.988	0.349	0.000					
	$COMRF^2$	-2.040	0.412	0.000					
	RIO^2	-7.298	0.696	0.000					
	$SSDSac^2$	-0.063	0.018	0.000					
	COMRF.RIO	4.322	0.794	0.000					
	COMRF.SSDSac	-0.730	0.245	0.003					
	RIO.SSDSac	2.646	0.285	0.000					
6	Constant	-6.303	0.921		70.7	-6.170	0.914		70.5
	LnNov1	0.509	0.060	0.000		0.515	0.060	0.000	
	COMRF	-5.428	0.781	0.000		-4.427	0.398	0.000	
	RIO	6.174	0.598	0.000		6.386	0.559	0.000	
	WEST	-1.814	0.820	0.027		-2.792	0.534	0.000	
	$COMRF^2$	-0.627	0.429	0.144					
	RIO^2	-1.269	0.378	0.001		-1.575	0.239	0.000	
	$WEST^2$	-2.261	0.619	0.000		-2.225	0.378	0.000	
	COMRF.RIO	4.489	0.665	0.000		4.083	0.530	0.000	
	COMRF.WEST	-1.655	1.016	0.104		-2.488	0.685	0.000	
	RIO.WEST	-0.593	0.837	0.479					
7	Constant	-6.205	0.909		70.6	-6.172	0.903	0.000	70.5
	LnNov1	0.527	0.061	0.000		0.533	0.061	0.000	
	COMRF	-4.777	0.751	0.000		-4.205	0.380	0.000	
	RIO	6.173	0.617	0.000		6.299	0.572	0.000	
	WEST	-1.859	0.854	0.030		-2.480	0.513	0.000	
	$COMRF^2$	-0.456	0.450	0.312					
	RIO^2	-1.592	0.410	0.000		-1.681	0.260	0.000	
	$WEST^2$	-2.914	0.689	0.000		-2.629	0.399	0.000	
	COMRF.RIO	4.028	0.698	0.000		3.995	0.542	0.000	
	COMRF.WEST	-1.007	1.122	0.370		-1.868	0.662	0.005	
	RIO.WEST	-0.004	0.904	0.997					
8	Constant	-6.190	0.912		70.1	-6.200	0.907	0.000	70.1
	LnNov1	0.542	0.062	0.000		0.546	0.062	0.000	
	COMRF	-4.376	0.723	0.000		-4.084	0.379	0.000	
	RIO	6.134	0.639	0.000		6.206	0.591	0.000	
	WEST	-1.888	0.877	0.032		-2.241	0.511	0.000	
	$COMRF^2$	-0.293	0.466	0.529					
	RIO^2	-1.757	0.445	0.000		-1.755	0.285	0.000	
	$WEST^2$	-3.169	0.765	0.000		-2.872	0.427	0.000	
	COMRF.RIO	3.827	0.757	0.000		3.930	0.568	0.000	
	COMRF.WEST	-0.772	1.230	0.530		-1.441	0.666	0.031	
	RIO.WEST	0.187	0.985	0.849					

Table 7, Continued.

MA		Full Model Est	SE	Sig	% Explained	Reduced Model Est	SE	Sig	% Explained
9	Constant	-6.304	0.922		69.7	-6.082	0.892		69.5
	LnNov1	0.560	0.063	0.000		0.566	0.063	0.000	
	COMRF	-4.025	0.723	0.000		-3.689	0.272	0.000	
	RIO	6.142	0.670	0.000		5.347	0.376	0.000	
	WEST	-2.112	0.916	0.021		-1.325	0.245	0.000	
	$COMRF^2$	-0.041	0.514	0.936					
	RIO^2	-1.891	0.488	0.000		-1.643	0.284	0.000	
	$WEST^2$	-3.292	0.857	0.000		-3.497	0.397	0.000	
	COMRF.RIO	3.735	0.836	0.000		3.067	0.273	0.000	
	COMRF.WEST	-0.897	1.366	0.511					
	RIO.WEST	0.305	1.092	0.780					
10	Constant	-8.892	1.062		69.2	-8.898	1.057		69.2
	LnNov1	0.729	0.072	0.000		0.729	0.072	0.000	
	COMRF	-5.108	0.809	0.000		-5.112	0.812	0.000	
	RIO	4.187	1.174	0.000		4.144	0.641	0.000	
	SSDSac	0.244	0.483	0.613		0.264	0.200	0.187	
	$COMRF^2$	-1.434	0.540	0.008		-1.432	0.540	0.008	
	RIO^2	-5.252	0.855	0.000		-5.248	0.847	0.000	
	$SSDSac^2$	-0.288	0.047	0.000		-0.289	0.043	0.000	
	COMRF.RIO	1.175	1.239	0.343		1.126	0.546	0.040	
	COMRF.SSDSac	-0.022	0.491	0.965					
	RIO.SSDSac	2.036	0.405	0.000		2.036	0.404	0.000	
11	Constant	-9.172	1.089		68.8	-8.715	1.044		68.7
	LnNov1	0.752	0.074	0.000		0.744	0.073	0.000	
	COMRF	-4.956	0.817	0.000		-4.336	0.682	0.000	
	RIO	3.086	1.241	0.013		2.968	0.468	0.000	
	SSDSac	0.685	0.519	0.187		0.391	0.204	0.056	
	$COMRF^2$	-1.287	0.555	0.021		-1.108	0.523	0.034	
	RIO^2	-5.471	0.896	0.000		-5.434	0.890	0.000	
	$SSDSac^2$	-0.347	0.053	0.000		-0.331	0.047	0.000	
	COMRF.RIO	0.222	1.360	0.871					
	COMRF.SSDSac	0.322	0.555	0.562					
	RIO.SSDSac	2.221	0.436	0.000		2.226	0.433	0.000	
12	Constant	-9.593	1.134		68.3	-9.434	1.120		68.2
	LnNov1	0.771	0.076	0.000		0.767	0.075	0.000	
	COMRF	-5.243	0.895	0.000		-5.211	0.881	0.000	
	RIO	1.251	1.309	0.340		2.748	0.489	0.000	
	SSDSac	1.548	0.551	0.005		0.976	0.299	0.001	
	$COMRF^2$	-1.363	0.599	0.023		-1.442	0.587	0.014	
	RIO^2	-6.000	0.937	0.000		-6.018	0.947	0.000	
	$SSDSac^2$	-0.431	0.060	0.000		-0.400	0.055	0.000	
	COMRF.RIO	-1.814	1.481	0.221					
	COMRF.SSDSac	1.247	0.611	0.042		0.561	0.247	0.024	
	RIO.SSDSac	2.548	0.468	0.000		2.449	0.465	0.000	

Table 7, Continued.

MA		Full Model Est	SE	Sig	% Explained	Reduced Model Est	SE	Sig	% Explained
13	Constant	-9.155	1.164		68.1				
	LnNov1	0.859	0.085	0.000					
	COMRF	-4.030	0.650	0.000					
	RIO	2.249	0.858	0.009					
	XGEO	2.387	0.543	0.000					
	$COMRF^2$	-1.910	0.485	0.000					
	RIO^2	-8.772	0.989	0.000					
	$XGEO^2$	-1.191	0.255	0.000					
	COMRF.RIO	-4.171	1.170	0.000					
	COMRF.XGEO	3.799	0.671	0.000					
	RIO.XGEO	5.511	0.914	0.000					
14	Constant	-9.475	1.177		68.1				
	LnNov1	0.901	0.086	0.000					
	COMRF	-3.827	0.628	0.000					
	RIO	2.000	0.839	0.017					
	XGEO	2.738	0.553	0.000					
	$COMRF^2$	-1.946	0.487	0.000					
	RIO^2	-9.684	1.035	0.000					
	$XGEO^2$	-1.251	0.261	0.000					
	COMRF.RIO	-4.835	1.177	0.000					
	COMRF.XGEO	4.286	0.689	0.000					
	RIO.XGEO	5.926	0.937	0.000					

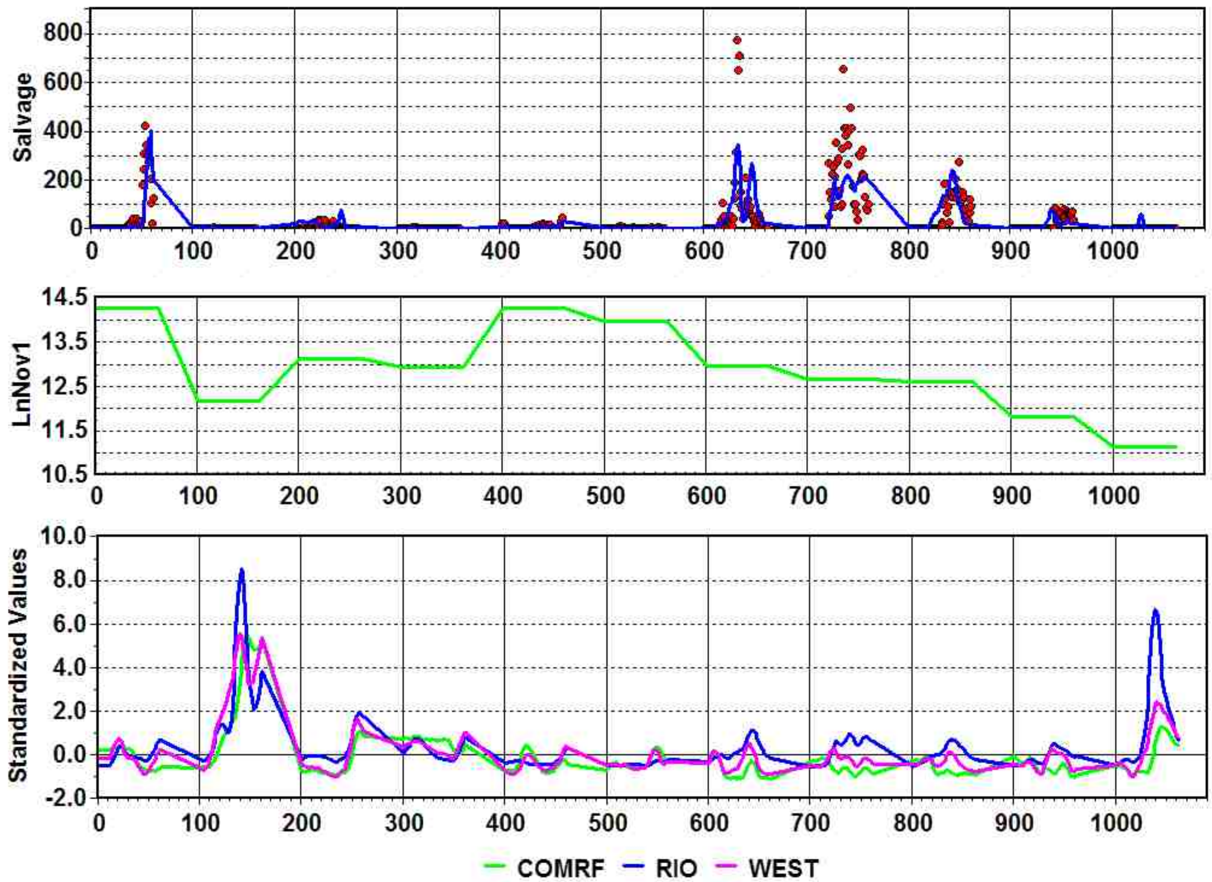

Figure 5 The top graph shows the observed (!) and predicted (—) Banks salvage numbers when the best fitting equation from those listed in Appendix B is simplified by removing the non-significant terms in the equation ($COMRF^2$ and RIO.WEST) and used to estimate the salvage for every December and January day, the middle graph shows the logarithms of abundance estimates (horizontal lines), and the bottom graph shows the standardized values of the three explanatory variables used. The horizontal scale gives the day in the water year with December 1, 1995 starting at 1, December 1, 1996 starting at day 101, and so on up to December 1, 2005 starting at 1001. The variables used in the equation are ten day averages.

The best fitting model in Appendix C (all models including LnNov1 and a general quadratic involving COMRF and two other variables, used to predict the daily Banks salvage numbers three days ahead) accounts for 80.9% of the variation in the daily salvage numbers. It uses 13 day averaging and includes the variables LnNov1, COMRF, RIO and SSDSSac. As this model does not involve the variable CCET that has missing values it is better to fit the model to all of the daily data with the variable CCET removed. In that case Appendix D shows that this equation accounts for 68.0% of the variation in daily salvage numbers, and is not the equation giving the best fit.

The best equation shown in Appendix D includes the variables LnNov1, COMRF, RIO and WEST, uses six day averaging, and accounts for 70.7% of the variation in daily salvage numbers. This is about 5% less than the variation accounted for when predicting only one day ahead. As shown in Table 7, this best fitting equation can be simplified by removing the non-significant terms $COMRF^2$ and RIO.WEST to give the reduced equation

$$E(Salvage) = Exp\{-6.170 + 0.515(LnNov1) - 4.427(COMRF) + 6.386(RIO) - 2.792(WEST) - 1.575(RIO)^2 - 2.225(WEST)^2 + 4.083(COMRF.RIO) - 2.488(COMRF.WEST)\}, \quad (2)$$

which accounts for 70.5% of the variation in the salvage numbers. It is interesting that this equation contains the same variables as equation (1) for estimating salvage one day ahead, with rather similar coefficients for these variables. However, here there is six day averaging of variables whereas the one day ahead equation uses ten day averaging. Figure 6 shows how well the reduced equation is able to predict the Banks daily salvage three days ahead.

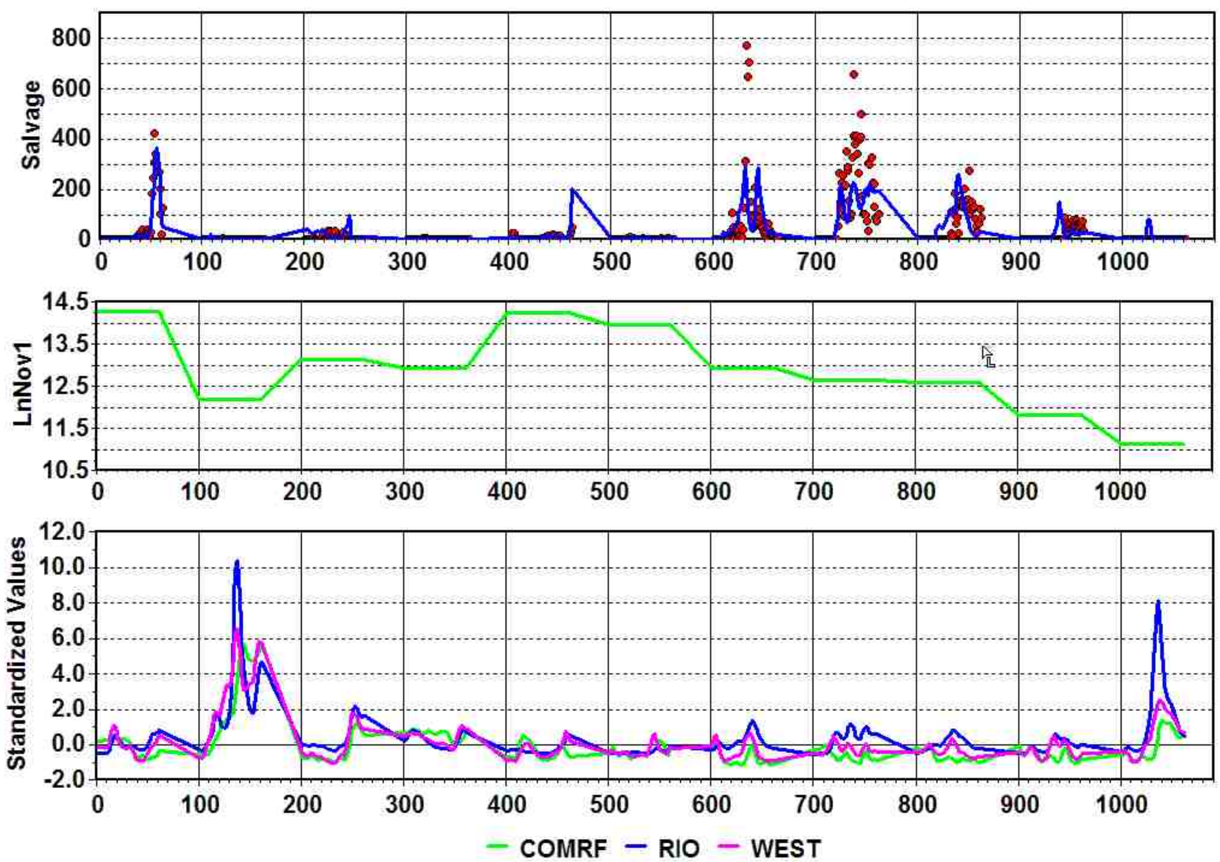

Figure 6. The top graph shows the observed (!) and predicted (—) Banks salvage numbers when the best fitting equation from those listed in Appendix D is simplified by removing the non-significant terms in the equation ($COMRF^2$ and RIO.WEST) and used to estimate the salvage for every December and January day three days ahead. The middle graph shows the logarithms of abundance estimates (horizontal lines), and the bottom graph shows the standardized values of the three explanatory variables used. The horizontal scale gives the day in the water year with December 1, 1995 starting at 1, December 1, 1996 starting at day 101, and so on up to December 1, 2005 starting at 1001. The variables used in the equation are six day averages.

In summary, it is suggested that equation (1) is about the best available for predicting the Banks salvage one day ahead, and equation (2) is about the best available for predicting the Banks salvage three days ahead. If necessary it is easily possible to produce equations for prediction any number of days ahead.

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Appendix A, Models for Banks Salvage

There were 392 models examined for predicting the Banks daily salvage numbers, with 28 models for each of the moving averages (MA) from 1 (no averaging of explanatory variables) to 14 days (averaging for 14 days). In this appendix the percentage of variation explained (% Exp), the estimated parameter values (b0 to b10), and estimated standard errors for the parameter values (SE) are given for each model in the order in which the models were estimated. For each order of averaging the model that accounts for the most variation in the salvage numbers is shown with bold, red type. These estimates were obtained only using the daily data with no missing values for any variable.

Model	% Exp	MA	X1	X2	X3	b0	SE	b1	SE	b2	SE	b3	SE	b4	SE	b5	SE	b6	SE	b7	SE	b8	SE	b9	SE	b10	SE
1	65.43	1	COMRF	RIO	SJR	-0.265	1.303	0.059	0.096	-5.459	0.720	3.217	0.677	3.793	1.064	-2.141	0.593	-0.891	0.327	-0.217	0.917	3.853	0.590	4.396	1.368	-7.423	1.177
2	63.47	1	COMRF	RIO	XGEO	-3.869	1.172	0.321	0.083	-5.705	0.766	5.442	0.914	-0.527	0.465	-1.410	0.414	-7.211	0.850	-2.097	0.266	2.918	0.869	-0.304	0.469	7.349	0.989
3	67.30	1	COMRF	RIO	CCET	-4.033	1.178	0.372	0.083	-4.286	0.718	2.601	0.588	5.015	0.716	-1.094	0.383	-1.134	0.289	-2.830	0.440	0.829	0.489	1.935	0.618	0.380	0.462
4	72.10	1	COMRF	RIO	CCETM	-1.424	0.970	0.173	0.070	-4.455	0.725	2.007	0.552	4.751	0.582	-1.411	0.386	-1.238	0.294	-2.524	0.319	0.361	0.464	1.818	0.555	1.888	0.473
5	69.57	1	COMRF	RIO	WEST	1.193	1.189	-0.058	0.088	-4.400	0.879	6.589	0.709	-1.174	0.896	-4.804	0.860	-3.726	0.533	-5.833	1.148	-1.912	1.021	8.664	1.752	5.895	1.408
6	64.21	1	COMRF	RIO	SSDSac	-0.834	1.124	0.091	0.079	-5.546	0.722	8.980	0.958	-2.093	0.416	-1.798	0.428	-6.233	0.783	-0.185	0.076	3.624	0.801	-0.640	0.277	2.787	0.492
7	67.09	1	COMRF	RIO	SSDSJ	-0.767	1.355	-0.016	0.095	-6.905	1.022	5.458	0.604	0.379	0.462	-2.396	0.591	-1.234	0.306	0.412	0.123	3.427	0.561	1.313	0.403	-2.060	0.355
8	57.11	1	COMRF	SJR	XGEO	3.259	1.191	-0.126	0.087	-4.258	0.695	3.445	0.827	1.551	0.306	-1.974	0.578	-4.536	1.239	-0.303	0.062	6.356	1.347	1.883	0.317	-2.994	0.489
9	70.86	1	COMRF	SJR	CCET	-0.270	1.193	0.091	0.087	-1.221	0.462	-4.855	1.040	8.114	0.744	-2.206	0.493	-5.349	1.229	-4.881	0.461	6.337	1.412	-1.431	0.906	6.760	1.353
10	**73.57**	**1**	**COMRF**	**SJR**	**CCETM**	**1.677**	**1.119**	**-0.069**	**0.080**	**-2.366**	**0.480**	**-3.911**	**0.747**	**8.623**	**0.652**	**-2.409**	**0.456**	**-2.194**	**0.933**	**-4.817**	**0.338**	**3.988**	**1.264**	**0.453**	**0.711**	**4.529**	**0.904**
11	50.12	1	COMRF	SJR	WEST	3.611	1.096	-0.153	0.082	-7.711	1.113	1.291	0.916	5.673	0.906	-6.438	1.080	-2.459	1.223	-4.949	0.662	5.302	1.673	10.228	1.414	-1.901	1.470
12	53.03	1	COMRF	SJR	SSDSac	0.082	1.244	0.002	0.090	-5.146	0.728	1.704	0.974	2.168	0.228	-1.691	0.608	-1.920	0.949	-0.326	0.039	3.876	1.345	1.464	0.222	-1.126	0.332
13	37.69	1	COMRF	SJR	SSDSJ	2.754	1.260	-0.141	0.082	-2.921	0.851	-4.472	2.913	3.044	1.238	-0.640	0.622	-7.370	5.330	-1.010	0.630	1.648	2.487	1.478	0.757	3.651	3.344
14	68.50	1	COMRF	XGEO	CCET	-5.330	1.173	0.497	0.082	-4.349	0.604	1.136	0.235	6.267	0.620	-1.200	0.330	-0.334	0.054	-3.688	0.400	0.419	0.236	2.151	0.590	-0.004	0.220
15	73.41	1	COMRF	XGEO	CCETM	-2.530	0.955	0.263	0.068	-4.859	0.643	1.061	0.236	5.866	0.513	-1.605	0.335	-0.279	0.050	-3.015	0.296	0.447	0.242	1.972	0.525	0.435	0.195
16	62.34	1	COMRF	XGEO	WEST	3.726	1.189	-0.254	0.088	-5.777	0.938	1.864	0.330	1.733	0.901	-3.876	1.043	0.199	0.121	-2.155	0.968	1.316	0.552	6.067	1.898	-1.018	0.552
17	53.21	1	COMRF	XGEO	SSDSac	-1.601	1.219	0.128	0.083	-5.444	0.766	1.050	0.387	1.537	0.297	-1.188	0.415	-0.410	0.156	-0.295	0.081	0.324	0.397	1.007	0.267	0.243	0.207
18	58.15	1	COMRF	XGEO	SSDSJ	1.812	1.209	-0.102	0.086	-5.277	0.748	2.055	0.294	1.671	0.360	-1.459	0.468	-0.226	0.063	-0.209	0.083	1.708	0.314	1.721	0.387	-1.391	0.221
19	69.75	1	COMRF	CCET	CCETM	-5.394	1.118	0.525	0.083	-4.138	0.516	2.156	0.814	6.440	0.743	-1.530	0.310	-2.262	0.645	-3.789	0.512	-0.592	0.794	3.418	0.763	1.021	0.882
20	72.96	1	COMRF	CCET	WEST	-6.285	1.210	0.633	0.089	-5.922	0.881	8.113	0.582	2.782	0.633	-4.299	0.770	-5.189	0.405	-4.623	0.446	2.585	0.710	7.101	1.023	0.874	0.644
21	66.01	1	COMRF	CCET	SSDSac	-4.301	1.135	0.393	0.080	-4.502	0.676	5.787	0.725	0.962	0.210	-1.223	0.357	-3.821	0.462	-0.223	0.033	1.895	0.653	0.329	0.178	0.495	0.196
22	68.89	1	COMRF	CCET	SSDSJ	-0.325	1.129	0.145	0.085	-3.334	0.555	7.905	0.733	-1.242	0.433	-1.910	0.473	-5.437	0.546	-0.279	0.112	1.000	0.878	0.965	0.471	1.921	0.490
23	72.47	1	COMRF	CCETM	WEST	-1.704	0.936	0.258	0.069	-6.645	0.947	6.137	0.513	3.280	0.691	-4.681	0.802	-3.681	0.294	-4.052	0.455	1.817	0.719	6.950	1.087	0.201	0.612
24	69.74	1	COMRF	CCETM	SSDSac	-1.972	0.953	0.219	0.069	-4.253	0.639	5.565	0.601	0.545	0.214	-1.196	0.342	-3.151	0.341	-0.127	0.031	1.899	0.577	0.036	0.173	0.625	0.170
25	71.16	1	COMRF	CCETM	SSDSJ	1.261	1.024	0.013	0.077	-3.652	0.509	7.908	0.554	-1.102	0.341	-2.005	0.362	-4.905	0.356	-0.016	0.041	1.739	0.640	0.748	0.322	1.394	0.387
26	59.89	1	COMRF	WEST	SSDSac	1.178	1.194	-0.044	0.087	-4.931	0.974	1.365	1.007	1.863	0.272	-4.434	0.939	-6.958	1.113	-0.329	0.060	10.751	1.721	-0.340	0.368	1.434	0.448
27	49.97	1	COMRF	WEST	SSDSJ	2.490	1.101	-0.095	0.081	-7.950	1.156	5.297	0.845	0.827	0.332	-5.272	1.043	-4.618	0.682	-0.050	0.117	8.797	1.437	1.865	0.486	-0.900	0.477
28	53.91	1	COMRF	SSDSac	SSDSJ	-0.893	1.232	0.041	0.087	-5.921	0.844	2.285	0.242	1.172	0.409	-1.483	0.507	-0.285	0.040	-0.098	0.083	1.380	0.227	1.324	0.391	-0.621	0.136
29	68.42	2	COMRF	RIO	SJR	-1.032	1.302	0.096	0.095	-6.573	0.839	3.010	0.588	5.111	1.156	-2.904	0.695	-0.518	0.274	-1.134	0.969	4.015	0.574	6.158	1.570	-7.758	1.098
30	67.45	2	COMRF	RIO	XGEO	-5.350	1.182	0.406	0.082	-6.434	0.837	5.574	0.920	-0.459	0.473	-1.633	0.466	-7.755	0.811	-2.297	0.244	3.055	0.898	-0.183	0.494	8.083	0.895
31	70.33	2	COMRF	RIO	CCET	-5.119	1.211	0.418	0.081	-5.295	0.919	2.459	0.569	4.824	0.773	-1.624	0.495	-0.896	0.246	-2.803	0.471	0.868	0.497	1.741	0.696	1.050	0.435
32	73.68	2	COMRF	RIO	CCETM	-2.158	0.989	0.197	0.070	-5.375	0.891	1.987	0.497	4.670	0.621	-1.924	0.497	-0.974	0.253	-2.435	0.317	0.443	0.430	1.764	0.634	1.967	0.453
33	71.06	2	COMRF	RIO	WEST	-0.267	1.231	0.040	0.089	-5.677	1.054	6.045	0.639	-0.182	0.903	-6.235	1.005	-3.709	0.523	-7.008	1.211	-2.999	1.059	10.998	1.894	6.949	1.451

34	67.30	2	COMRF	RIO	SSDSac	-1.489	1.139	0.135	0.079	-5.969	0.783	9.759	1.065	-2.593	0.434	-2.130	0.483	-6.966	0.863	-0.168	0.087	3.964	0.951	-0.839	0.333	3.183	0.519
35	69.13	2	COMRF	RIO	SSDSJ	-1.952	1.385	0.041	0.095	-8.216	1.147	5.302	0.567	1.322	0.543	-3.070	0.666	-0.881	0.255	0.212	0.136	3.646	0.558	2.052	0.514	-2.322	0.373
36	60.77	2	COMRF	SJR	XGEO	2.150	1.215	-0.064	0.087	-5.006	0.799	4.249	0.916	1.767	0.322	-2.271	0.646	-5.678	1.309	-0.279	0.059	7.572	1.471	2.258	0.336	-3.387	0.489
37	74.03	2	COMRF	SJR	CCET	-0.675	1.196	0.123	0.086	-0.948	0.573	-5.407	1.146	8.688	0.809	-3.026	0.565	-7.543	1.442	-5.757	0.494	8.999	1.475	-2.912	0.947	9.253	1.434
38	75.08	2	COMRF	SJR	CCETM	0.915	1.156	-0.017	0.084	-2.226	0.503	-4.553	0.696	9.179	0.601	-3.081	0.502	-3.553	1.181	-5.470	0.401	5.826	1.437	-0.560	0.732	6.720	1.039
39	52.44	2	COMRF	SJR	WEST	2.332	1.127	-0.071	0.082	-7.927	1.125	1.600	0.927	5.775	0.876	-6.147	1.036	-2.740	1.220	-4.782	0.597	6.037	1.681	10.016	1.340	-2.635	1.369
40	54.98	2	COMRF	SJR	SSDSac	-0.785	1.301	0.062	0.092	-5.400	0.798	2.285	1.081	2.031	0.231	-1.688	0.683	-2.547	1.172	-0.297	0.037	4.511	1.557	1.368	0.221	-1.234	0.336
41	39.51	2	COMRF	SJR	SSDSJ	1.718	1.320	-0.105	0.084	-3.128	0.950	-7.158	3.344	4.612	1.417	-0.316	0.696	-10.001	5.876	-1.825	0.785	0.915	2.531	1.857	0.775	6.394	3.929
42	71.47	2	COMRF	XGEO	CCET	-7.202	1.191	0.607	0.080	-5.002	0.706	1.210	0.257	6.301	0.652	-1.384	0.383	-0.296	0.050	-3.650	0.404	0.547	0.266	2.103	0.644	0.291	0.207
43	**75.20**	**2**	**COMRF**	**XGEO**	**CCETM**	**-4.069**	**0.998**	**0.329**	**0.068**	**-6.030**	**0.780**	**1.415**	**0.251**	**5.813**	**0.557**	**-2.087**	**0.404**	**-0.229**	**0.047**	**-2.802**	**0.287**	**0.870**	**0.266**	**2.033**	**0.606**	**0.587**	**0.192**
44	64.17	2	COMRF	XGEO	WEST	1.900	1.216	-0.150	0.087	-7.230	1.139	1.808	0.328	2.759	0.984	-4.703	1.233	0.275	0.127	-2.635	1.080	1.331	0.582	7.225	2.112	-0.906	0.623
45	55.07	2	COMRF	XGEO	SSDSac	-2.956	1.255	0.217	0.085	-5.343	0.761	1.283	0.413	1.300	0.278	-0.806	0.416	-0.384	0.162	-0.259	0.080	0.615	0.429	0.731	0.248	0.230	0.213
46	61.37	2	COMRF	XGEO	SSDSJ	0.278	1.259	-0.031	0.088	-6.276	0.875	2.413	0.313	1.842	0.438	-1.669	0.520	-0.190	0.059	-0.234	0.131	2.132	0.333	1.685	0.425	-1.449	0.215
47	70.98	2	COMRF	CCET	CCETM	-5.555	1.105	0.525	0.082	-4.734	0.604	1.527	0.916	7.148	0.872	-1.959	0.378	-2.383	0.711	-3.737	0.526	-1.616	0.938	4.479	0.934	0.995	0.894
48	74.47	2	COMRF	CCET	WEST	-7.126	1.221	0.707	0.090	-4.718	0.900	8.750	0.680	1.558	0.672	-2.868	0.790	-5.789	0.433	-4.258	0.422	2.832	0.819	5.149	1.030	1.231	0.622
49	68.40	2	COMRF	CCET	SSDSac	-4.788	1.141	0.426	0.079	-4.534	0.699	6.065	0.764	0.753	0.219	-1.176	0.370	-4.142	0.498	-0.200	0.033	2.142	0.699	0.169	0.182	0.722	0.194
50	71.79	2	COMRF	CCET	SSDSJ	-0.850	1.118	0.182	0.084	-3.860	0.598	8.037	0.760	-1.220	0.395	-2.698	0.527	-6.423	0.526	-0.260	0.081	0.075	0.976	1.416	0.486	2.331	0.412
51	72.98	2	COMRF	CCETM	WEST	-2.805	0.957	0.325	0.069	-7.257	1.052	5.933	0.545	3.603	0.722	-4.848	0.863	-3.693	0.303	-3.882	0.446	1.642	0.779	6.869	1.104	0.137	0.605
52	71.14	2	COMRF	CCETM	SSDSac	-2.471	0.969	0.245	0.069	-4.606	0.741	5.533	0.643	0.555	0.209	-1.383	0.425	-3.153	0.350	-0.121	0.032	1.861	0.648	0.037	0.166	0.644	0.168
53	72.35	2	COMRF	CCETM	SSDSJ	0.910	1.058	0.041	0.080	-3.742	0.547	8.155	0.603	-1.302	0.396	-2.244	0.423	-5.308	0.373	-0.013	0.076	1.529	0.741	0.799	0.416	1.695	0.402
54	62.30	2	COMRF	WEST	SSDSac	0.648	1.220	-0.006	0.088	-5.240	1.077	1.899	1.089	1.638	0.275	-5.417	1.071	-8.662	1.254	-0.367	0.067	13.565	1.918	-1.074	0.407	2.162	0.528
55	52.47	2	COMRF	WEST	SSDSJ	1.309	1.133	-0.018	0.082	-7.944	1.215	5.258	0.907	1.086	0.448	-4.667	1.062	-4.316	0.643	-0.045	0.156	8.111	1.436	2.355	0.597	-1.392	0.532
56	56.04	2	COMRF	SSDSac	SSDSJ	-1.841	1.296	0.098	0.089	-6.296	1.007	2.154	0.254	1.393	0.518	-1.496	0.607	-0.252	0.038	-0.138	0.144	1.292	0.234	1.373	0.457	-0.667	0.141
57	70.50	3	COMRF	RIO	SJR	-1.922	1.332	0.150	0.096	-7.572	0.976	2.868	0.519	6.485	1.287	-3.661	0.816	-0.238	0.227	-2.119	1.059	4.388	0.596	7.949	1.817	-8.378	1.085
58	69.33	3	COMRF	RIO	XGEO	-6.420	1.232	0.473	0.084	-6.541	0.806	5.586	0.876	-0.464	0.471	-1.457	0.439	-7.615	0.781	-2.308	0.235	3.152	0.868	-0.205	0.496	8.074	0.855
59	71.89	3	COMRF	RIO	CCET	-5.451	1.249	0.429	0.081	-5.585	0.976	2.233	0.530	5.317	0.798	-1.701	0.509	-0.704	0.188	-2.992	0.495	0.727	0.482	2.295	0.742	1.081	0.391
60	74.57	3	COMRF	RIO	CCETM	-2.774	1.024	0.242	0.072	-5.263	0.886	1.959	0.454	4.509	0.630	-1.783	0.494	-0.811	0.212	-2.387	0.325	0.447	0.404	1.611	0.656	1.788	0.421
61	71.16	3	COMRF	RIO	WEST	-1.377	1.306	0.123	0.094	-5.722	1.070	5.566	0.571	0.090	0.871	-5.418	0.968	-2.929	0.483	-5.503	1.097	-1.961	0.986	8.995	1.744	5.040	1.330
62	69.90	3	COMRF	RIO	SSDSac	-2.293	1.151	0.181	0.079	-6.574	0.812	11.165	1.167	-3.168	0.464	-2.470	0.507	-8.038	0.920	-0.274	0.095	5.248	1.031	-1.329	0.357	3.922	0.553
63	70.94	3	COMRF	RIO	SSDSJ	-2.951	1.407	0.103	0.096	-9.141	1.174	5.081	0.504	2.310	0.588	-3.662	0.712	-0.628	0.206	0.007	0.145	3.821	0.530	2.895	0.582	-2.760	0.397
64	62.94	3	COMRF	SJR	XGEO	1.291	1.256	0.007	0.090	-5.054	0.847	4.681	0.981	1.722	0.323	-2.325	0.708	-6.667	1.388	-0.264	0.058	8.385	1.609	2.341	0.333	-3.734	0.503
65	75.51	3	COMRF	SJR	CCET	0.221	1.197	0.043	0.086	-0.141	0.613	-6.960	1.285	9.510	0.893	-2.930	0.629	-10.497	1.795	-5.899	0.536	10.657	1.684	-2.988	1.057	10.955	1.543
66	75.89	3	COMRF	SJR	CCETM	1.998	1.175	-0.091	0.085	-1.820	0.540	-5.180	0.828	9.481	0.661	-3.591	0.583	-6.690	1.686	-5.477	0.418	8.307	1.794	-0.899	0.822	8.123	1.266
67	53.76	3	COMRF	SJR	WEST	1.600	1.165	-0.011	0.085	-8.023	1.077	2.162	0.947	5.717	0.804	-6.366	1.059	-3.168	1.299	-4.764	0.561	7.507	1.761	10.254	1.301	-3.924	1.342
68	56.45	3	COMRF	SJR	SSDSac	-1.631	1.386	0.131	0.095	-5.296	0.865	2.483	1.123	1.909	0.234	-1.442	0.738	-2.864	1.377	-0.273	0.037	4.506	1.678	1.318	0.220	-1.378	0.344
69	40.77	3	COMRF	SJR	SSDSJ	0.853	1.384	-0.073	0.086	-2.754	1.042	-12.103	3.746	7.092	1.585	0.216	0.768	-17.399	6.402	-3.414	0.922	0.402	2.761	2.137	0.872	12.532	4.412
70	72.87	3	COMRF	XGEO	CCET	-8.057	1.230	0.657	0.081	-5.139	0.712	1.201	0.261	6.568	0.680	-1.303	0.367	-0.266	0.049	-3.682	0.418	0.542	0.273	2.431	0.684	0.357	0.200
71	**76.28**	**3**	**COMRF**	**XGEO**	**CCETM**	**-5.339**	**1.048**	**0.415**	**0.070**	**-5.998**	**0.757**	**1.541**	**0.249**	**5.629**	**0.559**	**-1.893**	**0.371**	**-0.196**	**0.046**	**-2.673**	**0.290**	**1.010**	**0.266**	**1.894**	**0.621**	**0.616**	**0.185**
72	65.23	3	COMRF	XGEO	WEST	0.924	1.255	-0.085	0.089	-7.460	1.213	1.826	0.321	2.858	1.013	-4.531	1.308	0.318	0.125	-2.389	1.047	1.480	0.590	6.786	2.152	-1.033	0.613
73	56.60	3	COMRF	XGEO	SSDSac	-4.146	1.285	0.301	0.086	-5.285	0.754	1.388	0.420	1.199	0.266	-0.586	0.407	-0.457	0.169	-0.273	0.080	0.794	0.443	0.555	0.242	0.330	0.220
74	63.72	3	COMRF	XGEO	SSDSJ	-0.737	1.319	0.028	0.091	-6.831	0.935	2.498	0.302	2.140	0.477	-1.917	0.572	-0.167	0.057	-0.283	0.158	2.275	0.327	1.955	0.486	-1.559	0.210
75	71.52	3	COMRF	CCET	CCETM	-5.537	1.112	0.525	0.082	-4.687	0.619	2.134	0.972	6.867	0.910	-1.888	0.392	-3.307	0.809	-3.990	0.597	-0.920	1.041	4.174	1.016	1.942	1.113
76	75.51	3	COMRF	CCET	WEST	-6.581	1.190	0.680	0.087	-3.695	0.602	9.649	0.618	0.723	0.551	-1.786	0.432	-6.349	0.453	-4.112	0.386	3.872	0.705	3.867	0.807	1.100	0.600

77	69.64	3	COMRF	CCET	SSDSac	-5.082	1.172	0.445	0.079	-4.481	0.689	6.357	0.805	0.676	0.222	-1.047	0.355	-4.314	0.535	-0.188	0.033	2.490	0.754	0.089	0.186	0.754	0.188
78	73.44	3	COMRF	CCET	SSDSJ	0.076	1.097	0.108	0.084	-4.017	0.638	8.919	0.794	-1.192	0.424	-3.026	0.586	-7.152	0.658	-0.607	0.138	0.431	1.051	2.023	0.571	3.133	0.582
79	73.15	3	COMRF	CCETM	WEST	-3.695	1.010	0.410	0.072	-6.201	1.008	6.248	0.551	3.024	0.734	-3.736	0.827	-3.854	0.320	-3.706	0.436	2.174	0.787	5.803	1.087	-0.265	0.599
80	71.94	3	COMRF	CCETM	SSDSac	-3.064	1.007	0.286	0.071	-4.425	0.693	5.265	0.660	0.684	0.200	-1.106	0.394	-3.069	0.357	-0.130	0.032	1.662	0.669	0.130	0.163	0.600	0.164
81	73.09	3	COMRF	CCETM	SSDSJ	1.907	1.061	-0.031	0.082	-3.944	0.581	8.180	0.593	-1.007	0.415	-2.573	0.475	-5.301	0.370	-0.085	0.115	1.700	0.761	1.193	0.467	1.439	0.402
82	63.59	3	COMRF	WEST	SSDSac	-0.058	1.287	0.042	0.093	-4.859	0.998	1.398	1.101	1.710	0.267	-4.968	1.023	-9.020	1.254	-0.372	0.064	13.389	1.893	-1.100	0.396	2.345	0.513
83	54.13	3	COMRF	WEST	SSDSJ	0.450	1.177	0.041	0.084	-8.349	1.296	5.306	0.939	1.522	0.518	-4.835	1.116	-4.118	0.611	-0.095	0.186	7.928	1.440	3.139	0.687	-1.971	0.569
84	58.30	3	COMRF	SSDSac	SSDSJ	-2.982	1.384	0.155	0.093	-7.142	1.102	2.153	0.248	1.694	0.558	-1.894	0.653	-0.232	0.037	-0.113	0.170	1.346	0.236	1.641	0.517	-0.758	0.138
85	72.84	4	COMRF	RIO	SJR	-3.108	1.383	0.220	0.098	-8.400	1.060	3.016	0.505	7.260	1.337	-4.009	0.867	-0.099	0.214	-2.126	1.071	5.142	0.646	8.422	1.898	-9.276	1.107
86	71.36	4	COMRF	RIO	XGEO	-7.509	1.279	0.525	0.086	-7.472	0.903	6.186	0.901	-0.576	0.476	-1.909	0.490	-7.694	0.782	-2.345	0.231	3.833	0.911	-0.343	0.507	8.163	0.839
87	73.15	4	COMRF	RIO	CCET	-5.958	1.263	0.438	0.081	-6.367	0.992	2.536	0.528	5.410	0.810	-2.089	0.515	-0.661	0.159	-2.958	0.501	1.041	0.475	2.524	0.774	1.024	0.367
88	75.23	4	COMRF	RIO	CCETM	-3.482	1.074	0.289	0.074	-5.440	0.889	2.328	0.469	4.006	0.639	-1.869	0.501	-0.785	0.202	-2.312	0.336	0.802	0.427	1.047	0.672	1.538	0.397
89	71.77	4	COMRF	RIO	WEST	-2.594	1.381	0.192	0.097	-6.303	1.158	5.754	0.567	0.062	0.876	-5.086	0.972	-2.585	0.474	-4.548	1.014	-0.878	0.955	7.450	1.642	3.987	1.267
90	72.34	4	COMRF	RIO	SSDSac	-2.851	1.173	0.213	0.079	-7.048	0.847	11.858	1.230	-3.449	0.499	-2.779	0.524	-9.228	0.979	-0.353	0.102	5.646	1.106	-1.415	0.394	4.676	0.586
91	72.96	4	COMRF	RIO	SSDSJ	-4.088	1.442	0.172	0.097	-9.933	1.161	5.357	0.515	2.765	0.605	-4.078	0.702	-0.601	0.176	-0.059	0.156	4.372	0.554	3.143	0.616	-3.150	0.412
92	64.82	4	COMRF	SJR	XGEO	0.464	1.292	0.071	0.092	-5.061	0.844	4.753	0.980	1.798	0.318	-2.236	0.722	-6.655	1.404	-0.261	0.059	8.229	1.640	2.534	0.328	-4.028	0.511
93	76.42	4	COMRF	SJR	CCET	0.811	1.179	-0.012	0.085	0.232	0.646	-7.923	1.349	10.319	0.921	-2.788	0.652	-11.438	1.918	-6.184	0.535	10.835	1.708	-2.640	1.089	11.586	1.559
94	76.81	4	COMRF	SJR	CCETM	2.661	1.184	-0.135	0.086	-1.517	0.532	-5.586	0.929	9.688	0.703	-4.096	0.613	-8.555	1.797	-5.643	0.430	10.159	1.804	-1.488	0.845	9.339	1.338
95	54.62	4	COMRF	SJR	WEST	0.862	1.215	0.041	0.088	-8.319	1.111	2.309	0.928	5.930	0.821	-6.508	1.067	-3.055	1.247	-4.835	0.567	7.727	1.814	10.503	1.293	-4.316	1.317
96	58.50	4	COMRF	SJR	SSDSac	-2.695	1.436	0.205	0.098	-5.694	0.929	3.049	1.192	1.928	0.240	-1.465	0.806	-2.812	1.416	-0.264	0.039	4.535	1.801	1.505	0.224	-1.701	0.349
97	40.63	4	COMRF	SJR	SSDSJ	0.534	1.415	-0.064	0.087	-2.665	1.092	-14.612	3.987	8.234	1.638	0.394	0.794	-21.234	6.851	-4.174	0.966	-0.076	3.001	2.301	0.998	15.625	4.737
98	74.05	4	COMRF	XGEO	CCET	-8.960	1.258	0.706	0.082	-5.633	0.739	1.393	0.264	6.701	0.699	-1.533	0.375	-0.248	0.048	-3.672	0.422	0.737	0.277	2.606	0.716	0.339	0.195
99	**77.25**	**4**	**COMRF**	**XGEO**	**CCETM**	**-6.326**	**1.077**	**0.493**	**0.072**	**-5.863**	**0.704**	**1.685**	**0.244**	**5.282**	**0.542**	**-1.800**	**0.349**	**-0.190**	**0.046**	**-2.637**	**0.296**	**1.131**	**0.260**	**1.455**	**0.613**	**0.530**	**0.176**
100	66.42	4	COMRF	XGEO	WEST	-0.051	1.288	-0.026	0.090	-7.797	1.253	1.983	0.315	2.885	1.012	-4.213	1.326	0.416	0.122	-1.792	0.984	2.019	0.575	5.736	2.098	-1.485	0.583
101	58.43	4	COMRF	XGEO	SSDSac	-5.437	1.324	0.372	0.087	-6.112	0.843	1.400	0.450	1.416	0.296	-1.005	0.438	-0.544	0.189	-0.352	0.095	0.859	0.474	0.744	0.284	0.506	0.257
102	66.19	4	COMRF	XGEO	SSDSJ	-1.459	1.346	0.078	0.093	-7.149	0.849	2.608	0.269	2.550	0.494	-2.104	0.549	-0.155	0.057	-0.365	0.139	2.504	0.305	2.330	0.552	-1.817	0.205
103	72.01	4	COMRF	CCET	CCETM	-5.174	1.123	0.507	0.083	-4.500	0.603	2.987	1.051	6.166	0.931	-1.820	0.395	-4.942	1.027	-4.924	0.742	0.599	1.147	2.904	1.066	4.345	1.519
104	76.01	4	COMRF	CCET	WEST	-6.239	1.207	0.652	0.088	-3.921	0.618	9.760	0.618	0.940	0.551	-1.850	0.426	-6.457	0.450	-4.163	0.379	4.289	0.731	3.927	0.799	0.772	0.591
105	70.18	4	COMRF	CCET	SSDSac	-5.645	1.228	0.467	0.080	-4.900	0.759	6.416	0.834	0.810	0.235	-1.170	0.381	-4.223	0.542	-0.182	0.035	2.644	0.795	0.216	0.196	0.657	0.182
106	74.55	4	COMRF	CCET	SSDSJ	1.041	1.066	0.032	0.082	-4.247	0.669	9.655	0.820	-1.166	0.431	-3.250	0.610	-7.386	0.629	-0.710	0.168	1.190	1.057	2.081	0.579	3.136	0.577
107	74.03	4	COMRF	CCETM	WEST	-4.997	1.092	0.514	0.078	-6.333	1.034	6.257	0.545	3.210	0.738	-3.816	0.856	-3.987	0.324	-3.882	0.428	2.062	0.794	5.960	1.086	-0.356	0.583
108	72.67	4	COMRF	CCETM	SSDSac	-3.691	1.052	0.325	0.073	-4.470	0.694	4.830	0.671	0.865	0.211	-1.036	0.405	-2.986	0.365	-0.140	0.034	1.206	0.684	0.286	0.171	0.554	0.161
109	73.94	4	COMRF	CCETM	SSDSJ	2.562	1.067	-0.071	0.083	-4.180	0.634	8.094	0.594	-0.701	0.416	-3.021	0.536	-5.477	0.387	-0.254	0.151	1.416	0.787	1.601	0.496	1.520	0.422
110	64.04	4	COMRF	WEST	SSDSac	-0.927	1.352	0.091	0.098	-4.892	0.950	1.096	1.081	1.827	0.283	-4.127	0.951	-7.992	1.202	-0.333	0.061	11.454	1.778	-0.675	0.380	1.982	0.496
111	55.11	4	COMRF	WEST	SSDSJ	-0.393	1.209	0.079	0.087	-9.660	1.280	6.159	0.935	1.432	0.562	-5.776	1.070	-4.236	0.614	-0.048	0.203	8.821	1.422	3.132	0.722	-2.036	0.586
112	61.04	4	COMRF	SSDSac	SSDSJ	-3.947	1.398	0.214	0.095	-7.579	0.951	2.299	0.237	2.228	0.558	-1.986	0.561	-0.240	0.038	-0.218	0.137	1.559	0.224	2.002	0.561	-0.926	0.134
113	74.31	5	COMRF	RIO	SJR	-4.030	1.441	0.282	0.101	-7.982	1.069	3.260	0.527	6.236	1.250	-3.230	0.838	-0.163	0.216	-0.827	1.038	5.226	0.646	6.280	1.790	-8.965	1.058
114	73.92	5	COMRF	RIO	XGEO	-8.717	1.325	0.583	0.087	-8.566	1.006	6.716	0.949	-0.530	0.485	-2.494	0.534	-8.028	0.780	-2.438	0.224	4.390	0.980	-0.292	0.523	8.469	0.813
115	74.13	5	COMRF	RIO	CCET	-6.433	1.266	0.450	0.081	-7.038	1.005	3.059	0.554	4.924	0.824	-2.453	0.531	-0.745	0.164	-2.625	0.497	1.459	0.492	2.278	0.805	1.030	0.365
116	76.26	5	COMRF	RIO	CCETM	-4.188	1.120	0.325	0.076	-6.012	0.946	2.847	0.502	3.414	0.648	-2.215	0.539	-0.884	0.212	-2.138	0.340	1.250	0.471	0.491	0.689	1.510	0.392
117	72.89	5	COMRF	RIO	WEST	-3.514	1.416	0.242	0.099	-7.032	1.270	6.018	0.577	0.206	0.896	-5.388	1.026	-2.646	0.474	-4.372	0.956	-0.533	0.946	7.239	1.602	3.892	1.219
118	74.49	5	COMRF	RIO	SSDSac	-3.097	1.189	0.232	0.080	-7.192	0.835	11.817	1.241	-3.383	0.511	-2.925	0.499	-10.539	1.035	-0.399	0.111	5.166	1.137	-1.157	0.416	5.319	0.618
119	74.06	5	COMRF	RIO	SSDSJ	-4.908	1.503	0.235	0.100	-9.721	1.154	5.627	0.546	2.257	0.564	-3.797	0.667	-0.690	0.190	0.081	0.155	4.542	0.581	2.404	0.581	-3.000	0.379

120	66.64	5	COMRF	SJR	XGEO	-0.538	1.331	0.137	0.094	-5.407	0.881	4.859	0.975	2.016	0.327	-2.293	0.750	-6.037	1.416	-0.268	0.061	7.745	1.656	2.836	0.335	-4.213	0.522
121	76.10	5	COMRF	SJR	CCET	1.359	1.175	-0.045	0.085	0.027	0.695	-7.437	1.463	10.237	0.968	-3.065	0.697	-10.759	2.041	-6.416	0.558	10.793	1.750	-2.767	1.160	11.332	1.660
122	77.48	5	COMRF	SJR	CCETM	3.478	1.179	-0.190	0.086	-1.483	0.536	-5.416	0.970	9.562	0.723	-4.517	0.666	-9.077	1.734	-5.680	0.425	11.167	1.798	-1.905	0.881	9.600	1.325
123	55.56	5	COMRF	SJR	WEST	0.022	1.266	0.083	0.092	-9.229	1.210	2.150	0.925	6.652	0.885	-6.963	1.105	-2.155	1.203	-5.185	0.584	6.912	1.803	11.339	1.332	-4.113	1.327
124	60.74	5	COMRF	SJR	SSDSac	-3.924	1.464	0.285	0.101	-6.388	0.972	3.821	1.254	1.974	0.244	-1.732	0.871	-2.496	1.353	-0.255	0.041	4.669	1.933	1.710	0.234	-1.998	0.347
125	39.81	5	COMRF	SJR	SSDSJ	0.249	1.436	-0.063	0.087	-2.851	1.151	-17.021	4.272	9.132	1.699	0.243	0.820	-25.815	7.424	-4.777	1.011	-0.108	3.271	2.222	1.122	19.030	5.086
126	75.12	5	COMRF	XGEO	CCET	-10.080	1.268	0.769	0.082	-6.257	0.770	1.722	0.272	6.415	0.704	-1.866	0.396	-0.248	0.049	-3.429	0.412	1.066	0.287	2.397	0.740	0.347	0.190
127	**78.74**	**5**	**COMRF**	**XGEO**	**CCETM**	**-7.370**	**1.092**	**0.557**	**0.073**	**-6.274**	**0.708**	**1.937**	**0.247**	**4.931**	**0.531**	**-2.014**	**0.364**	**-0.193**	**0.046**	**-2.480**	**0.296**	**1.386**	**0.264**	**1.118**	**0.617**	**0.554**	**0.169**
128	68.48	5	COMRF	XGEO	WEST	-1.066	1.305	0.026	0.090	-8.640	1.294	2.192	0.312	3.200	0.998	-4.338	1.314	0.528	0.117	-1.389	0.907	2.647	0.551	5.204	1.989	-1.969	0.535
129	60.23	5	COMRF	XGEO	SSDSac	-7.001	1.382	0.446	0.088	-7.399	0.944	1.581	0.498	1.626	0.333	-1.669	0.471	-0.529	0.204	-0.371	0.105	1.061	0.535	0.977	0.342	0.521	0.282
130	68.35	5	COMRF	XGEO	SSDSJ	-2.307	1.373	0.135	0.094	-7.326	0.957	2.866	0.295	2.534	0.498	-2.098	0.617	-0.159	0.059	-0.344	0.158	2.820	0.325	2.154	0.541	-1.924	0.213
131	72.90	5	COMRF	CCET	CCETM	-4.920	1.138	0.491	0.084	-4.786	0.680	3.258	1.188	5.924	1.014	-2.187	0.477	-6.611	1.183	-6.358	0.868	1.803	1.340	1.765	1.197	7.343	1.798
132	76.32	5	COMRF	CCET	WEST	-6.147	1.244	0.641	0.090	-4.270	0.871	9.638	0.657	1.313	0.651	-2.083	0.700	-6.403	0.452	-4.381	0.382	4.391	0.801	4.348	0.939	0.609	0.595
133	70.43	5	COMRF	CCET	SSDSac	-6.568	1.291	0.505	0.081	-5.658	0.905	6.154	0.860	0.987	0.258	-1.498	0.457	-3.912	0.539	-0.168	0.037	2.554	0.841	0.412	0.218	0.589	0.176
134	74.72	5	COMRF	CCET	SSDSJ	1.878	1.057	-0.030	0.081	-4.338	0.700	9.881	0.876	-1.163	0.438	-3.384	0.644	-7.526	0.649	-0.696	0.198	1.502	1.146	2.021	0.590	3.049	0.597
135	75.23	5	COMRF	CCETM	WEST	-6.232	1.159	0.596	0.082	-7.220	1.154	6.051	0.538	3.720	0.752	-4.525	0.955	-3.987	0.317	-4.146	0.417	1.647	0.794	6.600	1.103	-0.209	0.554
136	73.77	5	COMRF	CCETM	SSDSac	-4.260	1.093	0.349	0.075	-4.977	0.821	4.386	0.682	1.012	0.229	-1.299	0.496	-2.849	0.366	-0.142	0.035	0.810	0.708	0.440	0.189	0.577	0.158
137	74.69	5	COMRF	CCETM	SSDSJ	3.126	1.057	-0.108	0.082	-4.407	0.700	8.005	0.602	-0.588	0.422	-3.370	0.606	-5.639	0.405	-0.339	0.149	1.165	0.823	1.697	0.518	1.593	0.429
138	64.85	5	COMRF	WEST	SSDSac	-1.970	1.390	0.145	0.099	-5.994	1.215	1.906	1.125	1.744	0.300	-3.914	1.107	-6.248	1.087	-0.233	0.058	9.639	1.699	-0.095	0.347	1.149	0.446
139	55.96	5	COMRF	WEST	SSDSJ	-0.921	1.247	0.117	0.089	-10.086	1.423	6.846	0.983	1.258	0.544	-6.050	1.190	-4.657	0.638	-0.060	0.188	9.744	1.484	2.770	0.722	-1.925	0.580
140	63.37	5	COMRF	SSDSac	SSDSJ	-4.848	1.430	0.285	0.098	-7.390	0.935	2.391	0.244	2.349	0.568	-1.663	0.568	-0.245	0.040	-0.255	0.158	1.690	0.223	1.851	0.547	-1.026	0.135
141	75.46	6	COMRF	RIO	SJR	-4.627	1.489	0.337	0.104	-7.189	1.050	3.280	0.545	5.168	1.156	-2.354	0.808	-0.179	0.228	0.335	1.034	4.982	0.614	4.152	1.702	-8.557	1.008
142	76.01	6	COMRF	RIO	XGEO	-9.687	1.369	0.635	0.090	-9.345	1.065	7.082	0.977	-0.477	0.491	-2.957	0.550	-8.050	0.759	-2.444	0.215	4.788	1.035	-0.268	0.536	8.436	0.775
143	75.37	6	COMRF	RIO	CCET	-6.720	1.280	0.465	0.082	-7.184	1.015	3.251	0.578	4.717	0.844	-2.507	0.537	-0.806	0.176	-2.441	0.505	1.547	0.521	2.270	0.833	1.104	0.365
144	77.11	6	COMRF	RIO	CCETM	-4.727	1.154	0.361	0.078	-6.109	0.946	3.182	0.528	2.994	0.656	-2.248	0.547	-1.011	0.228	-1.952	0.349	1.419	0.504	0.201	0.701	1.448	0.388
145	73.74	6	COMRF	RIO	WEST	-3.997	1.422	0.285	0.099	-6.628	1.266	6.292	0.590	-0.197	0.906	-4.950	1.028	-2.871	0.487	-4.231	0.933	-0.482	0.950	6.545	1.589	4.043	1.199
146	75.91	6	COMRF	RIO	SSDSac	-3.378	1.211	0.256	0.082	-7.203	0.862	10.892	1.194	-2.937	0.498	-2.978	0.504	-11.021	1.039	-0.442	0.114	4.134	1.103	-0.751	0.411	5.554	0.619
147	74.94	6	COMRF	RIO	SSDSJ	-5.471	1.540	0.295	0.102	-9.226	1.134	5.622	0.553	1.944	0.528	-3.481	0.646	-0.715	0.206	0.148	0.151	4.419	0.587	1.918	0.544	-2.871	0.355
148	68.28	6	COMRF	SJR	XGEO	-1.341	1.375	0.195	0.096	-5.743	0.988	4.884	0.984	2.218	0.363	-2.470	0.826	-6.030	1.478	-0.282	0.064	7.446	1.697	3.042	0.358	-4.251	0.544
149	76.57	6	COMRF	SJR	CCET	2.072	1.157	-0.096	0.083	-0.092	0.757	-7.243	1.614	10.366	1.009	-3.397	0.766	-11.056	2.392	-6.610	0.575	11.373	1.879	-2.779	1.233	11.400	1.786
150	77.81	6	COMRF	SJR	CCETM	4.302	1.170	-0.244	0.086	-1.618	0.577	-4.918	1.021	9.245	0.749	-5.087	0.771	-10.148	1.782	-5.593	0.419	12.753	1.954	-2.337	0.957	9.792	1.344
151	56.75	6	COMRF	SJR	WEST	-0.618	1.313	0.122	0.094	-9.714	1.338	2.155	0.931	6.964	0.951	-7.149	1.163	-1.794	1.209	-5.407	0.602	6.559	1.869	11.634	1.366	-3.974	1.340
152	63.62	6	COMRF	SJR	SSDSac	-5.234	1.517	0.377	0.104	-6.988	1.048	4.691	1.280	1.962	0.247	-2.023	0.925	-2.587	1.353	-0.236	0.041	5.140	2.024	1.831	0.248	-2.254	0.348
153	40.06	6	COMRF	SJR	SSDSJ	-0.232	1.451	-0.061	0.087	-3.086	1.225	-20.152	4.571	10.322	1.770	0.129	0.863	-31.491	8.016	-5.471	1.052	-0.172	3.494	2.280	1.217	22.921	5.427
154	76.58	6	COMRF	XGEO	CCET	-10.717	1.254	0.812	0.081	-6.477	0.768	1.830	0.275	6.372	0.705	-2.028	0.405	-0.254	0.049	-3.392	0.401	1.138	0.292	2.377	0.757	0.356	0.185
155	**79.81**	**6**	**COMRF**	**XGEO**	**CCETM**	**-7.969**	**1.091**	**0.603**	**0.073**	**-6.295**	**0.696**	**2.028**	**0.251**	**4.663**	**0.523**	**-2.049**	**0.368**	**-0.196**	**0.047**	**-2.404**	**0.300**	**1.444**	**0.271**	**0.877**	**0.619**	**0.535**	**0.165**
156	70.04	6	COMRF	XGEO	WEST	-1.609	1.297	0.061	0.089	-8.602	1.233	2.392	0.311	2.998	0.940	-3.784	1.211	0.643	0.116	-0.783	0.822	3.269	0.529	3.925	1.814	-2.509	0.493
157	61.98	6	COMRF	XGEO	SSDSac	-8.366	1.426	0.531	0.090	-7.694	0.958	1.704	0.528	1.668	0.345	-1.723	0.484	-0.447	0.213	-0.312	0.108	1.205	0.569	0.952	0.360	0.364	0.296
158	70.09	6	COMRF	XGEO	SSDSJ	-2.977	1.386	0.176	0.095	-7.613	0.950	3.087	0.294	2.513	0.484	-2.236	0.617	-0.165	0.060	-0.307	0.166	3.059	0.330	2.055	0.534	-1.951	0.199
159	74.07	6	COMRF	CCET	CCETM	-5.174	1.168	0.506	0.086	-5.194	0.748	4.438	1.376	4.966	1.121	-2.522	0.530	-9.045	1.422	-8.222	1.071	3.809	1.575	0.038	1.348	11.490	2.236
160	77.16	6	COMRF	CCET	WEST	-6.320	1.260	0.650	0.091	-4.372	0.797	9.754	0.647	1.320	0.622	-2.022	0.594	-6.423	0.443	-4.512	0.378	4.586	0.789	4.284	0.890	0.593	0.583
161	71.81	6	COMRF	CCET	SSDSac	-7.520	1.332	0.552	0.081	-6.193	1.013	6.110	0.877	1.058	0.275	-1.695	0.513	-3.687	0.534	-0.155	0.037	2.729	0.875	0.466	0.237	0.573	0.170
162	75.32	6	COMRF	CCET	SSDSJ	2.476	1.043	-0.080	0.080	-4.721	0.780	10.073	0.910	-0.964	0.462	-3.689	0.715	-7.630	0.650	-0.727	0.203	1.817	1.219	2.119	0.625	2.901	0.593

163	76.08	6	COMRF	CCETM	WEST	-6.893	1.201	0.646	0.085	-7.095	1.164	6.046	0.539	3.583	0.736	-4.220	0.963	-3.990	0.315	-4.224	0.404	1.664	0.788	6.245	1.072	-0.214	0.528
164	75.05	6	COMRF	CCETM	SSDSac	-4.952	1.131	0.385	0.077	-5.222	0.874	4.094	0.686	1.106	0.238	-1.299	0.525	-2.668	0.365	-0.139	0.036	0.697	0.722	0.511	0.204	0.578	0.154
165	75.09	6	COMRF	CCETM	SSDSJ	3.467	1.055	-0.137	0.082	-4.680	0.789	7.918	0.632	-0.441	0.445	-3.582	0.689	-5.730	0.421	-0.400	0.152	1.089	0.882	1.786	0.557	1.597	0.436
166	66.39	6	COMRF	WEST	SSDSac	-2.978	1.393	0.201	0.098	-6.745	1.184	2.527	1.099	1.651	0.305	-3.687	1.069	-4.801	0.959	-0.157	0.054	8.234	1.638	0.272	0.334	0.499	0.383
167	57.26	6	COMRF	WEST	SSDSJ	-1.581	1.261	0.131	0.092	-11.467	1.424	7.776	0.992	0.810	0.556	-6.975	1.165	-4.993	0.654	0.092	0.214	10.802	1.475	2.242	0.663	-1.611	0.553
168	66.22	6	COMRF	SSDSac	SSDSJ	-6.503	1.542	0.376	0.102	-8.372	1.270	2.521	0.267	2.589	0.596	-2.077	0.778	-0.237	0.041	-0.236	0.175	1.870	0.249	1.936	0.595	-1.086	0.134
169	76.80	7	COMRF	RIO	SJR	-5.521	1.569	0.404	0.107	-6.874	1.078	3.396	0.586	4.479	1.086	-1.800	0.789	-0.177	0.247	1.446	1.074	5.007	0.593	2.392	1.660	-8.504	1.005
170	77.59	7	COMRF	RIO	XGEO	-10.549	1.417	0.677	0.093	-10.161	1.103	7.651	1.019	-0.563	0.504	-3.452	0.554	-7.999	0.747	-2.401	0.209	5.419	1.097	-0.412	0.556	8.277	0.749
171	76.43	7	COMRF	RIO	CCET	-7.150	1.297	0.488	0.083	-7.405	1.046	3.557	0.612	4.174	0.871	-2.622	0.559	-0.903	0.197	-2.123	0.506	1.736	0.566	1.909	0.874	1.216	0.372
172	77.76	7	COMRF	RIO	CCETM	-5.273	1.194	0.390	0.080	-6.526	0.987	3.642	0.564	2.467	0.679	-2.508	0.585	-1.173	0.249	-1.745	0.361	1.706	0.547	-0.184	0.732	1.400	0.389
173	74.76	7	COMRF	RIO	WEST	-4.354	1.417	0.314	0.099	-6.538	1.295	6.532	0.614	-0.397	0.938	-4.892	1.074	-3.115	0.508	-4.403	0.954	-0.507	0.987	6.431	1.648	4.306	1.217
174	77.17	7	COMRF	RIO	SSDSac	-3.802	1.244	0.288	0.084	-7.230	0.886	10.604	1.240	-2.798	0.523	-3.008	0.519	-11.314	1.040	-0.452	0.120	3.919	1.167	-0.714	0.442	5.655	0.625
175	76.19	7	COMRF	RIO	SSDSJ	-6.335	1.597	0.366	0.105	-9.032	1.136	5.742	0.569	1.680	0.512	-3.307	0.634	-0.717	0.228	0.236	0.149	4.546	0.609	1.456	0.528	-2.944	0.351
176	69.62	7	COMRF	SJR	XGEO	-2.108	1.406	0.246	0.098	-6.135	1.023	4.725	1.003	2.475	0.364	-2.652	0.861	-5.859	1.462	-0.298	0.067	6.851	1.738	3.282	0.367	-4.219	0.537
177	77.01	7	COMRF	SJR	CCET	2.760	1.144	-0.144	0.082	-0.137	0.823	-7.185	1.752	10.336	1.057	-3.869	0.854	-12.011	2.591	-6.727	0.592	12.537	2.034	-3.177	1.316	11.942	1.901
178	77.82	7	COMRF	SJR	CCETM	4.893	1.165	-0.286	0.085	-1.851	0.642	-4.490	1.112	8.962	0.797	-5.553	0.874	-10.845	1.863	-5.533	0.421	13.875	2.129	-2.635	1.051	9.887	1.401
179	58.22	7	COMRF	SJR	WEST	-1.232	1.334	0.149	0.095	-10.633	1.468	2.166	0.984	7.534	1.027	-7.789	1.252	-1.175	1.288	-5.803	0.646	6.174	1.948	12.522	1.446	-3.998	1.388
180	66.48	7	COMRF	SJR	SSDSac	-6.556	1.576	0.473	0.109	-7.175	1.046	4.999	1.259	2.013	0.253	-1.896	0.930	-2.252	1.345	-0.237	0.044	4.728	2.045	1.958	0.258	-2.483	0.348
181	39.74	7	COMRF	SJR	SSDSJ	-0.160	1.448	-0.066	0.087	-3.038	1.316	-20.975	4.737	10.538	1.804	-0.094	0.905	-35.237	8.559	-5.799	1.106	1.088	3.781	1.882	1.337	25.177	5.764
182	77.73	7	COMRF	XGEO	CCET	-11.037	1.231	0.842	0.081	-6.436	0.755	1.842	0.274	6.196	0.701	-2.111	0.418	-0.256	0.050	-3.382	0.384	1.100	0.293	2.174	0.774	0.352	0.183
183	**80.46**	**7**	**COMRF**	**XGEO**	**CCETM**	**-8.184**	**1.081**	**0.627**	**0.074**	**-6.227**	**0.687**	**2.040**	**0.253**	**4.431**	**0.523**	**-2.102**	**0.382**	**-0.190**	**0.049**	**-2.407**	**0.304**	**1.417**	**0.276**	**0.653**	**0.632**	**0.499**	**0.164**
184	71.71	7	COMRF	XGEO	WEST	-2.050	1.287	0.085	0.088	-9.110	1.227	2.507	0.313	3.287	0.919	-3.999	1.166	0.752	0.118	-0.656	0.793	3.708	0.518	3.801	1.733	-2.909	0.475
185	63.81	7	COMRF	XGEO	SSDSac	-9.467	1.454	0.607	0.093	-7.757	0.986	1.876	0.557	1.665	0.352	-1.728	0.532	-0.345	0.218	-0.248	0.109	1.420	0.606	0.813	0.372	0.162	0.299
186	71.43	7	COMRF	XGEO	SSDSJ	-3.414	1.393	0.209	0.096	-7.656	0.922	3.344	0.305	2.311	0.461	-2.238	0.602	-0.177	0.063	-0.263	0.168	3.326	0.344	1.706	0.523	-1.955	0.196
187	75.14	7	COMRF	CCET	CCETM	-5.367	1.211	0.515	0.088	-5.685	0.824	5.757	1.612	3.690	1.283	-2.954	0.590	-12.389	1.885	-10.746	1.436	5.412	1.833	-1.538	1.535	17.250	3.076
188	77.96	7	COMRF	CCET	WEST	-6.426	1.281	0.652	0.092	-4.615	1.027	9.662	0.679	1.493	0.695	-2.172	0.822	-6.322	0.436	-4.791	0.390	4.574	0.839	4.618	0.997	0.609	0.579
189	73.21	7	COMRF	CCET	SSDSac	-8.284	1.357	0.592	0.082	-6.527	1.096	5.830	0.887	1.168	0.292	-1.817	0.564	-3.381	0.521	-0.162	0.039	2.683	0.905	0.505	0.258	0.567	0.167
190	75.91	7	COMRF	CCET	SSDSJ	3.032	1.033	-0.123	0.079	-4.836	0.862	10.122	0.932	-0.970	0.488	-3.820	0.802	-7.759	0.658	-0.714	0.205	1.881	1.285	2.086	0.671	2.880	0.591
191	76.84	7	COMRF	CCETM	WEST	-7.118	1.224	0.656	0.086	-7.426	1.229	5.976	0.548	3.723	0.736	-4.398	1.012	-3.969	0.315	-4.497	0.407	1.701	0.801	6.493	1.072	-0.241	0.514
192	76.12	7	COMRF	CCETM	SSDSac	-5.556	1.165	0.415	0.078	-5.490	0.929	3.832	0.696	1.200	0.251	-1.345	0.558	-2.491	0.367	-0.140	0.037	0.642	0.744	0.566	0.220	0.567	0.152
193	75.30	7	COMRF	CCETM	SSDSJ	3.957	1.064	-0.179	0.082	-4.783	0.884	8.061	0.691	-0.545	0.481	-3.560	0.775	-5.785	0.430	-0.385	0.157	1.370	0.959	1.580	0.604	1.541	0.440
194	68.36	7	COMRF	WEST	SSDSac	-3.702	1.392	0.238	0.097	-7.563	1.295	3.163	1.106	1.581	0.314	-3.965	1.171	-4.098	0.898	-0.113	0.055	7.937	1.705	0.437	0.350	0.127	0.351
195	58.93	7	COMRF	WEST	SSDSJ	-1.864	1.269	0.133	0.092	-12.179	1.510	8.419	1.032	0.545	0.549	-7.494	1.243	-5.303	0.692	0.237	0.212	11.649	1.544	2.079	0.659	-1.619	0.541
196	69.22	7	COMRF	SSDSac	SSDSJ	-8.008	1.595	0.472	0.106	-8.630	1.140	2.715	0.271	2.630	0.593	-1.977	0.693	-0.247	0.043	-0.162	0.172	2.100	0.257	1.776	0.598	-1.207	0.131
197	77.91	8	COMRF	RIO	SJR	-6.466	1.602	0.471	0.110	-6.620	0.912	3.601	0.587	3.692	0.999	-1.269	0.672	-0.226	0.269	2.708	1.069	5.017	0.574	0.463	1.577	-8.382	0.946
198	78.78	8	COMRF	RIO	XGEO	-10.883	1.436	0.705	0.095	-10.163	1.081	7.945	1.050	-0.653	0.521	-3.523	0.539	-8.081	0.754	-2.367	0.206	5.594	1.134	-0.528	0.579	8.206	0.739
199	77.40	8	COMRF	RIO	CCET	-7.362	1.294	0.504	0.083	-7.273	1.062	3.740	0.641	3.485	0.889	-2.537	0.573	-1.031	0.229	-1.727	0.505	1.743	0.619	1.426	0.904	1.460	0.385
200	78.33	8	COMRF	RIO	CCETM	-5.610	1.215	0.412	0.082	-6.649	1.001	3.990	0.592	1.946	0.699	-2.600	0.617	-1.384	0.275	-1.498	0.376	1.809	0.576	-0.534	0.758	1.426	0.396
201	75.95	8	COMRF	RIO	WEST	-4.643	1.399	0.352	0.099	-5.963	1.267	6.838	0.652	-0.827	0.981	-4.827	1.100	-3.702	0.549	-5.328	1.030	-1.188	1.055	7.069	1.751	5.489	1.300
202	78.53	8	COMRF	RIO	SSDSac	-3.989	1.266	0.313	0.086	-6.956	0.879	10.211	1.314	-2.732	0.562	-2.885	0.523	-12.261	1.082	-0.519	0.130	3.442	1.254	-0.667	0.484	6.217	0.656
203	77.16	8	COMRF	RIO	SSDSJ	-6.945	1.627	0.428	0.108	-8.515	1.089	5.801	0.579	1.311	0.501	-2.963	0.603	-0.730	0.252	0.333	0.150	4.532	0.617	0.908	0.518	-2.974	0.349
204	70.52	8	COMRF	SJR	XGEO	-2.690	1.422	0.286	0.099	-6.262	0.991	4.316	0.990	2.685	0.360	-2.590	0.850	-5.382	1.433	-0.318	0.072	5.825	1.733	3.443	0.369	-4.162	0.528
205	77.52	8	COMRF	SJR	CCET	3.451	1.138	-0.198	0.081	0.285	0.885	-7.963	1.907	10.506	1.134	-4.068	0.946	-14.423	2.798	-6.598	0.577	14.212	2.222	-3.605	1.419	13.213	1.997

206	77.74	8	COMRF	SJR	CCETM	5.181	1.166	-0.303	0.086	-1.997	0.706	-3.984	1.237	8.571	0.864	-5.929	0.985	-11.423	1.954	-5.511	0.428	15.024	2.318	-3.125	1.172	10.060	1.475
207	59.87	8	COMRF	SJR	WEST	-1.881	1.360	0.176	0.095	-11.670	1.610	1.984	1.046	8.265	1.106	-8.481	1.329	-0.646	1.435	-6.399	0.702	5.492	2.056	13.697	1.534	-3.828	1.428
208	69.05	8	COMRF	SJR	SSDSac	-7.871	1.644	0.570	0.113	-6.990	1.020	4.723	1.202	2.105	0.266	-1.359	0.907	-1.397	1.337	-0.248	0.048	3.358	1.997	2.069	0.266	-2.653	0.348
209	39.61	8	COMRF	SJR	SSDSJ	-0.155	1.463	-0.069	0.086	-3.093	1.443	-21.513	4.945	10.668	1.849	-0.374	0.955	-38.065	9.041	-6.055	1.156	2.269	4.172	1.510	1.502	26.932	6.072
210	78.74	8	COMRF	XGEO	CCET	-11.085	1.200	0.858	0.080	-6.105	0.731	1.715	0.271	5.948	0.688	-2.008	0.423	-0.247	0.052	-3.323	0.364	0.916	0.293	1.916	0.782	0.425	0.184
211	**80.94**	**8**	**COMRF**	**XGEO**	**CCETM**	**-8.099**	**1.064**	**0.634**	**0.074**	**-5.908**	**0.668**	**1.929**	**0.251**	**4.222**	**0.521**	**-2.007**	**0.391**	**-0.173**	**0.052**	**-2.424**	**0.305**	**1.250**	**0.277**	**0.439**	**0.642**	**0.496**	**0.165**
212	72.93	8	COMRF	XGEO	WEST	-2.391	1.284	0.108	0.087	-9.720	1.231	2.581	0.320	3.767	0.918	-4.528	1.142	0.817	0.123	-0.906	0.807	3.962	0.520	4.332	1.715	-3.113	0.478
213	65.60	8	COMRF	XGEO	SSDSac	-10.205	1.463	0.662	0.094	-7.731	1.045	1.816	0.604	1.755	0.377	-1.736	0.596	-0.303	0.226	-0.223	0.113	1.375	0.668	0.781	0.412	0.058	0.309
214	72.17	8	COMRF	XGEO	SSDSJ	-3.674	1.389	0.233	0.096	-7.581	0.872	3.588	0.313	2.044	0.439	-2.193	0.572	-0.196	0.067	-0.222	0.164	3.561	0.360	1.294	0.505	-1.933	0.189
215	75.95	8	COMRF	CCET	CCETM	-5.354	1.260	0.511	0.090	-5.927	0.861	7.701	1.865	1.698	1.479	-3.166	0.620	-17.047	2.673	-14.100	2.053	6.998	2.079	-3.233	1.731	25.211	4.507
216	78.84	8	COMRF	CCET	WEST	-6.544	1.284	0.659	0.091	-4.639	0.841	9.476	0.646	1.604	0.664	-2.150	0.616	-6.127	0.417	-5.193	0.407	4.493	0.813	4.978	0.960	0.598	0.577
217	74.60	8	COMRF	CCET	SSDSac	-8.792	1.343	0.622	0.081	-6.515	1.113	5.400	0.883	1.228	0.303	-1.731	0.579	-2.996	0.497	-0.170	0.041	2.528	0.921	0.484	0.271	0.600	0.165
218	76.27	8	COMRF	CCET	SSDSJ	3.539	1.031	-0.159	0.079	-4.585	0.912	10.286	0.977	-1.130	0.517	-3.559	0.858	-7.728	0.651	-0.694	0.207	2.213	1.350	1.841	0.713	2.852	0.583
219	77.60	8	COMRF	CCETM	WEST	-7.134	1.234	0.655	0.086	-7.424	1.266	5.889	0.561	3.779	0.741	-4.310	1.040	-3.908	0.317	-4.899	0.423	1.733	0.818	6.773	1.079	-0.217	0.513
220	77.09	8	COMRF	CCETM	SSDSac	-5.994	1.177	0.439	0.079	-5.536	0.934	3.600	0.702	1.245	0.260	-1.262	0.559	-2.305	0.368	-0.137	0.040	0.624	0.762	0.566	0.232	0.560	0.150
221	75.32	8	COMRF	CCETM	SSDSJ	4.441	1.086	-0.218	0.083	-4.643	0.932	8.174	0.759	-0.673	0.519	-3.326	0.826	-5.832	0.439	-0.360	0.159	1.627	1.048	1.351	0.652	1.483	0.442
222	70.40	8	COMRF	WEST	SSDSac	-4.172	1.385	0.265	0.096	-7.896	1.324	3.485	1.125	1.536	0.334	-3.985	1.218	-3.894	0.911	-0.079	0.061	7.829	1.790	0.546	0.386	-0.072	0.356
223	60.68	8	COMRF	WEST	SSDSJ	-2.175	1.275	0.136	0.093	-13.024	1.495	9.234	1.040	0.278	0.535	-8.152	1.238	-5.757	0.745	0.366	0.212	12.845	1.577	1.877	0.654	-1.587	0.543
224	71.79	8	COMRF	SSDSac	SSDSJ	-9.212	1.626	0.566	0.109	-8.164	1.025	2.904	0.282	2.421	0.577	-1.408	0.632	-0.260	0.047	-0.069	0.169	2.319	0.270	1.270	0.582	-1.333	0.135
225	78.65	9	COMRF	RIO	SJR	-7.109	1.624	0.522	0.112	-6.290	0.763	3.650	0.596	3.038	0.917	-0.806	0.561	-0.232	0.291	3.859	1.056	4.874	0.578	-1.229	1.494	-8.348	0.892
226	79.32	9	COMRF	RIO	XGEO	-10.473	1.426	0.711	0.097	-9.192	1.015	7.400	1.041	-0.487	0.534	-3.168	0.517	-7.895	0.750	-2.276	0.203	4.725	1.136	-0.332	0.601	7.905	0.728
227	78.05	9	COMRF	RIO	CCET	-7.097	1.268	0.509	0.084	-6.469	1.011	3.582	0.651	2.903	0.907	-2.131	0.575	-1.157	0.252	-1.394	0.512	1.295	0.643	1.056	0.932	1.721	0.399
228	78.62	9	COMRF	RIO	CCETM	-5.507	1.210	0.418	0.083	-6.173	0.971	4.005	0.602	1.587	0.715	-2.356	0.631	-1.552	0.295	-1.243	0.391	1.502	0.588	-0.679	0.784	1.444	0.401
229	77.00	9	COMRF	RIO	WEST	-4.884	1.374	0.398	0.098	-4.981	1.175	7.114	0.699	-1.423	1.015	-4.820	1.118	-4.593	0.605	-6.765	1.136	-2.574	1.164	8.311	1.890	7.440	1.427
230	79.70	9	COMRF	RIO	SSDSac	-3.602	1.261	0.313	0.087	-6.164	0.805	9.860	1.365	-2.892	0.592	-2.536	0.510	-13.151	1.134	-0.545	0.141	2.780	1.313	-0.712	0.511	6.754	0.698
231	77.78	9	COMRF	RIO	SSDSJ	-7.071	1.610	0.467	0.109	-7.558	0.969	5.646	0.575	0.873	0.493	-2.435	0.547	-0.699	0.275	0.438	0.151	4.222	0.602	0.334	0.514	-2.961	0.350
232	70.89	9	COMRF	SJR	XGEO	-2.981	1.430	0.310	0.101	-6.111	0.896	3.771	0.947	2.824	0.359	-2.340	0.787	-4.902	1.410	-0.343	0.077	4.668	1.693	3.527	0.375	-4.142	0.524
233	77.74	9	COMRF	SJR	CCET	4.186	1.136	-0.252	0.082	0.860	0.963	-8.707	2.045	10.579	1.232	-4.308	1.061	-17.332	2.993	-6.385	0.555	16.496	2.453	-4.244	1.552	14.781	2.086
234	77.50	9	COMRF	SJR	CCETM	5.257	1.181	-0.294	0.088	-2.278	0.781	-2.909	1.370	7.762	0.928	-6.780	1.118	-12.189	2.034	-5.569	0.449	17.234	2.521	-4.369	1.318	10.494	1.557
235	61.27	9	COMRF	SJR	WEST	-2.584	1.399	0.212	0.096	-12.349	1.720	1.722	1.099	8.823	1.175	-8.804	1.372	-0.286	1.506	-6.974	0.761	4.678	2.164	14.587	1.609	-3.550	1.451
236	70.88	9	COMRF	SJR	SSDSac	-8.894	1.702	0.653	0.117	-6.413	0.919	4.136	1.088	2.126	0.283	-0.568	0.824	-0.432	1.307	-0.252	0.053	1.569	1.858	2.067	0.274	-2.751	0.347
237	39.87	9	COMRF	SJR	SSDSJ	-0.442	1.500	-0.071	0.086	-3.272	1.597	-23.234	5.196	11.136	1.912	-0.541	1.014	-41.894	9.539	-6.341	1.201	2.722	4.610	1.381	1.678	29.159	6.375
238	79.35	9	COMRF	XGEO	CCET	-10.817	1.175	0.858	0.080	-5.501	0.697	1.476	0.271	5.640	0.680	-1.739	0.425	-0.225	0.054	-3.246	0.351	0.608	0.296	1.602	0.794	0.540	0.189
239	**81.07**	**9**	**COMRF**	**XGEO**	**CCETM**	**-7.797**	**1.055**	**0.630**	**0.074**	**-5.373**	**0.643**	**1.723**	**0.249**	**4.003**	**0.522**	**-1.787**	**0.399**	**-0.150**	**0.055**	**-2.439**	**0.304**	**0.967**	**0.278**	**0.187**	**0.654**	**0.510**	**0.168**
240	73.25	9	COMRF	XGEO	WEST	-2.637	1.292	0.130	0.088	-10.117	1.237	2.686	0.330	4.121	0.934	-4.936	1.134	0.849	0.131	-1.243	0.845	4.181	0.541	4.798	1.749	-3.226	0.502
241	66.95	9	COMRF	XGEO	SSDSac	-10.403	1.452	0.693	0.095	-7.210	1.046	1.674	0.636	1.755	0.392	-1.497	0.618	-0.283	0.236	-0.198	0.120	1.230	0.711	0.669	0.440	-0.018	0.324
242	72.26	9	COMRF	XGEO	SSDSJ	-3.702	1.381	0.244	0.096	-7.381	0.832	3.766	0.324	1.757	0.426	-2.126	0.551	-0.217	0.072	-0.174	0.162	3.714	0.382	0.896	0.499	-1.921	0.188
243	76.23	9	COMRF	CCET	CCETM	-5.146	1.308	0.499	0.093	-5.840	0.871	9.652	2.056	-0.468	1.656	-3.117	0.631	-22.431	3.442	-17.850	2.698	7.810	2.266	-4.414	1.919	34.309	5.923
244	79.28	9	COMRF	CCET	WEST	-6.540	1.292	0.658	0.091	-4.624	0.794	9.210	0.636	1.702	0.685	-2.079	0.565	-5.888	0.407	-5.559	0.429	4.443	0.812	5.246	0.996	0.433	0.573
245	75.63	9	COMRF	CCET	SSDSac	-8.635	1.291	0.633	0.080	-5.634	1.008	5.104	0.873	1.055	0.303	-1.209	0.534	-2.718	0.481	-0.155	0.044	2.484	0.928	0.237	0.272	0.646	0.164
246	76.12	9	COMRF	CCET	SSDSJ	4.053	1.035	-0.194	0.079	-4.330	0.948	10.129	1.009	-1.210	0.535	-3.349	0.900	-7.625	0.643	-0.644	0.205	2.193	1.406	1.706	0.746	2.779	0.572
247	77.98	9	COMRF	CCETM	WEST	-6.920	1.244	0.645	0.087	-7.062	1.272	5.812	0.584	3.736	0.756	-3.934	1.051	-3.838	0.323	-5.310	0.449	1.837	0.845	6.928	1.102	-0.250	0.519
248	77.70	9	COMRF	CCETM	SSDSac	-6.006	1.161	0.452	0.079	-4.963	0.833	3.516	0.700	1.118	0.262	-0.866	0.498	-2.166	0.370	-0.117	0.043	0.735	0.769	0.387	0.233	0.549	0.149

249	74.98	9	COMRF	CCETM	SSDSJ	4.825	1.125	-0.245	0.085	-4.621	0.982	7.877	0.808	-0.561	0.535	-3.314	0.889	-5.919	0.456	-0.345	0.158	1.319	1.142	1.472	0.683	1.433	0.438
250	71.88	9	COMRF	WEST	SSDSac	-4.363	1.373	0.283	0.096	-7.966	1.363	3.838	1.185	1.364	0.359	-3.956	1.293	-3.944	0.949	-0.028	0.070	7.982	1.923	0.528	0.430	-0.200	0.377
251	62.11	9	COMRF	WEST	SSDSJ	-2.660	1.310	0.156	0.094	-13.780	1.730	9.905	1.145	0.063	0.562	-8.735	1.426	-6.150	0.804	0.434	0.212	13.876	1.720	1.599	0.716	-1.602	0.559
252	73.49	9	COMRF	SSDSac	SSDSJ	-10.024	1.644	0.643	0.112	-7.413	0.887	2.998	0.302	2.084	0.549	-0.745	0.551	-0.259	0.052	0.034	0.168	2.438	0.291	0.647	0.551	-1.426	0.139
253	79.28	10	COMRF	RIO	SJR	-7.892	1.654	0.575	0.114	-6.202	0.695	3.753	0.619	2.436	0.876	-0.461	0.496	-0.242	0.314	5.081	1.058	4.806	0.606	-2.912	1.460	-8.362	0.857
254	79.86	10	COMRF	RIO	XGEO	-10.089	1.421	0.715	0.099	-8.299	0.960	6.992	1.039	-0.428	0.553	-2.824	0.503	-7.819	0.751	-2.219	0.202	3.993	1.148	-0.252	0.630	7.730	0.721
255	78.59	10	COMRF	RIO	CCET	-6.814	1.251	0.508	0.085	-5.718	0.964	3.415	0.660	2.461	0.934	-1.721	0.584	-1.296	0.270	-1.091	0.520	0.802	0.659	0.852	0.978	1.945	0.415
256	78.86	10	COMRF	RIO	CCETM	-5.320	1.201	0.417	0.083	-5.612	0.943	3.933	0.611	1.330	0.738	-2.009	0.645	-1.709	0.313	-0.962	0.405	1.076	0.603	-0.661	0.821	1.490	0.408
257	77.81	10	COMRF	RIO	WEST	-5.167	1.361	0.441	0.098	-4.256	1.096	7.299	0.745	-1.865	1.042	-4.985	1.143	-5.461	0.663	-8.111	1.241	-3.988	1.301	9.634	2.039	9.274	1.561
258	80.79	10	COMRF	RIO	SSDSac	-3.155	1.247	0.302	0.087	-5.616	0.761	9.267	1.424	-2.950	0.633	-2.341	0.513	-14.381	1.200	-0.627	0.156	1.752	1.381	-0.590	0.550	7.599	0.756
259	78.33	10	COMRF	RIO	SSDSJ	-7.442	1.595	0.515	0.110	-6.788	0.835	5.613	0.579	0.356	0.489	-1.943	0.487	-0.669	0.299	0.570	0.152	4.049	0.592	-0.351	0.516	-2.966	0.359
260	70.96	10	COMRF	SJR	XGEO	-3.257	1.441	0.331	0.102	-5.930	0.798	3.143	0.903	2.965	0.369	-2.023	0.712	-4.368	1.388	-0.371	0.083	3.381	1.640	3.587	0.395	-4.092	0.521
261	77.51	10	COMRF	SJR	CCET	4.711	1.148	-0.294	0.083	1.451	1.040	-9.507	2.166	10.871	1.356	-4.237	1.167	-19.623	3.199	-6.221	0.547	18.031	2.709	-4.435	1.707	16.147	2.206
262	76.94	10	COMRF	SJR	CCETM	4.963	1.227	-0.263	0.092	-2.722	0.865	-1.782	1.440	6.956	0.974	-7.463	1.230	-12.140	2.004	-5.655	0.472	18.607	2.668	-5.415	1.440	10.573	1.603
263	62.44	10	COMRF	SJR	WEST	-3.554	1.452	0.262	0.097	-13.152	1.829	1.251	1.172	9.532	1.249	-9.079	1.417	0.119	1.559	-7.616	0.830	3.437	2.276	15.600	1.705	-3.023	1.472
264	72.29	10	COMRF	SJR	SSDSac	-10.061	1.784	0.736	0.121	-6.120	0.879	3.474	0.985	2.256	0.309	0.097	0.733	0.779	1.307	-0.274	0.059	-0.392	1.740	2.145	0.292	-2.850	0.352
265	40.25	10	COMRF	SJR	SSDSJ	-0.910	1.552	-0.068	0.086	-3.504	1.762	-25.171	5.429	11.617	1.977	-0.603	1.079	-45.245	9.961	-6.501	1.231	2.700	5.050	1.391	1.857	30.920	6.622
266	79.86	10	COMRF	XGEO	CCET	-10.488	1.157	0.849	0.080	-4.916	0.665	1.218	0.272	5.349	0.684	-1.440	0.430	-0.198	0.057	-3.166	0.342	0.278	0.303	1.313	0.818	0.685	0.196
267	**81.19**	**10**	**COMRF**	**XGEO**	**CCETM**	**-7.481**	**1.051**	**0.621**	**0.075**	**-4.857**	**0.622**	**1.496**	**0.248**	**3.827**	**0.530**	**-1.521**	**0.409**	**-0.122**	**0.058**	**-2.414**	**0.302**	**0.656**	**0.280**	**0.013**	**0.674**	**0.566**	**0.173**
268	73.18	10	COMRF	XGEO	WEST	-2.924	1.307	0.156	0.089	-10.391	1.260	2.837	0.344	4.330	0.967	-5.207	1.147	0.874	0.142	-1.483	0.894	4.457	0.578	5.009	1.823	-3.373	0.537
269	68.14	10	COMRF	XGEO	SSDSac	-10.442	1.440	0.711	0.096	-6.746	1.049	1.451	0.661	1.808	0.411	-1.292	0.634	-0.286	0.247	-0.199	0.129	0.974	0.743	0.633	0.468	-0.040	0.343
270	72.00	10	COMRF	XGEO	SSDSJ	-3.727	1.374	0.257	0.096	-7.101	0.799	3.922	0.336	1.405	0.420	-2.009	0.541	-0.241	0.078	-0.112	0.163	3.829	0.407	0.419	0.508	-1.911	0.190
271	76.23	10	COMRF	CCET	CCETM	-4.901	1.342	0.485	0.094	-5.598	0.881	10.781	2.207	-1.953	1.823	-2.929	0.645	-27.419	3.971	-21.265	3.163	7.285	2.451	-4.452	2.132	42.690	6.904
272	79.38	10	COMRF	CCET	WEST	-6.546	1.306	0.655	0.091	-4.660	0.815	8.916	0.637	1.814	0.732	-2.027	0.586	-5.652	0.404	-5.876	0.457	4.385	0.821	5.497	1.068	0.274	0.573
273	76.46	10	COMRF	CCET	SSDSac	-8.397	1.249	0.634	0.080	-4.844	0.894	4.859	0.867	0.878	0.304	-0.725	0.472	-2.451	0.471	-0.141	0.047	2.522	0.933	-0.019	0.274	0.716	0.165
274	75.67	10	COMRF	CCET	SSDSJ	4.575	1.052	-0.228	0.080	-3.943	0.955	10.102	1.050	-1.388	0.549	-2.964	0.916	-7.527	0.638	-0.551	0.202	2.386	1.468	1.390	0.769	2.638	0.564
275	78.13	10	COMRF	CCETM	WEST	-6.694	1.258	0.633	0.087	-6.653	1.262	5.846	0.614	3.700	0.782	-3.484	1.051	-3.782	0.331	-5.697	0.482	2.132	0.880	7.062	1.143	-0.351	0.525
276	78.14	10	COMRF	CCETM	SSDSac	-5.943	1.151	0.457	0.080	-4.459	0.760	3.394	0.705	1.007	0.268	-0.511	0.456	-1.988	0.374	-0.106	0.047	0.845	0.784	0.199	0.238	0.569	0.150
277	74.43	10	COMRF	CCETM	SSDSJ	5.020	1.196	-0.261	0.089	-4.713	1.060	7.544	0.854	-0.443	0.532	-3.364	0.964	-6.034	0.475	-0.319	0.156	0.944	1.234	1.585	0.692	1.393	0.431
278	72.83	10	COMRF	WEST	SSDSac	-4.728	1.373	0.314	0.096	-7.905	1.377	3.957	1.259	1.305	0.390	-3.629	1.341	-3.727	1.001	0.021	0.081	7.492	2.072	0.679	0.481	-0.442	0.408
279	63.27	10	COMRF	WEST	SSDSJ	-3.379	1.349	0.189	0.095	-14.724	1.825	10.770	1.221	-0.306	0.589	-9.430	1.495	-6.618	0.871	0.510	0.211	15.190	1.822	1.070	0.758	-1.541	0.576
280	74.69	10	COMRF	SSDSac	SSDSJ	-10.890	1.674	0.709	0.115	-7.031	0.621	3.211	0.328	1.655	0.491	-0.314	0.288	-0.275	0.058	0.184	0.163	2.648	0.320	0.015	0.448	-1.499	0.144
281	79.84	11	COMRF	RIO	SJR	-8.742	1.688	0.631	0.116	-6.271	0.702	3.823	0.653	1.963	0.910	-0.243	0.478	-0.276	0.335	6.073	1.090	4.650	0.651	-4.320	1.527	-8.330	0.857
282	80.62	11	COMRF	RIO	XGEO	-9.759	1.413	0.712	0.100	-7.597	0.922	6.800	1.045	-0.537	0.578	-2.479	0.502	-7.810	0.751	-2.201	0.200	3.550	1.171	-0.379	0.668	7.673	0.713
283	79.32	11	COMRF	RIO	CCET	-6.648	1.234	0.508	0.086	-5.148	0.947	3.249	0.668	2.132	0.960	-1.334	0.612	-1.432	0.282	-0.793	0.518	0.301	0.682	0.778	1.032	2.122	0.425
284	79.30	11	COMRF	RIO	CCETM	-5.142	1.189	0.411	0.084	-5.080	0.932	3.752	0.619	1.147	0.768	-1.586	0.670	-1.832	0.323	-0.637	0.413	0.528	0.623	-0.493	0.872	1.583	0.414
285	78.48	11	COMRF	RIO	WEST	-5.480	1.354	0.478	0.097	-3.827	1.069	7.233	0.790	-2.084	1.076	-5.201	1.191	-6.110	0.715	-9.076	1.338	-5.289	1.438	10.719	2.195	10.607	1.683
286	**82.02**	**11**	**COMRF**	**RIO**	**SSDSac**	**-2.858**	**1.230**	**0.294**	**0.086**	**-5.333**	**0.734**	**9.116**	**1.503**	**-3.191**	**0.684**	**-2.276**	**0.526**	**-16.163**	**1.296**	**-0.745**	**0.176**	**1.170**	**1.476**	**-0.618**	**0.602**	**8.788**	**0.838**
287	78.92	11	COMRF	RIO	SSDSJ	-8.089	1.591	0.572	0.111	-6.350	0.743	5.612	0.599	-0.016	0.493	-1.549	0.451	-0.586	0.322	0.658	0.153	3.986	0.613	-0.943	0.533	-3.036	0.376
288	71.07	11	COMRF	SJR	XGEO	-3.621	1.455	0.356	0.103	-5.902	0.770	2.694	0.908	3.090	0.391	-1.819	0.693	-4.180	1.378	-0.402	0.090	2.493	1.642	3.619	0.434	-4.029	0.520
289	77.66	11	COMRF	SJR	CCET	4.930	1.154	-0.316	0.084	2.068	1.115	-10.509	2.351	11.121	1.511	-4.557	1.252	-23.280	3.385	-6.073	0.544	20.997	2.973	-5.323	1.841	18.679	2.380
290	76.52	11	COMRF	SJR	CCETM	4.338	1.290	-0.215	0.096	-3.354	0.993	-0.808	1.449	6.212	1.007	-8.200	1.334	-12.442	2.019	-5.662	0.484	20.029	2.792	-6.375	1.517	10.808	1.640
291	63.63	11	COMRF	SJR	WEST	-4.692	1.516	0.325	0.099	-13.878	1.955	0.921	1.277	10.101	1.327	-9.252	1.491	0.322	1.611	-8.219	0.897	2.459	2.435	16.454	1.815	-2.546	1.509

292	73.37	11	COMRF	SJR	SSDSac	-11.100	1.838	0.804	0.124	-6.111	0.841	2.971	0.969	2.340	0.334	0.484	0.672	1.796	1.327	-0.283	0.065	-1.984	1.741	2.176	0.318	-2.894	0.353
293	41.25	11	COMRF	SJR	SSDSJ	-1.461	1.610	-0.055	0.086	-3.859	1.954	-26.175	5.616	11.940	2.043	-0.749	1.187	-47.029	10.279	-6.598	1.252	2.997	5.513	1.383	2.051	31.881	6.812
294	80.67	11	COMRF	XGEO	CCET	-10.220	1.138	0.837	0.079	-4.420	0.643	0.949	0.275	5.105	0.696	-1.089	0.444	-0.169	0.060	-3.058	0.332	-0.066	0.313	1.100	0.849	0.860	0.201
295	81.56	11	COMRF	XGEO	CCETM	-7.172	1.045	0.605	0.075	-4.408	0.609	1.243	0.249	3.698	0.547	-1.176	0.425	-0.091	0.062	-2.316	0.298	0.315	0.285	-0.040	0.705	0.678	0.180
296	73.02	11	COMRF	XGEO	WEST	-3.211	1.323	0.181	0.089	-10.461	1.305	3.029	0.370	4.291	1.016	-5.190	1.182	0.888	0.154	-1.517	0.954	4.785	0.636	4.748	1.924	-3.570	0.582
297	69.37	11	COMRF	XGEO	SSDSac	-10.318	1.423	0.716	0.095	-6.251	1.048	1.230	0.679	1.814	0.427	-1.040	0.651	-0.295	0.256	-0.199	0.139	0.696	0.766	0.572	0.489	-0.050	0.359
298	71.78	11	COMRF	XGEO	SSDSJ	-3.920	1.376	0.279	0.097	-6.939	0.793	4.075	0.359	1.139	0.425	-1.920	0.551	-0.269	0.084	-0.094	0.165	3.926	0.446	0.017	0.532	-1.893	0.194
299	76.39	11	COMRF	CCET	CCETM	-4.724	1.367	0.473	0.095	-5.358	0.914	11.253	2.410	-2.872	2.044	-2.673	0.679	-32.838	4.466	-24.781	3.581	5.421	2.720	-3.284	2.426	51.626	7.801
300	79.43	11	COMRF	CCET	WEST	-6.702	1.315	0.660	0.091	-4.703	0.847	8.616	0.650	1.851	0.793	-1.887	0.622	-5.391	0.403	-6.149	0.485	4.326	0.837	5.609	1.156	0.116	0.567
301	77.39	11	COMRF	CCET	SSDSac	-8.030	1.212	0.619	0.079	-4.279	0.716	4.713	0.798	0.665	0.292	-0.383	0.302	-2.227	0.461	-0.122	0.051	2.645	0.837	-0.299	0.257	0.787	0.165
302	75.33	11	COMRF	CCET	SSDSJ	4.916	1.083	-0.254	0.082	-3.771	1.001	10.002	1.128	-1.467	0.580	-2.738	0.964	-7.451	0.634	-0.515	0.206	2.397	1.576	1.261	0.822	2.599	0.568
303	78.25	11	COMRF	CCETM	WEST	-6.544	1.271	0.623	0.088	-6.206	1.255	5.978	0.651	3.592	0.815	-2.905	1.051	-3.717	0.337	-6.025	0.516	2.586	0.919	7.053	1.195	-0.498	0.529
304	78.62	11	COMRF	CCETM	SSDSac	-5.723	1.140	0.447	0.080	-3.974	0.701	3.383	0.716	0.833	0.277	-0.136	0.422	-1.788	0.377	-0.089	0.052	1.133	0.808	-0.053	0.247	0.607	0.154
305	73.90	11	COMRF	CCETM	SSDSJ	4.762	1.307	-0.252	0.095	-5.151	1.213	7.068	0.916	-0.231	0.535	-3.631	1.087	-6.144	0.492	-0.324	0.156	0.376	1.337	1.810	0.709	1.409	0.431
306	73.59	11	COMRF	WEST	SSDSac	-5.080	1.375	0.342	0.095	-7.816	1.419	4.011	1.346	1.235	0.423	-3.241	1.412	-3.427	1.059	0.077	0.094	6.859	2.241	0.835	0.538	-0.706	0.452
307	64.42	11	COMRF	WEST	SSDSJ	-4.336	1.405	0.239	0.097	-15.587	1.941	11.538	1.317	-0.628	0.632	-9.963	1.580	-7.045	0.939	0.554	0.212	16.388	1.947	0.539	0.814	-1.503	0.598
308	75.47	11	COMRF	SSDSac	SSDSJ	-11.623	1.712	0.761	0.117	-6.902	0.596	3.359	0.362	1.257	0.515	-0.099	0.216	-0.274	0.064	0.292	0.165	2.805	0.362	-0.574	0.517	-1.537	0.149
309	80.32	12	COMRF	RIO	SJR	-9.423	1.728	0.679	0.118	-6.318	0.745	3.782	0.693	1.708	0.996	-0.104	0.484	-0.322	0.358	6.704	1.153	4.423	0.699	-5.255	1.675	-8.431	0.896
310	81.33	12	COMRF	RIO	XGEO	-9.479	1.406	0.704	0.100	-7.071	0.904	6.885	1.060	-0.812	0.602	-2.167	0.515	-7.929	0.757	-2.211	0.198	3.440	1.202	-0.702	0.703	7.745	0.708
311	79.91	12	COMRF	RIO	CCET	-6.470	1.226	0.510	0.087	-4.334	0.911	2.927	0.679	2.271	0.995	-0.703	0.622	-1.563	0.294	-0.605	0.517	-0.397	0.710	1.238	1.099	2.223	0.435
312	79.73	12	COMRF	RIO	CCETM	-4.868	1.171	0.402	0.084	-4.270	0.888	3.405	0.619	1.320	0.794	-0.895	0.672	-1.919	0.330	-0.400	0.394	-0.177	0.645	0.054	0.933	1.662	0.422
313	78.82	12	COMRF	RIO	WEST	-5.721	1.345	0.505	0.097	-3.433	1.025	7.163	0.840	-2.332	1.110	-5.041	1.214	-6.468	0.765	-9.475	1.426	-5.902	1.544	10.882	2.323	11.100	1.779
314	**83.07**	**12**	**COMRF**	**RIO**	**SSDSac**	**-2.637**	**1.219**	**0.288**	**0.086**	**-5.044**	**0.697**	**9.095**	**1.565**	**-3.448**	**0.722**	**-2.115**	**0.531**	**-18.236**	**1.407**	**-0.882**	**0.200**	**0.813**	**1.559**	**-0.671**	**0.643**	**10.149**	**0.935**
315	79.49	12	COMRF	RIO	SSDSJ	-8.817	1.606	0.630	0.113	-6.101	0.690	5.604	0.627	-0.219	0.506	-1.238	0.435	-0.477	0.345	0.709	0.153	3.975	0.656	-1.373	0.567	-3.199	0.393
316	71.16	12	COMRF	SJR	XGEO	-3.818	1.467	0.372	0.104	-5.825	0.764	2.359	0.933	3.130	0.413	-1.673	0.695	-4.359	1.383	-0.424	0.096	2.012	1.670	3.586	0.480	-4.008	0.529
317	77.99	12	COMRF	SJR	CCET	4.903	1.167	-0.339	0.086	3.191	1.148	-13.206	2.539	12.589	1.674	-4.208	1.314	-28.247	3.661	-5.899	0.539	23.264	3.201	-5.030	1.972	22.085	2.621
318	76.16	12	COMRF	SJR	CCETM	4.049	1.340	-0.201	0.099	-3.547	1.066	-0.665	1.496	6.030	1.050	-8.212	1.382	-12.671	2.113	-5.517	0.478	20.302	2.865	-6.407	1.552	10.822	1.678
319	64.41	12	COMRF	SJR	WEST	-5.382	1.556	0.375	0.100	-13.828	2.031	0.857	1.368	10.159	1.392	-8.999	1.549	0.312	1.657	-8.676	0.965	2.138	2.586	16.730	1.915	-2.362	1.575
320	74.33	12	COMRF	SJR	SSDSac	-11.815	1.881	0.850	0.125	-6.090	0.835	2.578	0.998	2.340	0.356	0.797	0.640	2.478	1.359	-0.267	0.070	-3.207	1.798	2.172	0.342	-2.936	0.354
321	42.38	12	COMRF	SJR	SSDSJ	-1.928	1.658	-0.047	0.087	-3.736	2.120	-28.089	5.824	12.545	2.124	-0.710	1.286	-51.407	10.888	-7.010	1.299	4.219	6.105	0.994	2.289	34.618	7.184
322	81.49	12	COMRF	XGEO	CCET	-9.946	1.123	0.822	0.079	-3.881	0.615	0.626	0.280	5.095	0.721	-0.606	0.451	-0.136	0.063	-2.970	0.325	-0.480	0.325	1.195	0.890	1.042	0.205
323	82.23	12	COMRF	XGEO	CCETM	-6.984	1.035	0.592	0.075	-3.923	0.581	0.959	0.250	3.653	0.564	-0.687	0.426	-0.055	0.065	-2.068	0.285	-0.069	0.291	0.097	0.735	0.855	0.185
324	72.73	12	COMRF	XGEO	WEST	-3.424	1.339	0.206	0.090	-10.310	1.361	3.147	0.394	4.190	1.061	-5.041	1.236	0.878	0.166	-1.626	1.018	4.958	0.690	4.505	2.022	-3.674	0.629
325	70.47	12	COMRF	XGEO	SSDSac	-10.161	1.410	0.715	0.095	-5.794	1.053	0.773	0.706	1.932	0.447	-0.748	0.672	-0.394	0.264	-0.243	0.147	0.173	0.798	0.645	0.513	0.079	0.373
326	71.57	12	COMRF	XGEO	SSDSJ	-4.126	1.390	0.302	0.098	-6.792	0.797	4.167	0.385	0.984	0.431	-1.855	0.571	-0.290	0.090	-0.117	0.167	3.955	0.489	-0.244	0.553	-1.870	0.199
327	76.49	12	COMRF	CCET	CCETM	-4.704	1.378	0.470	0.096	-5.044	0.915	11.464	2.618	-3.253	2.266	-2.257	0.681	-36.818	4.749	-27.181	3.781	3.718	3.008	-1.833	2.738	57.999	8.265
328	79.46	12	COMRF	CCET	WEST	-6.857	1.315	0.664	0.090	-4.661	0.871	8.497	0.678	1.680	0.857	-1.608	0.659	-5.193	0.401	-6.383	0.513	4.505	0.868	5.411	1.247	-0.104	0.557
329	78.19	12	COMRF	CCET	SSDSac	-7.703	1.195	0.598	0.079	-4.043	0.652	4.651	0.791	0.489	0.299	-0.243	0.259	-2.048	0.455	-0.103	0.055	2.833	0.847	-0.545	0.266	0.819	0.166
330	75.08	12	COMRF	CCET	SSDSJ	5.251	1.116	-0.283	0.084	-3.556	1.008	10.252	1.202	-1.593	0.611	-2.370	0.980	-7.354	0.628	-0.529	0.215	2.868	1.673	1.102	0.876	2.609	0.580
331	78.44	12	COMRF	CCETM	WEST	-6.523	1.276	0.625	0.088	-5.682	0.870	6.232	0.557	3.371	0.790	-2.226	0.664	-3.671	0.342	-6.313	0.544	3.209	0.778	6.842	1.179	-0.776	0.525
332	79.18	12	COMRF	CCETM	SSDSac	-5.540	1.129	0.434	0.080	-3.725	0.564	3.348	0.648	0.676	0.271	0.077	0.230	-1.586	0.371	-0.071	0.056	1.360	0.684	-0.286	0.241	0.632	0.156
333	73.53	12	COMRF	CCETM	SSDSJ	4.569	1.376	-0.246	0.099	-5.371	1.253	6.813	0.935	-0.106	0.521	-3.639	1.112	-6.160	0.496	-0.331	0.157	0.145	1.363	1.929	0.702	1.401	0.428
334	74.23	12	COMRF	WEST	SSDSac	-5.360	1.373	0.367	0.096	-7.280	1.292	3.518	1.390	1.287	0.453	-2.304	1.311	-2.992	1.132	0.140	0.109	5.383	2.328	1.175	0.595	-1.013	0.511

335	65.15	12	COMRF	WEST	SSDSJ	-4.973	1.449	0.281	0.098	-15.763	2.030	11.883	1.415	-0.857	0.683	-9.988	1.656	-7.377	1.012	0.585	0.215	17.007	2.074	0.169	0.882	-1.498	0.626
336	76.10	12	COMRF	SSDSac	SSDSJ	-12.271	1.745	0.805	0.119	-6.796	0.607	3.434	0.383	0.758	0.532	0.126	0.212	-0.242	0.069	0.394	0.167	2.930	0.397	-1.305	0.575	-1.542	0.151
337	80.75	13	COMRF	RIO	SJR	-10.331	1.790	0.738	0.119	-6.456	0.819	3.762	0.741	1.249	1.091	0.090	0.504	-0.425	0.381	7.396	1.243	4.066	0.750	-6.500	1.851	-8.314	0.937
338	82.00	13	COMRF	RIO	XGEO	-9.170	1.399	0.694	0.101	-6.545	0.887	6.897	1.071	-1.050	0.622	-1.838	0.534	-8.027	0.764	-2.209	0.196	3.238	1.230	-0.981	0.734	7.777	0.702
339	80.45	13	COMRF	RIO	CCET	-6.313	1.217	0.511	0.088	-3.586	0.863	2.682	0.699	2.198	1.039	-0.078	0.630	-1.712	0.311	-0.377	0.512	-1.025	0.748	1.411	1.183	2.285	0.444
340	80.25	13	COMRF	RIO	CCETM	-4.632	1.157	0.394	0.085	-3.553	0.839	3.032	0.617	1.434	0.811	-0.256	0.673	-2.000	0.336	-0.239	0.314	-0.880	0.677	0.426	1.011	1.741	0.424
341	79.07	13	COMRF	RIO	WEST	-5.868	1.339	0.524	0.097	-3.128	1.012	7.093	0.905	-2.625	1.164	-4.886	1.268	-6.796	0.824	-9.566	1.511	-6.386	1.650	10.673	2.460	11.303	1.869
342	**84.06**	**13**	**COMRF**	**RIO**	**SSDSac**	**-2.445**	**1.206**	**0.282**	**0.086**	**-4.810**	**0.666**	**8.890**	**1.618**	**-3.609**	**0.753**	**-1.969**	**0.541**	**-19.904**	**1.499**	**-0.965**	**0.230**	**0.287**	**1.648**	**-0.618**	**0.684**	**11.210**	**1.030**
343	80.01	13	COMRF	RIO	SSDSJ	-9.647	1.632	0.693	0.114	-5.879	0.665	5.509	0.659	-0.440	0.538	-0.889	0.434	-0.350	0.381	0.755	0.155	3.844	0.719	-1.844	0.631	-3.339	0.407
344	71.33	13	COMRF	SJR	XGEO	-4.177	1.487	0.396	0.105	-5.754	0.757	1.861	0.973	3.181	0.441	-1.408	0.694	-4.503	1.382	-0.433	0.102	1.246	1.703	3.560	0.535	-3.938	0.538
345	77.89	13	COMRF	SJR	CCET	4.585	1.190	-0.333	0.087	3.573	1.230	-14.500	2.748	13.285	1.834	-4.324	1.421	-30.797	3.896	-5.905	0.558	24.893	3.391	-5.239	2.100	24.426	2.853
346	75.76	13	COMRF	SJR	CCETM	3.805	1.379	-0.191	0.101	-3.679	1.126	-0.655	1.506	5.802	1.080	-8.115	1.420	-12.471	2.199	-5.405	0.473	20.117	2.912	-6.511	1.568	10.767	1.721
347	64.91	13	COMRF	SJR	WEST	-5.926	1.578	0.415	0.100	-13.524	2.082	0.567	1.449	10.105	1.457	-8.445	1.591	0.513	1.679	-9.053	1.035	1.369	2.697	16.769	2.027	-2.017	1.648
348	75.37	13	COMRF	SJR	SSDSac	-12.640	1.940	0.896	0.127	-6.156	0.843	1.971	1.048	2.319	0.377	1.208	0.615	3.240	1.384	-0.222	0.074	-4.784	1.876	2.178	0.365	-2.920	0.339
349	43.75	13	COMRF	SJR	SSDSJ	-2.546	1.711	-0.038	0.087	-3.157	2.265	-31.639	6.067	13.681	2.224	-0.341	1.369	-58.627	11.818	-7.834	1.378	5.751	6.916	0.315	2.599	39.557	7.760
350	82.28	13	COMRF	XGEO	CCET	-9.580	1.104	0.796	0.079	-3.427	0.587	0.385	0.286	4.812	0.752	-0.162	0.467	-0.104	0.065	-2.868	0.317	-0.805	0.339	0.916	0.942	1.193	0.206
351	83.11	13	COMRF	XGEO	CCETM	-6.799	1.018	0.574	0.074	-3.509	0.549	0.694	0.251	3.437	0.587	-0.206	0.432	-0.012	0.067	-1.759	0.277	-0.425	0.297	0.032	0.776	1.083	0.190
352	72.49	13	COMRF	XGEO	WEST	-3.629	1.357	0.233	0.091	-10.028	1.428	3.229	0.419	4.034	1.103	-4.793	1.312	0.852	0.179	-1.829	1.087	5.042	0.743	4.296	2.120	-3.690	0.678
353	71.62	13	COMRF	XGEO	SSDSac	-10.032	1.400	0.711	0.094	-5.446	1.053	0.163	0.739	2.103	0.468	-0.430	0.688	-0.562	0.271	-0.303	0.155	-0.491	0.843	0.802	0.539	0.304	0.383
354	71.48	13	COMRF	XGEO	SSDSJ	-4.523	1.418	0.337	0.100	-6.657	0.799	4.252	0.416	0.835	0.438	-1.738	0.590	-0.297	0.095	-0.152	0.170	3.989	0.539	-0.525	0.573	-1.839	0.204
355	76.30	13	COMRF	CCET	CCETM	-4.682	1.369	0.472	0.096	-4.561	0.870	10.395	2.842	-2.482	2.506	-1.719	0.657	-38.852	4.905	-28.181	3.810	0.901	3.342	0.630	3.092	61.050	8.431
356	79.29	13	COMRF	CCET	WEST	-6.817	1.301	0.659	0.089	-4.393	0.871	8.234	0.709	1.344	0.921	-1.179	0.695	-5.016	0.400	-6.599	0.547	4.411	0.906	5.041	1.345	-0.187	0.554
357	78.81	13	COMRF	CCET	SSDSac	-7.259	1.182	0.568	0.079	-3.784	0.620	4.468	0.814	0.344	0.316	-0.088	0.252	-1.891	0.451	-0.082	0.060	2.812	0.899	-0.757	0.293	0.801	0.165
358	74.67	13	COMRF	CCET	SSDSJ	5.344	1.165	-0.295	0.087	-3.631	1.068	9.848	1.263	-1.481	0.634	-2.352	1.042	-7.345	0.636	-0.570	0.224	2.353	1.773	1.326	0.933	2.750	0.604
359	78.47	13	COMRF	CCETM	WEST	-6.492	1.282	0.620	0.089	-5.484	0.852	6.069	0.565	3.132	0.838	-1.883	0.668	-3.604	0.347	-6.517	0.577	3.191	0.784	6.589	1.256	-0.927	0.525
360	79.74	13	COMRF	CCETM	SSDSac	-5.318	1.126	0.415	0.080	-3.593	0.547	3.141	0.661	0.564	0.284	0.196	0.223	-1.388	0.370	-0.054	0.060	1.331	0.720	-0.466	0.260	0.631	0.158
361	73.14	13	COMRF	CCETM	SSDSJ	4.206	1.421	-0.226	0.102	-5.540	1.286	6.313	0.940	-0.007	0.506	-3.644	1.139	-6.177	0.501	-0.327	0.160	-0.461	1.371	2.047	0.696	1.434	0.427
362	74.95	13	COMRF	WEST	SSDSac	-5.605	1.374	0.385	0.096	-6.648	1.211	2.616	1.464	1.431	0.483	-1.076	1.303	-2.415	1.225	0.225	0.126	3.192	2.512	1.718	0.680	-1.369	0.588
363	65.61	13	COMRF	WEST	SSDSJ	-5.419	1.477	0.315	0.100	-15.607	2.107	12.030	1.523	-1.119	0.746	-9.761	1.733	-7.651	1.088	0.623	0.220	17.367	2.215	-0.238	0.964	-1.471	0.660
364	76.82	13	COMRF	SSDSac	SSDSJ	-12.954	1.775	0.848	0.120	-6.703	0.620	3.411	0.394	0.166	0.546	0.413	0.219	-0.167	0.074	0.498	0.167	3.017	0.423	-2.175	0.636	-1.516	0.147
365	81.09	14	COMRF	RIO	SJR	-11.329	1.875	0.787	0.122	-6.932	0.920	4.096	0.816	0.297	1.200	0.180	0.533	-0.713	0.407	8.354	1.393	3.968	0.837	-8.403	2.067	-8.000	0.991
366	82.41	14	COMRF	RIO	XGEO	-9.031	1.405	0.701	0.102	-5.998	0.859	6.575	1.071	-0.918	0.643	-1.573	0.549	-8.103	0.773	-2.155	0.196	2.557	1.253	-0.825	0.768	7.609	0.696
367	80.72	14	COMRF	RIO	CCET	-6.236	1.225	0.514	0.090	-3.160	0.854	2.569	0.726	2.055	1.079	0.266	0.672	-1.944	0.338	-0.208	0.506	-1.521	0.795	1.421	1.269	2.238	0.454
368	80.56	14	COMRF	RIO	CCETM	-4.548	1.160	0.394	0.087	-3.186	0.829	2.835	0.637	1.384	0.852	0.066	0.699	-2.188	0.354	-0.125	0.213	-1.417	0.729	0.519	1.109	1.743	0.424
369	79.24	14	COMRF	RIO	WEST	-5.851	1.337	0.527	0.097	-2.859	1.012	7.119	0.981	-3.064	1.231	-4.637	1.329	-7.102	0.875	-9.302	1.586	-6.577	1.756	9.875	2.593	11.142	1.934
370	**84.45**	**14**	**COMRF**	**RIO**	**SSDSac**	**-2.617**	**1.211**	**0.295**	**0.087**	**-4.839**	**0.683**	**7.758**	**1.677**	**-3.076**	**0.770**	**-1.996**	**0.577**	**-20.934**	**1.607**	**-1.087**	**0.264**	**-0.933**	**1.780**	**-0.105**	**0.738**	**11.868**	**1.152**
371	80.44	14	COMRF	RIO	SSDSJ	-10.325	1.658	0.740	0.116	-5.867	0.668	5.651	0.711	-0.935	0.615	-0.736	0.447	-0.433	0.427	0.828	0.161	3.842	0.814	-2.599	0.750	-3.400	0.424
372	71.68	14	COMRF	SJR	XGEO	-4.660	1.510	0.418	0.106	-5.864	0.755	1.002	1.051	3.410	0.485	-1.124	0.692	-4.606	1.391	-0.422	0.107	0.009	1.778	3.753	0.611	-3.802	0.550
373	77.49	14	COMRF	SJR	CCET	4.126	1.225	-0.310	0.090	3.546	1.348	-14.966	2.965	13.509	1.984	-4.737	1.567	-32.144	4.138	-5.970	0.586	26.315	3.612	-5.721	2.225	26.116	3.085
374	74.71	14	COMRF	SJR	CCETM	4.097	1.400	-0.220	0.102	-3.552	1.187	-0.799	1.569	5.552	1.137	-7.659	1.470	-12.349	2.360	-4.960	0.437	19.549	3.005	-6.203	1.601	10.251	1.781
375	65.21	14	COMRF	SJR	WEST	-6.250	1.590	0.437	0.100	-13.193	2.111	0.207	1.543	9.971	1.528	-7.926	1.601	0.705	1.697	-9.255	1.100	0.618	2.814	16.695	2.149	-1.806	1.724
376	76.37	14	COMRF	SJR	SSDSac	-13.453	2.000	0.924	0.129	-6.562	0.863	1.009	1.098	2.439	0.398	1.547	0.600	4.240	1.443	-0.179	0.077	-6.925	1.971	2.408	0.400	-2.977	0.324
377	45.21	14	COMRF	SJR	SSDSJ	-3.119	1.772	-0.037	0.088	-2.326	2.417	-36.249	6.372	15.144	2.350	-0.147	1.449	-69.298	13.318	-9.028	1.509	8.751	8.100	-0.874	3.022	46.778	8.697

378	82.71	14	COMRF	XGEO	CCET	-9.062	1.090	0.754	0.079	-3.268	0.594	0.299	0.295	4.230	0.787	0.036	0.508	-0.082	0.069	-2.759	0.313	-0.948	0.356	0.264	0.997	1.261	0.207
379	83.60	14	COMRF	XGEO	CCETM	-6.560	1.008	0.547	0.074	-3.325	0.543	0.558	0.258	3.031	0.621	0.105	0.454	0.019	0.071	-1.372	0.254	-0.641	0.309	-0.188	0.835	1.281	0.193
380	72.41	14	COMRF	XGEO	WEST	-3.742	1.366	0.251	0.092	-9.643	1.457	3.511	0.461	3.570	1.138	-4.467	1.353	0.830	0.193	-2.054	1.158	5.362	0.815	3.777	2.200	-3.673	0.734
381	72.64	14	COMRF	XGEO	SSDSac	-9.941	1.398	0.701	0.094	-5.360	1.059	-0.420	0.778	2.306	0.489	-0.249	0.703	-0.771	0.277	-0.384	0.160	-1.090	0.892	1.004	0.567	0.595	0.391
382	71.57	14	COMRF	XGEO	SSDSJ	-4.958	1.444	0.367	0.102	-6.748	0.805	4.520	0.467	0.567	0.457	-1.765	0.607	-0.283	0.101	-0.176	0.174	4.271	0.616	-0.937	0.604	-1.788	0.211
383	75.47	14	COMRF	CCET	CCETM	-4.884	1.350	0.486	0.095	-4.181	0.786	9.466	3.018	-1.562	2.678	-1.209	0.597	-40.206	4.925	-26.744	3.501	-2.394	3.607	3.918	3.350	60.851	8.146
384	78.91	14	COMRF	CCET	WEST	-6.548	1.290	0.640	0.089	-3.970	0.887	8.039	0.745	0.833	0.999	-0.661	0.750	-4.895	0.402	-6.780	0.585	4.379	0.948	4.460	1.461	-0.251	0.558
385	78.94	14	COMRF	CCET	SSDSac	-6.771	1.186	0.537	0.080	-3.545	0.600	4.299	0.833	0.316	0.328	0.028	0.250	-1.799	0.450	-0.088	0.064	2.731	0.943	-0.884	0.316	0.711	0.165
386	74.22	14	COMRF	CCET	SSDSJ	5.292	1.231	-0.296	0.091	-3.774	1.146	9.076	1.323	-1.278	0.657	-2.448	1.123	-7.397	0.653	-0.635	0.235	1.275	1.874	1.710	0.988	2.980	0.637
387	77.94	14	COMRF	CCETM	WEST	-6.479	1.282	0.616	0.089	-5.348	0.873	5.812	0.590	2.943	0.902	-1.606	0.716	-3.367	0.350	-6.766	0.622	3.192	0.810	6.415	1.359	-1.120	0.526
388	79.74	14	COMRF	CCETM	SSDSac	-5.141	1.132	0.397	0.081	-3.543	0.545	2.804	0.674	0.627	0.291	0.257	0.229	-1.062	0.351	-0.077	0.064	1.245	0.766	-0.531	0.278	0.601	0.161
389	72.09	14	COMRF	CCETM	SSDSJ	4.082	1.441	-0.222	0.103	-5.480	1.292	5.850	0.941	0.037	0.500	-3.381	1.144	-5.785	0.476	-0.305	0.168	-0.700	1.359	2.004	0.699	1.247	0.415
390	75.48	14	COMRF	WEST	SSDSac	-5.897	1.372	0.400	0.096	-5.653	1.019	0.782	1.435	1.923	0.494	0.533	1.191	-2.016	1.318	0.256	0.136	0.268	2.559	2.473	0.761	-1.520	0.658
391	65.89	14	COMRF	WEST	SSDSJ	-5.671	1.491	0.336	0.100	-15.352	2.141	12.110	1.626	-1.430	0.819	-9.484	1.775	-7.830	1.161	0.667	0.225	17.608	2.357	-0.688	1.063	-1.446	0.697
392	77.66	14	COMRF	SSDSac	SSDSJ	-13.633	1.792	0.879	0.120	-6.803	0.635	3.591	0.412	-0.680	0.566	0.694	0.238	-0.095	0.077	0.649	0.169	3.367	0.461	-3.360	0.701	-1.519	0.144

Appendix B, Models for Banks Salvage with All Daily Data

There were 210 models examined for predicting the Banks daily salvage numbers, with 15 models for each of the moving averages (MA) from 1 (no averaging of explanatory variables) to 14 days (averaging for 14 days). In this appendix the percentage of variation explained (% Exp), the estimated parameter values (b0 to b10), and estimated standard errors for the parameter values (SE) are given for each model in the order in which the models were estimated. For each order of averaging the model that accounts for the most variation in the salvage numbers is shown with bold, red type. These estimates were obtained using the variables CCET and CCETM omitted so that all of the daily data could be used.

Model	% Exp	MA	X1	X2	X3	b0	SE	b1	SE	b2	SE	b3	SE	b4	SE	b5	SE	b6	SE	b7	SE	b8	SE	b9	SE	b10	SE
1	61.39	1	COMRF	RIO	SJR-	2.125	1.039	0.254	0.069-	4.626	0.620	5.099	0.569	0.427	0.845-	1.789	0.406-	2.153	0.250-	0.342	0.936	2.161	0.439	0.322	1.054-	1.485	0.868
2	62.67	1	COMRF	RIO	XGEO-	1.324	0.920	0.175	0.067-	5.341	0.673	5.811	0.797-	0.397	0.421-	2.207	0.373-	2.979	0.701-	0.691	0.230	2.129	0.761-	0.279	0.421	1.550	0.810
3	**63.68**	**1**	**COMRF**	**RIO**	**WEST-**	**2.764**	**0.895**	**0.302**	**0.064-**	**4.018**	**0.682**	**6.390**	**0.568-**	**1.166**	**0.617-**	**1.557**	**0.490-**	**2.479**	**0.348-**	**0.540**	**0.414**	**2.340**	**0.568-**	**0.379**	**0.750-**	**0.054**	**0.662**
4	62.29	1	COMRF	RIO	SSDSac-	3.364	0.935	0.333	0.066-	5.082	0.621	5.971	0.625-	0.208	0.213-	2.108	0.363-	2.973	0.486-	0.009	0.011	1.493	0.528	0.171	0.133	0.351	0.200
5	61.78	1	COMRF	RIO	SSDSJ-	2.385	0.957	0.254	0.067-	5.316	0.686	5.407	0.489	0.739	0.364-	2.258	0.401-	2.155	0.247-	0.059	0.097	2.099	0.450	0.661	0.305-	0.791	0.286
6	53.62	1	COMRF	SJR	XGEO	1.782	1.027	0.140	0.074-	3.579	0.551	3.402	0.706	1.098	0.286-	2.214	0.457-	7.817	1.218-	0.467	0.068	5.545	1.101	1.416	0.265-	3.458	0.511
7	47.29	1	COMRF	SJR	WEST	1.164	0.972	0.113	0.067-	6.535	0.843-	1.196	0.973	5.461	0.733-	4.174	0.616-	6.634	1.441-	4.222	0.469	1.524	1.337	5.556	0.847	3.804	1.308
8	47.65	1	COMRF	SJR	SSDSac-	1.767	1.115	0.273	0.075-	5.197	0.753	2.489	0.854	1.164	0.147-	2.557	0.544-	3.962	1.152-	0.095	0.012	3.358	1.167	0.765	0.123-	0.609	0.223
9	39.67	1	COMRF	SJR	SSDSJ-	1.309	1.250	0.022	0.070-	4.524	1.020	-24.989	4.139	11.023	1.458-	1.551	0.459	-35.513	6.236-	4.707	0.704-	3.704	3.127	2.907	0.935	22.427	3.920
10	52.65	1	COMRF	XGEO	WEST-	0.736	0.962	0.191	0.070-	5.875	0.748	1.646	0.238	2.486	0.546-	2.665	0.571-	0.002	0.082-	0.939	0.400	1.811	0.276	2.078	0.759-	1.693	0.239
11	52.80	1	COMRF	XGEO	SSDSac-	2.375	1.043	0.245	0.072-	5.437	0.693	1.154	0.275	1.291	0.146-	1.959	0.409-	0.166	0.099-	0.073	0.011	0.311	0.283	0.679	0.125-	0.319	0.077
12	54.65	1	COMRF	XGEO	SSDSJ-	0.984	0.977	0.236	0.070-	4.729	0.612	1.706	0.258	2.690	0.328-	1.872	0.397-	0.352	0.066-	0.660	0.119	1.209	0.267	1.722	0.337-	1.435	0.182
13	52.35	1	COMRF	WEST	SSDSac-	2.683	0.981	0.303	0.069-	6.202	0.840	2.542	0.583	1.076	0.131-	2.634	0.634-	1.658	0.417-	0.049	0.014	2.471	0.794	0.810	0.130-	0.500	0.145
14	46.99	1	COMRF	WEST	SSDSJ	0.455	0.903	0.163	0.066-	6.385	0.781	3.772	0.638	1.261	0.383-	3.693	0.619-	4.131	0.513-	0.658	0.157	4.787	0.903	0.985	0.456	1.044	0.453
15	49.29	1	COMRF	SSDSac	SSDSJ-	3.041	1.039	0.309	0.071-	5.959	0.796	1.213	0.129	2.194	0.376-	2.438	0.496-	0.079	0.012-	0.498	0.123	0.722	0.118	1.388	0.352-	0.359	0.065
16	63.14	2	COMRF	RIO	SJR-	3.570	1.083	0.345	0.070-	5.078	0.726	4.731	0.560	0.825	0.854-	1.677	0.478-	1.883	0.236	0.275	0.973	2.067	0.453-	0.162	1.125-	1.892	0.848
17	64.23	2	COMRF	RIO	XGEO-	2.358	0.944	0.236	0.068-	5.673	0.788	5.338	0.802-	0.168	0.434-	2.272	0.450-	2.887	0.687-	0.682	0.228	1.600	0.818	0.029	0.454	1.602	0.797
18	**64.82**	**2**	**COMRF**	**RIO**	**WEST-**	**3.596**	**0.913**	**0.354**	**0.064-**	**4.342**	**0.762**	**5.864**	**0.534-**	**0.940**	**0.631-**	**1.109**	**0.538-**	**1.753**	**0.330-**	**0.001**	**0.429**	**3.089**	**0.580-**	**1.414**	**0.801-**	**1.405**	**0.655**
19	64.48	2	COMRF	RIO	SSDSac-	4.214	0.952	0.388	0.066-	5.442	0.693	6.624	0.689-	0.627	0.250-	2.274	0.423-	3.498	0.526-	0.002	0.013	1.817	0.597-	0.037	0.166	0.655	0.218
20	63.50	2	COMRF	RIO	SSDSJ-	3.779	1.010	0.341	0.068-	5.553	0.777	5.133	0.492	0.780	0.401-	2.065	0.448-	1.870	0.237-	0.018	0.115	2.109	0.470	0.389	0.328-	1.072	0.312
21	56.55	2	COMRF	SJR	XGEO-	0.084	1.059	0.260	0.075-	4.032	0.641	4.261	0.776	1.091	0.307-	2.141	0.519-	7.921	1.223-	0.412	0.064	6.134	1.197	1.624	0.286-	3.953	0.526
22	50.61	2	COMRF	SJR	WEST-	0.115	0.990	0.179	0.067-	6.703	0.913-	1.318	1.005	5.672	0.772-	3.630	0.642-	6.000	1.423-	4.426	0.473	1.021	1.363	5.426	0.873	4.130	1.294
23	49.63	2	COMRF	SJR	SSDSac-	2.997	1.160	0.346	0.076-	5.578	0.903	2.953	0.931	1.173	0.157-	2.399	0.667-	3.773	1.198-	0.100	0.013	3.307	1.304	0.786	0.136-	0.714	0.233
24	42.33	2	COMRF	SJR	SSDSJ-	1.435	1.297	0.047	0.071-	3.244	1.100	-25.317	4.216	11.615	1.489-	0.975	0.523	-40.073	6.670-	5.827	0.785-	0.220	3.502	1.582	1.027	26.886	4.278
25	56.88	2	COMRF	XGEO	WEST-	2.051	0.973	0.257	0.069-	6.470	0.842	1.634	0.245	2.839	0.582-	2.572	0.626	0.153	0.083-	0.963	0.400	2.110	0.268	2.093	0.780-	2.022	0.233
26	53.60	2	COMRF	XGEO	SSDSac-	3.607	1.092	0.319	0.074-	5.487	0.774	1.166	0.319	1.261	0.162-	1.644	0.470-	0.153	0.102-	0.075	0.012	0.339	0.334	0.660	0.149-	0.284	0.081
27	58.23	2	COMRF	XGEO	SSDSJ-	2.626	1.004	0.331	0.070-	4.992	0.664	1.798	0.275	2.852	0.340-	1.545	0.416-	0.293	0.063-	0.707	0.126	1.404	0.285	1.643	0.348-	1.614	0.179
28	55.40	2	COMRF	WEST	SSDSac-	3.420	0.974	0.343	0.068-	6.255	0.917	2.698	0.630	1.067	0.141-	1.997	0.689-	1.486	0.416-	0.030	0.015	1.883	0.801	0.982	0.140-	0.707	0.148
29	50.48	2	COMRF	WEST	SSDSJ-	0.399	0.917	0.207	0.065-	6.347	0.848	3.999	0.718	1.042	0.421-	3.139	0.666-	4.644	0.565-	0.697	0.172	4.975	1.004	0.649	0.500	1.433	0.499
30	51.70	2	COMRF	SSDSac	SSDSJ-	4.014	1.068	0.375	0.072-	5.696	0.831	1.188	0.138	2.356	0.402-	1.853	0.525-	0.073	0.013-	0.531	0.138	0.737	0.132	1.275	0.363-	0.459	0.074
31	64.67	3	COMRF	RIO	SJR-	4.672	1.137	0.431	0.072-	4.958	0.731	4.242	0.565	1.340	0.892-	1.269	0.487-	1.589	0.227	0.396	1.096	2.095	0.454-	0.275	1.232-	2.799	0.901
32	65.14	3	COMRF	RIO	XGEO-	3.489	0.974	0.321	0.069-	5.346	0.784	4.950	0.794-	0.043	0.438-	1.865	0.447-	2.914	0.677-	0.699	0.227	1.169	0.832	0.216	0.466	1.777	0.787

33	**66.37**	**3**	**COMRF**	**RIO**	**WEST-**	**4.596**	**0.934**	**0.421**	**0.064-**	**4.059**	**0.757**	**5.730**	**0.520-**	**1.398**	**0.656-**	**0.209**	**0.527-**	**1.203**	**0.320**	**0.568**	**0.432**	**3.883**	**0.560-**	**2.961**	**0.817-**	**2.414**	**0.636**
34	66.21	3	COMRF	RIO	SSDSac-	5.111	0.971	0.454	0.066-	5.451	0.696	7.334	0.761-	1.070	0.289-	2.167	0.431-	4.145	0.572	0.003	0.014	2.185	0.656-	0.246	0.197	1.020	0.238
35	65.07	3	COMRF	RIO	SSDSJ-	4.910	1.043	0.425	0.069-	5.417	0.783	4.770	0.491	1.060	0.413-	1.677	0.447-	1.544	0.231-	0.060	0.127	2.134	0.474	0.321	0.341-	1.520	0.339
36	58.91	3	COMRF	SJR	XGEO-	1.503	1.103	0.360	0.077-	4.021	0.650	4.644	0.836	1.061	0.314-	1.897	0.545-	8.507	1.305-	0.381	0.063	6.685	1.313	1.788	0.293-	4.418	0.544
37	52.63	3	COMRF	SJR	WEST-	0.524	0.996	0.214	0.067-	6.101	0.874-	0.764	0.992	5.133	0.776-	3.013	0.629-	5.578	1.459-	4.273	0.465	1.856	1.395	4.768	0.877	3.344	1.274
38	51.72	3	COMRF	SJR	SSDSac-	3.905	1.191	0.417	0.078-	5.128	0.894	2.983	0.957	1.174	0.169-	1.726	0.684-	3.666	1.302-	0.111	0.015	2.856	1.383	0.819	0.147-	0.936	0.252
39	44.27	3	COMRF	SJR	SSDSJ-	0.669	1.291	0.050	0.074-	1.852	1.072	-22.852	4.081	11.366	1.471-	0.737	0.575	-40.821	6.802-	6.512	0.842	4.186	3.674	0.326	1.109	28.449	4.451
40	59.91	3	COMRF	XGEO	WEST-	2.861	0.981	0.304	0.069-	6.458	0.852	1.681	0.246	2.778	0.591-	2.225	0.632	0.250	0.083-	0.858	0.406	2.335	0.264	1.752	0.785-	2.227	0.234
41	54.44	3	COMRF	XGEO	SSDSac-	4.790	1.131	0.395	0.076-	5.430	0.795	1.141	0.345	1.295	0.182-	1.315	0.481-	0.150	0.104-	0.084	0.014	0.334	0.364	0.688	0.174-	0.248	0.084
42	60.98	3	COMRF	XGEO	SSDSJ-	3.892	1.038	0.417	0.071-	4.866	0.642	1.835	0.277	2.865	0.353-	1.137	0.406-	0.254	0.061-	0.732	0.138	1.518	0.288	1.497	0.374-	1.779	0.180
43	57.78	3	COMRF	WEST	SSDSac-	3.917	0.970	0.377	0.068-	5.755	0.892	2.323	0.654	1.156	0.156-	1.188	0.677-	1.284	0.429-	0.029	0.017	1.033	0.805	1.136	0.148-	0.810	0.157
44	52.74	3	COMRF	WEST	SSDSJ-	0.778	0.929	0.235	0.066-	5.787	0.827	3.535	0.748	1.206	0.454-	2.369	0.651-	4.517	0.574-	0.685	0.181	4.112	1.040	1.001	0.530	1.256	0.504
45	54.43	3	COMRF	SSDSac	SSDSJ-	4.786	1.075	0.434	0.073-	5.332	0.772	1.212	0.151	2.539	0.411-	1.331	0.497-	0.075	0.015-	0.599	0.151	0.767	0.146	1.248	0.375-	0.570	0.080
46	66.67	4	COMRF	RIO	SJR-	5.695	1.172	0.501	0.073-	5.337	0.797	4.040	0.585	2.018	0.960-	1.238	0.531-	1.375	0.229	0.213	1.196	2.584	0.477-	0.039	1.355-	3.995	0.967
47	66.40	4	COMRF	RIO	XGEO-	4.826	1.013	0.397	0.071-	5.817	0.861	5.135	0.828-	0.035	0.452-	1.902	0.480-	3.219	0.681-	0.782	0.226	1.421	0.876	0.272	0.483	2.196	0.779
48	**68.63**	**4**	**COMRF**	**RIO**	**WEST-**	**5.701**	**0.953**	**0.474**	**0.063-**	**4.676**	**0.787**	**5.947**	**0.531-**	**1.843**	**0.679-**	**0.055**	**0.416-**	**0.872**	**0.333**	**0.830**	**0.451**	**4.762**	**0.571-**	**4.074**	**0.805-**	**2.971**	**0.661**
49	68.41	4	COMRF	RIO	SSDSac-	6.246	0.992	0.517	0.067-	6.238	0.758	9.099	0.889-	1.768	0.341-	2.527	0.462-	5.183	0.637	0.013	0.015	3.610	0.760-	0.690	0.241	1.489	0.264
50	67.30	4	COMRF	RIO	SSDSJ-	6.203	1.078	0.500	0.070-	6.008	0.862	4.830	0.511	1.376	0.420-	1.706	0.480-	1.292	0.234-	0.114	0.137	2.687	0.507	0.266	0.366-	2.087	0.351
51	61.35	4	COMRF	SJR	XGEO-	2.799	1.138	0.443	0.079-	4.377	0.707	4.975	0.913	1.221	0.321-	1.993	0.604-	9.283	1.385-	0.365	0.062	7.402	1.454	2.128	0.304-	4.771	0.558
52	54.85	4	COMRF	SJR	WEST-	0.748	1.005	0.241	0.068-	5.811	0.882	0.105	0.997	4.562	0.802-	2.896	0.644-	5.389	1.507-	4.236	0.471	3.166	1.494	4.424	0.918	2.169	1.276
53	54.14	4	COMRF	SJR	SSDSac-	4.594	1.203	0.468	0.078-	5.102	0.931	3.244	1.007	1.202	0.184-	1.530	0.725-	3.881	1.410-	0.124	0.017	2.973	1.490	0.895	0.163-	1.189	0.279
54	45.83	4	COMRF	SJR	SSDSJ-	0.247	1.269	0.046	0.074-	1.442	1.103	-21.580	4.020	11.205	1.469-	1.040	0.627	-42.887	7.118-	7.075	0.905	7.532	3.884-	0.677	1.216	30.286	4.724
55	62.94	4	COMRF	XGEO	WEST-	3.675	0.988	0.348	0.069-	6.796	0.896	1.815	0.248	2.754	0.609-	2.221	0.663	0.347	0.085-	0.823	0.428	2.682	0.265	1.540	0.818-	2.439	0.241
56	55.74	4	COMRF	XGEO	SSDSac-	6.045	1.167	0.469	0.078-	5.834	0.852	1.358	0.369	1.289	0.200-	1.364	0.513-	0.146	0.108-	0.091	0.015	0.607	0.392	0.665	0.201-	0.224	0.089
57	63.74	4	COMRF	XGEO	SSDSJ-	5.092	1.060	0.487	0.072-	5.215	0.667	2.056	0.278	2.879	0.375-	1.105	0.430-	0.229	0.060-	0.756	0.149	1.840	0.291	1.389	0.414-	1.930	0.179
58	60.28	4	COMRF	WEST	SSDSac-	4.438	0.967	0.404	0.067-	5.816	0.931	2.078	0.681	1.274	0.166-	0.889	0.695-	1.180	0.459-	0.028	0.018	0.462	0.837	1.328	0.160-	0.917	0.169
59	55.11	4	COMRF	WEST	SSDSJ-	1.066	0.936	0.256	0.065-	5.600	0.844	3.163	0.771	1.498	0.486-	2.033	0.662-	4.383	0.574-	0.697	0.189	3.479	1.075	1.511	0.566	0.902	0.510
60	57.07	4	COMRF	SSDSac	SSDSJ-	5.361	1.078	0.475	0.073-	5.307	0.788	1.253	0.162	2.699	0.430-	1.146	0.514-	0.081	0.016-	0.680	0.163	0.804	0.160	1.256	0.405-	0.668	0.086
61	68.87	5	COMRF	RIO	SJR-	6.718	1.188	0.568	0.073-	5.685	0.835	4.045	0.604	2.422	1.016-	1.178	0.554-	1.297	0.238	0.150	1.274	3.112	0.501-	0.043	1.456-	5.045	1.015
62	68.16	5	COMRF	RIO	XGEO-	6.245	1.051	0.489	0.072-	6.171	0.910	5.010	0.866	0.271	0.465-	1.945	0.501-	3.845	0.694-	0.944	0.224	1.207	0.925	0.691	0.500	2.896	0.773
63	70.67	5	COMRF	RIO	WEST-	6.761	0.967	0.525	0.062-	5.321	0.842	6.316	0.571-	2.174	0.741-	0.064	0.436-	0.829	0.355	0.571	0.497	5.374	0.633-	4.514	0.895-	2.936	0.715
64	**70.77**	**5**	**COMRF**	**RIO**	**SSDSac-**	**7.414**	**1.009**	**0.585**	**0.067-**	**6.767**	**0.797**	**10.426**	**0.995-**	**2.221**	**0.375-**	**2.674**	**0.476-**	**6.505**	**0.699**	**0.003**	**0.017**	**4.480**	**0.860-**	**0.906**	**0.277**	**2.055**	**0.285**
65	69.62	5	COMRF	RIO	SSDSJ-	7.335	1.098	0.564	0.070-	6.555	0.911	5.031	0.534	1.590	0.428-	1.755	0.500-	1.166	0.243-	0.180	0.146	3.229	0.539	0.180	0.396-	2.543	0.357
66	63.79	5	COMRF	SJR	XGEO-	4.172	1.168	0.523	0.080-	5.000	0.797	5.083	0.994	1.572	0.331-	2.239	0.678	-10.100	1.463-	0.362	0.062	7.930	1.594	2.602	0.320-	4.939	0.567
67	57.60	5	COMRF	SJR	WEST-	1.139	1.013	0.277	0.067-	5.939	0.933	0.827	0.997	4.378	0.832-	3.146	0.676-	5.278	1.552-	4.556	0.486	4.217	1.596	4.848	0.975	0.941	1.276
68	57.12	5	COMRF	SJR	SSDSac-	5.493	1.221	0.522	0.079-	5.456	1.031	3.592	1.097	1.302	0.204-	1.546	0.793-	4.117	1.528-	0.141	0.018	3.181	1.641	1.078	0.183-	1.503	0.310
69	47.01	5	COMRF	SJR	SSDSJ-	0.446	1.282	0.062	0.074-	1.733	1.185	-20.624	4.069	11.005	1.485-	1.282	0.674	-41.864	7.131-	7.188	0.914	8.201	4.035-	0.876	1.294	29.934	4.755
70	66.20	5	COMRF	XGEO	WEST-	4.674	0.991	0.401	0.069-	7.473	0.958	2.017	0.251	2.959	0.632-	2.481	0.702	0.437	0.086-	1.007	0.463	3.111	0.271	1.701	0.866-	2.635	0.252
71	57.80	5	COMRF	XGEO	SSDSac-	7.608	1.211	0.550	0.079-	6.650	0.952	1.574	0.400	1.367	0.224-	1.620	0.560-	0.165	0.113-	0.106	0.018	0.876	0.428	0.733	0.236-	0.184	0.095
72	66.30	5	COMRF	XGEO	SSDSJ-	6.348	1.076	0.553	0.072-	5.921	0.726	2.431	0.283	2.903	0.396-	1.317	0.470-	0.215	0.060-	0.806	0.157	2.299	0.301	1.313	0.452-	1.984	0.174
73	63.34	5	COMRF	WEST	SSDSac-	5.267	0.975	0.443	0.066-	6.314	1.034	1.932	0.734	1.490	0.179-	0.878	0.750-	1.377	0.505-	0.035	0.020	0.234	0.908	1.618	0.177-	0.983	0.185
74	57.96	5	COMRF	WEST	SSDSJ-	1.520	0.937	0.287	0.065-	5.850	0.891	3.255	0.796	1.737	0.503-	2.150	0.693-	4.629	0.582-	0.724	0.193	3.747	1.116	1.863	0.593	0.546	0.520
75	59.90	5	COMRF	SSDSac	SSDSJ-	6.083	1.085	0.514	0.072-	5.576	0.860	1.400	0.175	2.786	0.457-	1.095	0.556-	0.092	0.017-	0.752	0.171	0.948	0.176	1.218	0.444-	0.748	0.092

76	70.70	6	COMRF	RIO	SJR-	7.558	1.191	0.624	0.073-	5.929	0.845	4.118	0.623	2.643	1.056-	1.122	0.561-	1.286	0.252	0.174	1.340	3.579	0.525-	0.158	1.541-	5.903	1.051
77	69.94	6	COMRF	RIO	XGEO-	7.477	1.078	0.575	0.073-	6.424	0.935	4.815	0.897	0.628	0.475-	2.026	0.512-	4.482	0.706-	1.091	0.222	0.843	0.968	1.174	0.513	3.539	0.766
78	72.17	6	COMRF	RIO	WEST-	7.493	0.966	0.566	0.062-	5.551	0.833	6.753	0.613-	2.526	0.792	0.005	0.442-	1.008	0.376-	0.003	0.552	5.685	0.682-	4.545	0.996-	2.452	0.769
79	**72.67**	**6**	**COMRF**	**RIO**	**SSDSac-**	**8.504**	**1.029**	**0.654**	**0.067-**	**7.098**	**0.847**	**10.704**	**1.063-**	**2.226**	**0.394-**	**2.723**	**0.494-**	**7.557**	**0.742-**	**0.029**	**0.018**	**4.418**	**0.941-**	**0.784**	**0.307**	**2.523**	**0.300**
80	71.42	6	COMRF	RIO	SSDSJ-	8.134	1.100	0.610	0.070-	6.991	0.942	5.235	0.555	1.771	0.439-	1.852	0.515-	1.106	0.258-	0.252	0.150	3.648	0.568	0.175	0.428-	2.863	0.364
81	65.53	6	COMRF	SJR	XGEO-	5.400	1.195	0.591	0.081-	5.685	0.904	5.015	1.067	1.944	0.340-	2.564	0.768	-10.674	1.534-	0.355	0.063	8.171	1.730	3.035	0.335-	4.920	0.573
82	60.22	6	COMRF	SJR	WEST-	1.534	1.018	0.309	0.067-	6.340	1.014	1.436	1.002	4.438	0.863-	3.673	0.720-	5.117	1.564-	5.052	0.506	5.106	1.707	5.767	1.038-	0.322	1.273
83	60.49	6	COMRF	SJR	SSDSac-	6.592	1.242	0.586	0.078-	6.130	1.179	4.189	1.203	1.453	0.227-	1.802	0.891-	4.388	1.635-	0.162	0.020	3.640	1.824	1.355	0.207-	1.907	0.343
84	47.64	6	COMRF	SJR	SSDSJ-	1.330	1.369	0.086	0.075-	2.826	1.360	-21.549	4.442	11.394	1.595-	1.466	0.727	-40.035	7.037-	7.115	0.910	5.676	4.276	0.043	1.392	28.873	4.704
85	68.60	6	COMRF	XGEO	WEST-	5.565	0.991	0.449	0.068-	8.223	1.019	2.200	0.256	3.272	0.662-	2.880	0.746	0.512	0.089-	1.392	0.510	3.500	0.285	2.115	0.937-	2.742	0.270
86	60.08	6	COMRF	XGEO	SSDSac-	9.283	1.264	0.633	0.080-	7.698	1.097	1.573	0.439	1.594	0.260-	2.014	0.626-	0.205	0.117-	0.132	0.021	0.925	0.472	0.939	0.284-	0.119	0.103
87	67.98	6	COMRF	XGEO	SSDSJ-	7.437	1.092	0.607	0.073-	6.764	0.800	2.811	0.291	2.981	0.417-	1.711	0.519-	0.200	0.061-	0.863	0.162	2.763	0.316	1.346	0.489-	1.984	0.171
88	66.13	6	COMRF	WEST	SSDSac-	6.305	1.007	0.486	0.065-	7.072	1.199	1.559	0.808	1.841	0.198-	1.009	0.841-	1.904	0.569-	0.054	0.023	0.116	1.009	2.003	0.202-	0.898	0.208
89	60.64	6	COMRF	WEST	SSDSJ-	2.000	0.937	0.315	0.064-	6.399	0.966	3.571	0.822	1.947	0.515-	2.588	0.745-	4.999	0.595-	0.717	0.195	4.438	1.169	2.218	0.620	0.136	0.525
90	63.11	6	COMRF	SSDSac	SSDSJ-	7.055	1.101	0.560	0.072-	6.189	0.987	1.624	0.190	2.946	0.484-	1.245	0.624-	0.107	0.018-	0.799	0.174	1.183	0.195	1.260	0.485-	0.858	0.097
91	72.51	7	COMRF	RIO	SJR-	8.752	1.199	0.692	0.073-	6.240	0.837	4.388	0.648	2.366	1.093-	0.904	0.546-	1.319	0.268	0.848	1.388	4.037	0.547-	1.151	1.624-	6.369	1.069
92	71.75	7	COMRF	RIO	XGEO-	8.684	1.099	0.659	0.074-	6.630	0.950	4.708	0.924	0.922	0.485-	2.070	0.516-	4.961	0.714-	1.178	0.218	0.596	1.008	1.546	0.528	3.959	0.755
93	73.76	7	COMRF	RIO	WEST-	8.039	0.962	0.597	0.061-	5.566	0.879	7.238	0.654-	3.018	0.857	0.150	0.491-	1.284	0.403-	0.672	0.617	5.882	0.734-	4.550	1.108-	1.829	0.834
94	**74.30**	**7**	**COMRF**	**RIO**	**SSDSac-**	**9.639**	**1.042**	**0.725**	**0.067-**	**7.439**	**0.881**	**11.508**	**1.157-**	**2.428**	**0.424-**	**2.787**	**0.513-**	**8.533**	**0.783-**	**0.057**	**0.021**	**5.109**	**1.039-**	**0.978**	**0.346**	**2.931**	**0.316**
95	73.30	7	COMRF	RIO	SSDSJ-	9.172	1.094	0.676	0.069-	7.257	0.932	5.511	0.570	1.643	0.445-	1.785	0.508-	1.079	0.274-	0.241	0.150	4.125	0.587-	0.202	0.451-	3.218	0.375
96	66.88	7	COMRF	SJR	XGEO-	6.766	1.222	0.666	0.082-	6.251	0.982	4.600	1.122	2.319	0.349-	2.623	0.833	-10.472	1.578-	0.342	0.064	7.474	1.820	3.385	0.348-	4.714	0.570
97	62.63	7	COMRF	SJR	WEST-	2.055	1.030	0.341	0.066-	6.812	1.115	1.749	1.036	4.574	0.902-	4.109	0.765-	4.551	1.556-	5.628	0.538	5.355	1.835	6.784	1.105-	1.361	1.285
98	63.71	7	COMRF	SJR	SSDSac-	7.709	1.242	0.661	0.077-	6.098	1.162	4.193	1.219	1.557	0.240-	1.441	0.881-	3.906	1.680-	0.188	0.022	2.991	1.881	1.486	0.217-	2.215	0.362
99	48.10	7	COMRF	SJR	SSDSJ-	1.632	1.390	0.107	0.075-	3.019	1.453	-21.042	4.572	11.218	1.648-	1.699	0.777	-40.406	7.245-	7.314	0.943	6.671	4.459-	0.387	1.483	29.441	4.863
100	70.54	7	COMRF	XGEO	WEST-	6.388	0.993	0.497	0.067-	8.736	1.057	2.385	0.264	3.452	0.688-	3.124	0.778	0.569	0.093-	1.821	0.562	3.846	0.304	2.436	1.008-	2.781	0.293
101	62.49	7	COMRF	XGEO	SSDSac	-10.640	1.289	0.719	0.081-	8.008	1.127	1.632	0.471	1.686	0.286-	2.073	0.640-	0.266	0.121-	0.165	0.025	1.086	0.509	0.926	0.318-	0.035	0.111
102	69.21	7	COMRF	XGEO	SSDSJ-	8.467	1.105	0.665	0.073-	7.188	0.814	3.146	0.296	2.702	0.424-	1.809	0.531-	0.183	0.062-	0.816	0.163	3.162	0.327	0.955	0.507-	1.955	0.168
103	68.38	7	COMRF	WEST	SSDSac-	7.067	1.028	0.523	0.065-	7.057	1.270	0.862	0.882	2.173	0.222-	0.700	0.892-	2.413	0.652-	0.084	0.025-	0.201	1.114	2.264	0.232-	0.770	0.237
104	62.85	7	COMRF	WEST	SSDSJ-	2.635	0.948	0.345	0.064-	7.168	1.061	4.244	0.848	1.717	0.521-	3.168	0.811-	5.475	0.628-	0.590	0.195	5.674	1.230	2.055	0.642-	0.257	0.543
105	66.04	7	COMRF	SSDSac	SSDSJ-	7.890	1.096	0.615	0.071-	6.039	0.970	1.794	0.202	2.732	0.491-	0.921	0.615-	0.125	0.020-	0.739	0.173	1.312	0.210	0.894	0.501-	0.959	0.103
106	73.64	8	COMRF	RIO	SJR-	9.859	1.214	0.751	0.072-	6.518	0.825	4.755	0.681	1.681	1.133-	0.645	0.516-	1.429	0.289	1.814	1.422	4.330	0.577-	2.656	1.711-	6.362	1.081
107	73.05	8	COMRF	RIO	XGEO-	9.554	1.112	0.731	0.075-	6.506	0.928	4.573	0.943	1.134	0.497-	2.003	0.506-	5.403	0.728-	1.231	0.216	0.240	1.044	1.830	0.547	4.263	0.752
108	74.88	8	COMRF	RIO	WEST-	8.202	0.947	0.616	0.061-	5.234	0.846	7.583	0.690-	3.393	0.911	0.277	0.496-	1.686	0.437-	1.676	0.705	5.670	0.786-	3.986	1.207-	0.897	0.934
109	**74.94**	**8**	**COMRF**	**RIO**	**SSDSac**	**-10.456**	**1.063**	**0.786**	**0.069-**	**7.338**	**0.903**	**11.065**	**1.243-**	**2.191**	**0.462-**	**2.629**	**0.531-**	**8.850**	**0.828-**	**0.101**	**0.027**	**4.857**	**1.136-**	**0.902**	**0.394**	**3.107**	**0.339**
110	74.55	8	COMRF	RIO	SSDSJ-	9.974	1.082	0.735	0.069-	7.216	0.883	5.710	0.582	1.390	0.455-	1.601	0.485-	1.091	0.295-	0.207	0.151	4.446	0.601-	0.681	0.477-	3.494	0.390
111	67.30	8	COMRF	SJR	XGEO-	7.880	1.255	0.729	0.084-	6.533	1.005	3.952	1.154	2.598	0.357-	2.456	0.857-	9.845	1.606-	0.324	0.067	6.239	1.871	3.577	0.359-	4.390	0.564
112	64.63	8	COMRF	SJR	WEST-	2.681	1.059	0.373	0.065-	7.493	1.252	1.746	1.109	4.891	0.952-	4.631	0.822-	4.046	1.554-	6.401	0.584	5.082	2.013	8.042	1.184-	1.966	1.322
113	66.65	8	COMRF	SJR	SSDSac-	8.880	1.232	0.735	0.076-	5.978	1.085	3.882	1.204	1.705	0.251-	0.914	0.817-	2.901	1.678-	0.220	0.023	1.710	1.889	1.603	0.225-	2.432	0.374
114	48.61	8	COMRF	SJR	SSDSJ-	2.139	1.429	0.130	0.075-	3.371	1.579	-21.254	4.755	11.320	1.718-	2.003	0.838	-41.571	7.518-	7.678	0.991	7.500	4.697-	0.832	1.590	30.847	5.078
115	71.59	8	COMRF	XGEO	WEST-	7.018	1.000	0.541	0.067-	9.056	1.077	2.499	0.274	3.662	0.716-	3.335	0.802	0.611	0.100-	2.438	0.637	4.071	0.333	2.972	1.091-	2.741	0.329
116	64.73	8	COMRF	XGEO	SSDSac	-11.826	1.311	0.799	0.082-	8.073	1.151	1.461	0.497	1.867	0.310-	2.013	0.648-	0.332	0.126-	0.214	0.029	1.022	0.540	0.960	0.351	0.068	0.120
117	69.62	8	COMRF	XGEO	SSDSJ-	9.253	1.125	0.715	0.074-	7.351	0.811	3.370	0.303	2.375	0.429-	1.799	0.532-	0.160	0.065-	0.766	0.164	3.443	0.342	0.499	0.523-	1.922	0.169
118	70.46	8	COMRF	WEST	SSDSac-	7.624	1.033	0.554	0.066-	6.465	1.261-	0.145	0.971	2.548	0.250-	0.002	0.910-	2.852	0.754-	0.119	0.028-	0.810	1.224	2.531	0.264-	0.667	0.278

119	64.68	8	COMRF	WEST	SSDSJ-	3.352	0.964	0.378	0.063-	8.120	1.165	4.971	0.883	1.417	0.538-	3.928	0.885-	6.128	0.679-	0.473	0.195	7.194	1.310	1.726	0.679-	0.588	0.568
120	68.62	8	COMRF	SSDSac	SSDSJ-	8.737	1.082	0.670	0.070-	5.810	0.905	2.011	0.216	2.358	0.498-	0.528	0.579-	0.150	0.022-	0.629	0.172	1.476	0.227	0.357	0.517-	1.045	0.108
121	73.96	9	COMRF	RIO	SJR	-10.468	1.232	0.786	0.073-	6.634	0.829	4.938	0.717	0.981	1.180-	0.478	0.498-	1.557	0.312	2.521	1.466	4.298	0.614-	3.929	1.820-	6.118	1.101
122	73.64	9	COMRF	RIO	XGEO-	9.839	1.109	0.776	0.076-	6.025	0.879	4.250	0.946	1.299	0.508-	1.865	0.493-	5.683	0.740-	1.219	0.215-	0.431	1.074	2.082	0.568	4.343	0.753
123	**75.33**	**9**	**COMRF**	**RIO**	**WEST-**	**8.165**	**0.930**	**0.632**	**0.061-**	**4.581**	**0.813**	**7.747**	**0.716-**	**3.733**	**0.962**	**0.514**	**0.513-**	**2.095**	**0.480-**	**2.540**	**0.795**	**5.219**	**0.838-**	**3.455**	**1.317-**	**0.017**	**1.040**
124	74.96	9	COMRF	RIO	SSDSac	-10.935	1.087	0.833	0.071-	6.895	0.915	9.546	1.300-	1.615	0.495-	2.340	0.550-	8.709	0.871-	0.164	0.033	3.704	1.220-	0.582	0.443	3.161	0.366
125	74.86	9	COMRF	RIO	SSDSJ	-10.324	1.070	0.774	0.069-	6.866	0.812	5.700	0.597	1.142	0.473-	1.355	0.458-	1.101	0.321-	0.172	0.154	4.433	0.617-	1.044	0.510-	3.580	0.407
126	66.76	9	COMRF	SJR	XGEO-	8.400	1.288	0.760	0.086-	6.555	0.999	3.329	1.183	2.706	0.367-	2.265	0.865-	9.373	1.641-	0.299	0.070	5.202	1.926	3.598	0.373-	4.084	0.566
127	65.86	9	COMRF	SJR	WEST-	3.318	1.094	0.407	0.065-	8.094	1.394	1.785	1.199	5.004	1.001-	5.091	0.893-	3.738	1.571-	6.965	0.632	4.978	2.208	8.826	1.263-	2.365	1.369
128	68.81	9	COMRF	SJR	SSDSac-	9.661	1.212	0.788	0.075-	5.777	0.989	3.623	1.186	1.795	0.262-	0.487	0.745-	2.080	1.673-	0.251	0.025	0.651	1.898	1.647	0.237-	2.618	0.387
129	48.92	9	COMRF	SJR	SSDSJ-	2.977	1.498	0.155	0.075-	4.162	1.751	-22.176	5.004	11.660	1.805-	2.374	0.915	-42.033	7.781-	7.875	1.035	7.067	4.984-	0.772	1.706	31.632	5.283
130	71.64	9	COMRF	XGEO	WEST-	7.371	1.011	0.571	0.068-	9.134	1.104	2.542	0.288	3.741	0.748-	3.429	0.836	0.640	0.109-	2.996	0.726	4.188	0.373	3.337	1.187-	2.668	0.376
131	66.37	9	COMRF	XGEO	SSDSac	-12.545	1.325	0.861	0.084-	7.705	1.144	1.193	0.516	2.007	0.328-	1.803	0.649-	0.384	0.131-	0.268	0.034	0.878	0.566	0.913	0.378	0.171	0.130
132	69.04	9	COMRF	XGEO	SSDSJ-	9.714	1.153	0.751	0.076-	7.350	0.816	3.458	0.315	2.129	0.439-	1.766	0.544-	0.129	0.068-	0.746	0.167	3.573	0.363	0.157	0.547-	1.870	0.174
133	71.69	9	COMRF	WEST	SSDSac-	7.998	1.027	0.580	0.066-	5.501	1.195-	1.382	1.075	2.906	0.286	0.966	0.917-	2.962	0.852-	0.154	0.033-	1.935	1.354	2.782	0.304-	0.604	0.322
134	65.83	9	COMRF	WEST	SSDSJ-	4.115	0.984	0.415	0.063-	8.948	1.270	5.351	0.929	1.224	0.570-	4.553	0.963-	6.571	0.727-	0.383	0.197	8.133	1.400	1.523	0.734-	0.855	0.588
135	70.39	9	COMRF	SSDSac	SSDSJ-	9.397	1.067	0.716	0.070-	5.598	0.836	2.190	0.233	2.008	0.510-	0.230	0.541-	0.175	0.024-	0.517	0.172	1.594	0.250-	0.140	0.542-	1.120	0.115
136	73.96	10	COMRF	RIO	SJR	-11.043	1.267	0.813	0.073-	6.857	0.877	5.093	0.758	0.088	1.249-	0.385	0.497-	1.729	0.337	3.319	1.523	4.066	0.656-	5.406	1.969-	5.585	1.123
137	73.92	10	COMRF	RIO	XGEO-	9.968	1.105	0.807	0.077-	5.572	0.848	4.071	0.958	1.310	0.523-	1.741	0.494-	6.003	0.760-	1.212	0.218-	0.958	1.116	2.160	0.595	4.435	0.761
138	**75.38**	**10**	**COMRF**	**RIO**	**WEST-**	**8.185**	**0.917**	**0.652**	**0.061-**	**4.038**	**0.776**	**7.753**	**0.739-**	**3.847**	**1.001**	**0.716**	**0.545-**	**2.402**	**0.519-**	**3.175**	**0.883**	**4.789**	**0.891-**	**2.948**	**1.443**	**0.588**	**1.137**
139	74.86	10	COMRF	RIO	SSDSac	-11.361	1.110	0.876	0.073-	6.477	0.918	8.134	1.364-	1.100	0.535-	2.099	0.569-	8.383	0.905-	0.225	0.039	2.813	1.331-	0.391	0.508	3.135	0.394
140	74.81	10	COMRF	RIO	SSDSJ	-10.606	1.066	0.807	0.070-	6.504	0.753	5.619	0.622	0.854	0.499-	1.116	0.439-	1.105	0.350-	0.131	0.158	4.282	0.651-	1.407	0.554-	3.546	0.424
141	65.75	10	COMRF	SJR	XGEO-	8.667	1.322	0.776	0.088-	6.472	1.000	2.677	1.221	2.712	0.380-	2.030	0.873-	8.956	1.667-	0.270	0.073	4.182	1.979	3.481	0.395-	3.729	0.571
142	66.67	10	COMRF	SJR	WEST-	4.277	1.142	0.448	0.065-	9.121	1.558	1.531	1.300	5.296	1.060-	5.657	0.987-	3.205	1.601-	7.419	0.680	4.245	2.401	9.547	1.356-	2.344	1.414
143	70.28	10	COMRF	SJR	SSDSac	-10.213	1.199	0.824	0.073-	5.659	0.951	3.233	1.190	1.837	0.277-	0.195	0.699-	1.234	1.650-	0.282	0.028-	0.449	1.923	1.581	0.256-	2.677	0.398
144	49.30	10	COMRF	SJR	SSDSJ-	4.145	1.582	0.186	0.075-	5.403	1.948	-23.392	5.277	12.059	1.906-	2.832	1.002	-41.619	7.966-	7.925	1.072	5.686	5.285-	0.425	1.837	31.778	5.439
145	71.24	10	COMRF	XGEO	WEST-	7.673	1.025	0.597	0.069-	9.329	1.191	2.491	0.305	3.905	0.792-	3.640	0.912	0.655	0.121-	3.562	0.819	4.161	0.422	3.835	1.308-	2.554	0.429
146	67.74	10	COMRF	XGEO	SSDSac	-12.908	1.333	0.908	0.086-	7.064	1.120	0.980	0.530	2.042	0.341-	1.527	0.654-	0.415	0.135-	0.321	0.038	0.811	0.587	0.720	0.401	0.258	0.139
147	68.05	10	COMRF	XGEO	SSDSJ	-10.058	1.185	0.783	0.079-	7.200	0.836	3.432	0.330	1.920	0.456-	1.648	0.571-	0.095	0.072-	0.747	0.172	3.556	0.391-	0.138	0.580-	1.796	0.181
148	72.19	10	COMRF	WEST	SSDSac-	8.261	1.023	0.599	0.067-	4.812	1.172-	2.255	1.186	3.132	0.327	1.674	0.965-	2.869	0.943-	0.177	0.040-	2.898	1.526	2.938	0.362-	0.600	0.369
149	66.63	10	COMRF	WEST	SSDSJ-	5.058	1.010	0.457	0.064	-10.034	1.393	5.800	0.996	0.921	0.616-	5.314	1.056-	6.991	0.778-	0.288	0.199	9.078	1.511	1.139	0.805-	0.935	0.606
150	71.45	10	COMRF	SSDSac	SSDSJ-	9.844	1.055	0.747	0.069-	5.435	0.812	2.298	0.253	1.621	0.529-	0.049	0.528-	0.202	0.026-	0.407	0.172	1.614	0.278-	0.635	0.580-	1.155	0.122
151	73.92	11	COMRF	RIO	SJR	-11.791	1.326	0.846	0.074-	7.256	0.961	5.193	0.801-	0.947	1.341-	0.334	0.511-	1.925	0.360	4.150	1.610	3.671	0.698-	7.103	2.156-	4.900	1.152
152	74.17	11	COMRF	RIO	XGEO	-10.275	1.111	0.847	0.078-	5.270	0.841	3.934	0.972	1.296	0.538-	1.648	0.509-	6.371	0.783-	1.224	0.220-	1.388	1.164	2.180	0.623	4.564	0.772
153	**75.35**	**11**	**COMRF**	**RIO**	**WEST-**	**8.394**	**0.916**	**0.678**	**0.062-**	**3.614**	**0.751**	**7.782**	**0.766-**	**4.090**	**1.039**	**1.039**	**0.588-**	**2.595**	**0.556-**	**3.463**	**0.965**	**4.636**	**0.958-**	**3.005**	**1.574**	**0.832**	**1.226**
154	74.68	11	COMRF	RIO	SSDSac	-11.730	1.131	0.910	0.075-	6.196	0.924	7.082	1.428-	0.728	0.576-	1.951	0.592-	7.890	0.927-	0.273	0.046	2.398	1.453-	0.389	0.578	2.992	0.419
155	74.79	11	COMRF	RIO	SSDSJ	-10.992	1.074	0.844	0.071-	6.232	0.720	5.428	0.653	0.527	0.534-	0.886	0.436-	1.070	0.379-	0.100	0.161	4.011	0.705-	1.847	0.607-	3.485	0.441
156	64.92	11	COMRF	SJR	XGEO-	9.079	1.363	0.799	0.091-	6.435	1.029	1.971	1.283	2.699	0.397-	1.742	0.890-	8.741	1.678-	0.236	0.077	3.116	2.033	3.312	0.423-	3.333	0.573
157	67.23	11	COMRF	SJR	WEST-	5.387	1.196	0.492	0.065	-10.231	1.709	1.159	1.403	5.425	1.112-	6.113	1.079-	2.580	1.643-	7.679	0.726	3.248	2.584	9.863	1.439-	2.178	1.461
158	71.33	11	COMRF	SJR	SSDSac	-10.642	1.199	0.847	0.072-	5.642	0.966	2.666	1.210	1.828	0.292	0.020	0.679-	0.518	1.635-	0.312	0.030-	1.631	1.965	1.420	0.278-	2.636	0.404
159	50.19	11	COMRF	SJR	SSDSJ-	5.169	1.648	0.222	0.075-	6.387	2.114	-23.551	5.500	12.101	1.998-	3.299	1.087	-40.806	8.196-	8.010	1.113	5.537	5.559-	0.581	1.966	31.860	5.627
160	70.73	11	COMRF	XGEO	WEST-	8.012	1.049	0.620	0.069-	9.556	1.337	2.402	0.330	3.929	0.843-	3.821	1.023	0.646	0.133-	4.031	0.912	4.031	0.478	4.149	1.434-	2.386	0.487
161	69.02	11	COMRF	XGEO	SSDSac	-13.164	1.343	0.949	0.088-	6.406	1.083	0.851	0.544	1.980	0.355-	1.273	0.661-	0.442	0.137-	0.374	0.042	0.855	0.610	0.409	0.426	0.345	0.145

162	67.29	11	COMRF	XGEO	SSDSJ	-10.509	1.220	0.822	0.081-	6.980	0.865	3.352	0.348	1.722	0.474-	1.422	0.604-	0.056	0.076-	0.780	0.177	3.454	0.422-	0.446	0.615-	1.692	0.188
163	72.37	11	COMRF	WEST	SSDSac-	8.566	1.022	0.623	0.067-	4.245	1.177-	2.955	1.287	3.252	0.372	2.240	1.038-	2.501	1.024-	0.201	0.047-	3.901	1.721	2.962	0.432-	0.644	0.419
164	67.21	11	COMRF	WEST	SSDSJ-	6.087	1.045	0.500	0.064	-11.135	1.522	6.080	1.074	0.536	0.683-	5.987	1.150-	7.242	0.828-	0.194	0.205	9.703	1.630	0.622	0.897-	0.990	0.626
165	72.19	11	COMRF	SSDSac	SSDSJ	-10.204	1.046	0.772	0.068-	5.338	0.816	2.346	0.275	1.171	0.555	0.072	0.532-	0.229	0.029-	0.312	0.174	1.560	0.309-	1.201	0.636-	1.165	0.130
166	73.44	12	COMRF	RIO	SJR	-12.181	1.396	0.857	0.076-	7.758	1.063	5.328	0.854-	1.833	1.459-	0.545	0.545-	2.249	0.386	4.562	1.750	3.379	0.753-	8.302	2.387-	4.379	1.226
167	73.93	12	COMRF	RIO	XGEO	-10.496	1.122	0.874	0.079-	5.271	0.882	3.974	1.011	1.271	0.562-	1.809	0.555-	6.848	0.818-	1.211	0.226-	1.656	1.236	2.190	0.659	4.638	0.791
168	**74.81**	**12**	**COMRF**	**RIO**	**WEST-**	**8.489**	**0.922**	**0.694**	**0.063-**	**3.332**	**0.778**	**7.983**	**0.824-**	**4.366**	**1.089**	**1.251**	**0.713-**	**2.869**	**0.601-**	**3.609**	**1.062**	**4.715**	**1.104-**	**3.219**	**1.757**	**0.972**	**1.329**
169	74.11	12	COMRF	RIO	SSDSac	-11.954	1.165	0.921	0.077-	6.349	1.013	5.243	1.478	0.082	0.611-	2.052	0.648-	7.507	0.941-	0.331	0.054	0.859	1.563	0.209	0.640	2.868	0.439
170	74.28	12	COMRF	RIO	SSDSJ	-11.108	1.091	0.859	0.072-	6.193	0.740	5.331	0.692	0.221	0.585-	0.933	0.466-	1.225	0.412-	0.089	0.167	3.717	0.774-	2.184	0.685-	3.348	0.459
171	63.70	12	COMRF	SJR	XGEO-	9.147	1.407	0.799	0.094-	6.555	1.151	1.378	1.388	2.615	0.412-	1.765	0.971-	8.979	1.708-	0.192	0.081	2.566	2.147	3.141	0.458-	3.051	0.591
172	67.16	12	COMRF	SJR	WEST-	6.358	1.257	0.529	0.066	-11.375	1.876	0.977	1.524	5.450	1.168-	6.761	1.193-	2.154	1.695-	7.773	0.777	2.789	2.793	10.044	1.534-	2.222	1.537
173	71.60	12	COMRF	SJR	SSDSac	-11.009	1.233	0.859	0.071-	6.028	1.074	2.153	1.279	1.880	0.310-	0.088	0.725-	0.195	1.695-	0.343	0.034-	2.492	2.088	1.404	0.301-	2.656	0.425
174	50.95	12	COMRF	SJR	SSDSJ-	6.542	1.722	0.254	0.076-	7.953	2.299	-25.081	5.767	12.657	2.109-	3.999	1.175	-40.704	8.545-	8.120	1.166	4.239	5.865-	0.204	2.110	32.249	5.895
175	69.78	12	COMRF	XGEO	WEST-	8.407	1.087	0.638	0.070	-10.353	1.564	2.265	0.360	4.103	0.912-	4.531	1.185	0.625	0.146-	4.692	1.014	3.805	0.541	4.847	1.588-	2.107	0.550
176	69.47	12	COMRF	XGEO	SSDSac	-13.598	1.391	0.973	0.090-	6.570	1.184	0.384	0.574	2.214	0.391-	1.368	0.719-	0.475	0.139-	0.432	0.047	0.491	0.651	0.509	0.471	0.452	0.150
177	66.16	12	COMRF	XGEO	SSDSJ	-10.812	1.264	0.850	0.085-	6.938	0.952	3.230	0.371	1.679	0.505-	1.413	0.677-	0.006	0.080-	0.872	0.185	3.315	0.460-	0.535	0.668-	1.572	0.198
178	72.19	12	COMRF	WEST	SSDSac-	8.950	1.039	0.639	0.068-	3.993	1.272-	3.941	1.409	3.518	0.421	2.706	1.161-	2.204	1.116-	0.238	0.057-	5.192	1.956	3.150	0.506-	0.624	0.479
179	67.16	12	COMRF	WEST	SSDSJ-	6.997	1.092	0.537	0.065	-12.244	1.682	6.154	1.171	0.386	0.769-	6.714	1.267-	7.376	0.886-	0.158	0.215	9.982	1.771	0.420	1.016-	0.992	0.653
180	72.17	12	COMRF	SSDSac	SSDSJ	-10.642	1.062	0.790	0.068-	5.666	0.890	2.514	0.300	0.632	0.606-	0.049	0.580-	0.265	0.032-	0.214	0.179	1.660	0.341-	1.835	0.724-	1.149	0.138
181	73.17	13	COMRF	RIO	SJR	-13.073	1.494	0.882	0.078-	8.446	1.155	5.808	0.923-	3.369	1.606-	0.446	0.533-	2.632	0.411	5.661	1.897	3.359	0.813	-10.744	2.650-	3.660	1.301
182	73.90	13	COMRF	RIO	XGEO	-10.831	1.135	0.918	0.081-	4.977	0.845	3.814	1.014	1.453	0.575-	1.754	0.552-	7.506	0.849-	1.238	0.231-	2.206	1.265	2.448	0.680	4.854	0.806
183	**74.42**	**13**	**COMRF**	**RIO**	**WEST-**	**8.658**	**0.932**	**0.711**	**0.064-**	**2.988**	**0.795**	**8.293**	**0.900-**	**4.967**	**1.144**	**1.743**	**0.841-**	**3.101**	**0.648-**	**3.376**	**1.157**	**5.080**	**1.288-**	**4.264**	**1.953**	**0.847**	**1.426**
184	73.72	13	COMRF	RIO	SSDSac	-12.234	1.197	0.936	0.078-	6.261	1.058	3.019	1.499	1.084	0.626-	1.849	0.677-	7.499	0.957-	0.408	0.061-	1.332	1.630	1.132	0.673	2.946	0.459
185	73.89	13	COMRF	RIO	SSDSJ	-11.353	1.113	0.881	0.074-	6.094	0.730	5.325	0.728-	0.255	0.653-	0.827	0.463-	1.429	0.442-	0.052	0.175	3.493	0.831-	2.754	0.782-	3.195	0.476
186	62.89	13	COMRF	SJR	XGEO-	9.588	1.460	0.817	0.097-	6.383	1.090	0.026	1.475	2.698	0.434-	1.166	0.889-	8.820	1.718-	0.146	0.085	0.643	2.203	3.113	0.496-	2.709	0.607
187	66.77	13	COMRF	SJR	WEST-	7.143	1.314	0.565	0.068	-11.502	1.953	0.566	1.632	5.195	1.211-	6.422	1.225-	1.176	1.739-	7.551	0.831	1.783	2.956	9.561	1.611-	2.311	1.615
188	71.82	13	COMRF	SJR	SSDSac	-11.673	1.266	0.876	0.072-	6.298	1.077	1.039	1.333	2.052	0.325	0.317	0.686	0.746	1.731-	0.374	0.037-	4.521	2.165	1.509	0.317-	2.620	0.436
189	51.73	13	COMRF	SJR	SSDSJ-	7.915	1.786	0.293	0.076-	8.732	2.393	-27.413	6.010	13.421	2.218-	3.932	1.183	-40.471	8.939-	8.265	1.219	2.058	6.053	0.280	2.213	32.788	6.192
190	69.08	13	COMRF	XGEO	WEST-	8.662	1.111	0.662	0.072	-10.156	1.587	2.319	0.389	3.754	0.952-	4.397	1.213	0.595	0.160-	5.122	1.107	3.775	0.600	4.737	1.705-	1.814	0.612
191	69.83	13	COMRF	XGEO	SSDSac	-14.129	1.434	1.004	0.093-	6.500	1.196-	0.131	0.601	2.496	0.416-	1.146	0.715-	0.538	0.140-	0.485	0.051	0.047	0.688	0.709	0.503	0.582	0.152
192	65.60	13	COMRF	XGEO	SSDSJ	-11.344	1.305	0.896	0.088-	6.663	0.936	3.199	0.397	1.489	0.527-	1.127	0.677	0.051	0.084-	0.944	0.192	3.273	0.502-	0.865	0.706-	1.460	0.209
193	72.37	13	COMRF	WEST	SSDSac-	9.309	1.039	0.646	0.068-	2.853	1.226-	6.252	1.541	4.166	0.472	4.275	1.205-	1.951	1.217-	0.303	0.068-	7.907	2.186	3.677	0.580-	0.432	0.547
194	66.80	13	COMRF	WEST	SSDSJ-	7.456	1.122	0.569	0.066	-11.965	1.738	5.642	1.247	0.425	0.846-	6.320	1.317-	7.218	0.948-	0.145	0.224	9.210	1.882	0.501	1.125-	0.958	0.687
195	72.19	13	COMRF	SSDSac	SSDSJ	-11.198	1.074	0.808	0.068-	5.861	0.847	2.819	0.325-	0.212	0.669	0.144	0.532-	0.302	0.035-	0.060	0.185	1.931	0.375-	2.863	0.824-	1.123	0.145
196	72.71	14	COMRF	RIO	SJR	-13.731	1.595	0.886	0.080-	9.301	1.262	6.427	1.003-	5.055	1.792-	0.510	0.529-	3.108	0.436	6.400	2.052	3.633	0.897	-13.151	2.943-	3.173	1.402
197	**73.74**	**14**	**COMRF**	**RIO**	**XGEO**	**-11.123**	**1.150**	**0.959**	**0.082-**	**4.833**	**0.830**	**3.620**	**1.017**	**1.770**	**0.590-**	**1.890**	**0.563-**	**8.319**	**0.885-**	**1.256**	**0.237-**	**2.892**	**1.296**	**2.894**	**0.705**	**5.084**	**0.825**
198	73.68	14	COMRF	RIO	WEST-	8.678	0.947	0.718	0.065-	2.889	0.810	8.563	0.962-	5.298	1.191	1.906	0.918-	3.398	0.693-	3.182	1.260	5.390	1.434-	4.928	2.138	0.687	1.519
199	73.34	14	COMRF	RIO	SSDSac	-12.757	1.233	0.954	0.079-	6.687	1.164	0.402	1.490	2.350	0.627-	1.941	0.737-	7.806	0.975-	0.509	0.070-	4.235	1.659	2.446	0.689	3.164	0.477
200	73.27	14	COMRF	RIO	SSDSJ	-11.364	1.137	0.883	0.076-	6.204	0.746	5.586	0.781-	0.788	0.739-	0.929	0.468-	1.837	0.470-	0.024	0.186	3.506	0.908-	3.333	0.899-	3.027	0.495
201	61.91	14	COMRF	SJR	XGEO-	9.960	1.530	0.820	0.100-	6.569	1.135-	1.581	1.632	2.861	0.461-	0.825	0.866-	8.855	1.750-	0.087	0.089-	1.456	2.359	3.232	0.544-	2.411	0.640
202	66.10	14	COMRF	SJR	WEST-	7.947	1.381	0.595	0.070	-11.983	2.049-	0.161	1.763	5.218	1.266-	6.364	1.268-	0.293	1.785-	7.280	0.895	0.466	3.133	9.477	1.707-	2.534	1.711
203	71.68	14	COMRF	SJR	SSDSac	-12.250	1.301	0.884	0.072-	6.801	1.121-	0.103	1.428	2.272	0.338	0.544	0.677	1.362	1.809-	0.408	0.039-	6.413	2.287	1.741	0.332-	2.672	0.462
204	52.42	14	COMRF	SJR	SSDSJ-	9.528	1.852	0.328	0.077-	9.761	2.506	-31.233	6.291	14.722	2.345-	3.995	1.186	-42.144	9.540-	8.604	1.287-	0.576	6.288	0.989	2.326	34.536	6.617

205	68.26	14	COMRF	XGEO	WEST-	8.992	1.145	0.687	0.074	-10.352	1.634	2.448	0.421	3.610	1.004-	4.690	1.256	0.583	0.174-	5.774	1.210	3.843	0.668	5.088	1.842-	1.468	0.679
206	69.75	14	COMRF	XGEO	SSDSac	-14.762	1.484	1.026	0.094-	6.924	1.261-	0.777	0.644	2.969	0.451-	1.137	0.732-	0.596	0.143-	0.543	0.056-	0.592	0.743	1.171	0.546	0.701	0.156
207	64.80	14	COMRF	XGEO	SSDSJ	-11.728	1.355	0.929	0.092-	6.576	0.950	3.225	0.430	1.310	0.560-	1.047	0.696	0.120	0.089-	1.048	0.200	3.312	0.555-	1.147	0.756-	1.317	0.224
208	72.35	14	COMRF	WEST	SSDSac-	9.659	1.046	0.643	0.069-	1.939	1.256-	8.766	1.678	4.946	0.521	5.556	1.283-	2.202	1.326-	0.400	0.075	-10.190	2.423	4.206	0.644-	0.003	0.604
209	66.10	14	COMRF	WEST	SSDSJ-	7.855	1.159	0.595	0.068	-11.934	1.797	5.433	1.329	0.392	0.921-	6.199	1.373-	7.039	1.022-	0.137	0.234	8.833	2.004	0.499	1.230-	0.958	0.729
210	71.97	14	COMRF	SSDSac	SSDSJ	-11.755	1.088	0.817	0.069-	6.376	0.849	3.250	0.353-	1.214	0.761	0.180	0.505-	0.343	0.038	0.103	0.196	2.374	0.411-	4.082	0.953-	1.105	0.151

Appendix C, Models for Banks Salvage Three Days Ahead

There were 294 models examined for predicting the Banks daily salvage numbers, with 15 models for each of the moving averages (MA) from 1 (no averaging of explanatory variables) to 14 days (averaging for 14 days). In this appendix the percentage of variation explained (% Exp), the estimated parameter values (b0 to b10), and estimated standard errors for the parameter values (SE) are given for each model in the order in which the models were estimated. For each order of averaging the model that accounts for the most variation in the salvage numbers is shown with bold, red type. These estimates were obtained with the dependent variable being the salvage number three days ahead of the other variables. For example, with no averaging the models predict the daily salvage numbers three days ahead of the day when the flow and other variables were measured.

Model	% Exp	MA	X1	X2	X3	b0	SE	b1	SE	b2	SE	b3	SE	b4	SE	b5	SE	b6	SE	b7	SE	b8	SE	b9	SE	b10	SE
1	66.45	1	COMRF	RIO	SJR-	1.310	1.264	0.173	0.089-	4.512	0.690	2.831	0.462	2.586	0.812-	1.472	0.493	-0.606	0.168	0.274	0.830	2.219	0.369	2.129	1.083-	4.653	0.809
2	63.94	1	COMRF	RIO	XGEO-	3.398	1.105	0.302	0.079-	5.196	0.696	4.009	0.700	0.215	0.408-	1.607	0.399	-3.636	0.601-	1.028	0.209	1.110	0.698	0.409	0.426	3.361	0.732
3	70.14	1	COMRF	RIO	CCET-	4.030	1.153	0.388	0.081-	4.266	0.667	2.023	0.400	4.655	0.690-	1.475	0.376	-0.613	0.130-	2.828	0.458	0.347	0.349	1.576	0.625	0.505	0.342
4	65.97	1	COMRF	RIO	WEST-	1.309	1.196	0.133	0.086-	3.793	0.758	5.585	0.493-	1.999	0.694-	0.800	0.570	-1.083	0.277	0.364	0.436	2.645	0.538-	1.803	0.871-	1.025	0.626
5	70.66	1	COMRF	RIO	SSDSac-	0.866	1.033	0.099	0.073-	6.228	0.689	10.069	0.963-	2.662	0.377-	2.672	0.420	-7.571	0.780-	0.343	0.072	4.140	0.818-	0.902	0.279	3.868	0.461
6	66.50	1	COMRF	RIO	SSDSJ-	1.749	1.229	0.141	0.087-	5.905	0.819	4.272	0.406	1.053	0.405-	2.153	0.475	-0.838	0.167	0.056	0.108	2.195	0.391	1.078	0.347-	1.615	0.287
7	59.30	1	COMRF	SJR	XGEO	1.377	1.194	0.064	0.087-	3.812	0.609	3.754	0.714	1.227	0.288-	1.605	0.498	-4.966	1.244-	0.187	0.057	5.236	1.119	1.736	0.270-	3.578	0.473
8	68.66	1	COMRF	SJR	CCET-	1.720	1.212	0.211	0.086-	2.071	0.508-	3.885	0.831	8.699	0.744-	1.588	0.409	-1.579	0.881-	5.214	0.535	2.229	1.073	0.583	0.823	4.216	1.240
9	45.51	1	COMRF	SJR	WEST	2.226	1.121-	0.003	0.082-	5.049	0.808	0.371	0.812	3.665	0.700-	2.873	0.681	-2.475	1.354-	2.878	0.407	3.435	1.244	4.254	0.856-	0.537	1.133
10	52.61	1	COMRF	SJR	SSDSac-	0.641	1.253	0.141	0.089-	3.868	0.647	2.205	0.776	1.487	0.196-	1.075	0.498	-1.962	1.038-	0.223	0.028	3.083	1.093	0.856	0.155-	1.281	0.290
11	35.92	1	COMRF	SJR	SSDSJ	1.791	1.319-	0.109	0.081-	2.452	0.882	-14.995	3.702	7.420	1.441-	0.349	0.516	-24.706	6.235-	3.646	0.787	0.241	2.745	1.569	0.846	16.520	4.162
12	70.17	1	COMRF	XGEO	CCET-	6.553	1.159	0.593	0.080-	4.509	0.580	1.166	0.208	5.866	0.604-	1.565	0.327	-0.215	0.048-	3.602	0.409	0.513	0.209	1.587	0.596	0.107	0.204
13	60.04	1	COMRF	XGEO	WEST	0.676	1.165-	0.002	0.084-	4.139	0.612	2.013	0.219	0.205	0.389-	0.355	0.444	0.524	0.085	1.020	0.197	2.841	0.284-	1.123	0.470-	2.649	0.260
14	53.70	1	COMRF	XGEO	SSDSac-	2.478	1.192	0.237	0.082-	4.752	0.631	0.998	0.369	1.145	0.239-	1.097	0.365	-0.630	0.154-	0.284	0.062	0.371	0.391	0.602	0.224	0.548	0.182
15	60.78	1	COMRF	XGEO	SSDSJ-	0.344	1.210	0.089	0.086-	5.000	0.657	1.893	0.256	2.172	0.369-	1.361	0.401	-0.096	0.056-	0.332	0.122	1.670	0.264	1.592	0.352-	1.636	0.203
16	**70.77**	**1**	**COMRF**	**CCET**	**WEST-**	**6.043**	**1.136**	**0.654**	**0.084-**	**2.862**	**0.636**	**8.801**	**0.615-**	**0.046**	**0.492-**	**0.705**	**0.523**	**-5.866**	**0.494-**	**2.434**	**0.283**	**3.328**	**0.647**	**0.945**	**0.648**	**0.806**	**0.558**
17	66.23	1	COMRF	CCET	SSDSac-	4.468	1.120	0.437	0.079-	4.001	0.592	5.839	0.720	0.702	0.167-	1.241	0.337	-3.998	0.496-	0.134	0.024	1.726	0.666	0.157	0.137	0.289	0.172
18	68.08	1	COMRF	CCET	SSDSJ-	1.119	1.103	0.216	0.082-	3.125	0.497	8.643	0.696-	1.411	0.364-	1.539	0.397	-5.465	0.540-	0.042	0.094	2.176	0.806	0.088	0.361	1.288	0.446
19	53.56	1	COMRF	WEST	SSDSac-	2.003	1.182	0.218	0.085-	4.254	0.753	0.808	0.670	1.679	0.215-	1.036	0.631	-1.383	0.527-	0.166	0.035	1.670	0.935	0.745	0.199-	0.252	0.216
20	46.10	1	COMRF	WEST	SSDSJ	1.600	1.071	0.031	0.080-	5.327	0.809	3.161	0.639	0.781	0.415-	2.204	0.678	-2.776	0.448-	0.206	0.159	3.157	0.888	1.528	0.439-	0.125	0.421
21	54.77	1	COMRF	SSDSac	SSDSJ-	1.736	1.214	0.162	0.087-	4.813	0.659	1.785	0.187	1.278	0.410-	1.065	0.423	-0.205	0.028-	0.067	0.129	0.894	0.157	1.066	0.329-	0.636	0.107
22	69.70	2	COMRF	RIO	SJR-	3.115	1.310	0.257	0.089-	6.065	0.925	3.363	0.503	3.363	0.885-	1.956	0.619	-0.534	0.172	0.658	0.877	3.271	0.441	2.187	1.202-	5.450	0.838
23	66.75	2	COMRF	RIO	XGEO-	4.679	1.126	0.341	0.078-	6.803	0.895	5.058	0.775-	0.036	0.435-	2.342	0.506	-4.052	0.604-	1.136	0.204	2.262	0.785	0.148	0.460	3.792	0.715
24	72.29	2	COMRF	RIO	CCET-	5.411	1.172	0.416	0.078-	6.345	0.913	2.886	0.463	4.402	0.755-	2.510	0.492	-0.696	0.142-	2.489	0.468	1.250	0.416	1.554	0.710	0.778	0.348
25	68.11	2	COMRF	RIO	WEST-	2.602	1.210	0.175	0.085-	5.378	0.852	5.966	0.492-	1.766	0.626-	1.047	0.438	-0.596	0.273	1.222	0.432	4.242	0.541-	2.963	0.737-	2.382	0.630
26	**72.31**	**2**	**COMRF**	**RIO**	**SSDSac-**	**1.491**	**1.049**	**0.132**	**0.073-**	**6.794**	**0.785**	**9.870**	**1.031-**	**2.587**	**0.420-**	**3.076**	**0.477**	**-7.423**	**0.801-**	**0.273**	**0.075**	**3.806**	**0.924-**	**0.701**	**0.331**	**3.675**	**0.468**
27	69.34	2	COMRF	RIO	SSDSJ-	4.049	1.293	0.237	0.086-	7.788	1.017	5.082	0.464	1.108	0.432-	2.770	0.547	-0.759	0.170	0.144	0.116	3.357	0.470	0.815	0.367-	1.916	0.296
28	63.20	2	COMRF	SJR	XGEO	0.079	1.200	0.139	0.087-	4.467	0.674	4.506	0.749	1.538	0.306-	1.754	0.535	-5.417	1.239-	0.196	0.057	5.916	1.188	2.320	0.288-	4.217	0.492
29	69.66	2	COMRF	SJR	CCET-	3.006	1.285	0.285	0.088-	2.410	0.577-	4.650	0.967	10.060	0.862-	1.602	0.478	-1.637	0.905-	6.138	0.538	1.565	1.195	1.221	0.942	5.146	1.324
30	46.86	2	COMRF	SJR	WEST	1.335	1.148	0.041	0.083-	5.345	0.866-	0.087	0.829	4.208	0.750-	2.610	0.703	-2.147	1.315-	2.997	0.435	2.695	1.245	4.536	0.923-	0.208	1.103
31	55.65	2	COMRF	SJR	SSDSac-	1.875	1.295	0.210	0.090-	4.394	0.661	2.730	0.842	1.675	0.212-	0.930	0.524	-1.898	1.103-	0.251	0.030	3.012	1.236	1.137	0.178-	1.636	0.305
32	35.46	2	COMRF	SJR	SSDSJ	1.928	1.295-	0.102	0.082-	1.593	0.796	-15.394	3.726	7.673	1.450	0.041	0.525	-26.948	6.622-	4.103	0.842	1.911	2.691	0.906	0.810	18.241	4.393

33	72.11	2	COMRF	XGEO	CCET-	8.242	1.166	0.677	0.078-	5.542	0.698	1.466	0.235	6.121	0.659-	1.963	0.377	-0.216	0.048-	3.500	0.408	0.841	0.240	1.871	0.664	0.206	0.194
34	64.61	2	COMRF	XGEO	WEST-	0.208	1.153	0.032	0.082-	4.728	0.715	2.217	0.226	0.417	0.515-	0.202	0.535	0.689	0.084	1.307	0.273	3.509	0.267-	1.548	0.670-	3.148	0.249
35	55.79	2	COMRF	XGEO	SSDSac-	4.128	1.235	0.313	0.082-	5.808	0.785	1.206	0.406	1.324	0.257-	1.445	0.432	-0.544	0.159-	0.287	0.065	0.630	0.434	0.729	0.246	0.476	0.191
36	65.22	2	COMRF	XGEO	SSDSJ-	2.025	1.212	0.174	0.085-	5.694	0.708	2.293	0.268	2.386	0.382-	1.331	0.408	-0.073	0.056-	0.310	0.127	2.273	0.272	1.588	0.368-	2.000	0.215
37	72.04	2	COMRF	CCET	WEST-	6.688	1.136	0.700	0.084-	2.773	0.479	9.599	0.626-	0.446	0.466-	0.440	0.285	-6.241	0.463-	2.262	0.277	4.115	0.662	0.217	0.608	0.630	0.522
38	67.72	2	COMRF	CCET	SSDSac-	5.164	1.128	0.459	0.077-	4.708	0.697	6.109	0.793	0.778	0.200-	1.506	0.379	-4.059	0.515-	0.136	0.027	2.148	0.738	0.237	0.160	0.405	0.173
39	69.43	2	COMRF	CCET	SSDSJ-	1.940	1.142	0.260	0.084-	3.189	0.518	10.670	0.820-	2.066	0.370-	1.210	0.401	-6.382	0.512	0.010	0.111	4.095	0.932-	0.733	0.371	1.483	0.426
40	55.96	2	COMRF	WEST	SSDSac-	2.991	1.185	0.261	0.085-	4.645	0.817	0.885	0.699	1.896	0.238-	0.520	0.688	-0.699	0.488-	0.157	0.035	0.664	0.951	1.173	0.207-	0.584	0.189
41	47.20	2	COMRF	WEST	SSDSJ	0.912	1.098	0.065	0.081-	5.427	0.847	3.685	0.707	0.317	0.380-	1.890	0.718	-2.853	0.495-	0.065	0.127	3.458	1.022	1.097	0.439-	0.085	0.422
42	58.43	2	COMRF	SSDSac	SSDSJ-	3.183	1.233	0.234	0.088-	5.461	0.708	2.109	0.197	1.588	0.404-	0.985	0.423	-0.237	0.029-	0.058	0.114	1.254	0.177	1.086	0.344-	0.845	0.113
43	71.94	3	COMRF	RIO	SJR-	4.330	1.364	0.329	0.091-	6.450	0.988	3.620	0.537	3.625	0.953-	1.822	0.653	-0.545	0.183	0.977	0.933	3.901	0.491	1.904	1.311-	6.235	0.913
44	69.05	3	COMRF	RIO	XGEO-	5.739	1.160	0.405	0.080-	7.064	0.886	5.073	0.801	0.241	0.442-	2.292	0.492	-4.562	0.640-	1.237	0.203	2.163	0.809	0.526	0.468	4.260	0.722
45	73.13	3	COMRF	RIO	CCET-	5.918	1.194	0.432	0.078-	6.854	0.962	3.482	0.514	3.750	0.789-	2.736	0.513	-0.841	0.167-	2.062	0.476	1.707	0.460	1.128	0.752	0.835	0.361
46	69.63	3	COMRF	RIO	WEST-	3.447	1.209	0.218	0.085-	5.894	0.783	6.305	0.513-	1.767	0.633-	1.079	0.431	-0.577	0.266	1.336	0.454	4.789	0.535-	3.294	0.783-	2.600	0.639
47	**74.18**	**3**	**COMRF**	**RIO**	**SSDSac-**	**2.087**	**1.065**	**0.170**	**0.073-**	**7.014**	**0.780**	**10.655**	**1.063-**	**2.877**	**0.433-**	**3.150**	**0.466**	**-8.441**	**0.829-**	**0.246**	**0.069**	**4.180**	**0.949-**	**0.770**	**0.333**	**4.030**	**0.459**
48	71.42	3	COMRF	RIO	SSDSJ-	5.407	1.342	0.308	0.087-	8.571	1.060	5.569	0.504	1.277	0.440-	2.964	0.556	-0.782	0.180	0.157	0.122	4.055	0.520	0.761	0.378-	2.271	0.324
49	65.89	3	COMRF	SJR	XGEO-	0.983	1.229	0.202	0.088-	4.876	0.717	4.626	0.792	1.842	0.321-	1.816	0.570	-5.819	1.275-	0.213	0.058	6.105	1.280	2.728	0.299-	4.442	0.511
50	70.22	3	COMRF	SJR	CCET-	2.156	1.283	0.212	0.088-	1.655	0.614-	6.087	1.357	10.720	0.997-	1.255	0.527	-3.117	2.014-	6.339	0.607	1.869	1.422	1.236	1.075	6.495	1.669
51	48.74	3	COMRF	SJR	WEST	0.776	1.166	0.075	0.084-	5.552	0.894-	0.054	0.832	4.481	0.775-	2.648	0.724	-1.876	1.347-	3.233	0.455	2.770	1.287	5.048	0.952-	0.712	1.117
52	58.67	3	COMRF	SJR	SSDSac-	3.201	1.355	0.281	0.093-	4.987	0.723	3.062	0.897	1.868	0.218-	0.851	0.573	-1.840	1.206-	0.264	0.031	2.895	1.361	1.459	0.195-	1.919	0.310
53	35.98	3	COMRF	SJR	SSDSJ	1.833	1.307-	0.102	0.083-	1.157	0.812	-17.430	3.903	8.815	1.540	0.281	0.572	-30.457	7.031-	4.991	0.927	2.508	2.879	0.821	0.906	21.327	4.734
54	72.97	3	COMRF	XGEO	CCET-	9.244	1.195	0.734	0.079-	5.861	0.711	1.780	0.253	5.655	0.675-	2.043	0.376	-0.222	0.048-	3.166	0.406	1.152	0.258	1.456	0.698	0.198	0.190
55	68.06	3	COMRF	XGEO	WEST-	0.824	1.169	0.051	0.082-	5.732	0.822	2.385	0.236	0.959	0.604-	0.871	0.593	0.724	0.083	1.124	0.337	3.738	0.252-	0.825	0.778-	3.189	0.231
56	57.84	3	COMRF	XGEO	SSDSac-	5.934	1.296	0.391	0.083-	7.141	0.919	1.608	0.419	1.434	0.272-	1.935	0.474	-0.439	0.158-	0.261	0.063	1.088	0.450	0.805	0.272	0.346	0.190
57	68.38	3	COMRF	XGEO	SSDSJ-	2.980	1.210	0.224	0.084-	6.156	0.734	2.586	0.271	2.469	0.408-	1.420	0.431	-0.078	0.056-	0.309	0.138	2.650	0.274	1.598	0.418-	2.169	0.219
58	72.36	3	COMRF	CCET	WEST-	6.044	1.132	0.660	0.083-	2.693	0.475	9.359	0.625-	0.246	0.477-	0.523	0.279	-6.258	0.480-	2.564	0.295	3.856	0.683	0.683	0.624	0.961	0.531
59	68.38	3	COMRF	CCET	SSDSac-	6.152	1.191	0.490	0.078-	5.577	0.844	5.186	0.837	1.115	0.230-	1.788	0.446	-3.484	0.520-	0.158	0.029	1.489	0.805	0.558	0.193	0.505	0.173
60	69.98	3	COMRF	CCET	SSDSJ-	1.059	1.122	0.206	0.083-	2.894	0.494	11.145	0.874-	2.194	0.394-	1.117	0.417	-6.913	0.637-	0.256	0.157	4.305	1.008-	0.700	0.409	2.160	0.560
61	59.03	3	COMRF	WEST	SSDSac-	3.919	1.202	0.305	0.085-	4.805	0.833	0.659	0.742	2.125	0.256	0.023	0.690	-0.589	0.482-	0.156	0.036-	0.044	0.950	1.530	0.212-	0.700	0.179
62	49.10	3	COMRF	WEST	SSDSJ	0.410	1.108	0.094	0.082-	5.727	0.887	4.110	0.734	0.278	0.386-	1.982	0.759	-3.021	0.520-	0.029	0.122	3.932	1.072	1.135	0.472-	0.276	0.437
63	61.72	3	COMRF	SSDSac	SSDSJ-	4.420	1.263	0.297	0.088-	6.121	0.790	2.348	0.215	1.881	0.442-	1.046	0.452	-0.254	0.030-	0.110	0.136	1.545	0.192	1.153	0.377-	0.975	0.124
64	73.42	4	COMRF	RIO	SJR-	4.829	1.388	0.380	0.094-	6.151	0.917	3.566	0.539	3.857	0.977-	1.542	0.623	-0.570	0.196	0.949	0.957	4.148	0.503	1.902	1.360-	7.020	0.969
65	70.86	4	COMRF	RIO	XGEO-	6.545	1.196	0.470	0.082-	6.921	0.840	4.940	0.819	0.498	0.444-	2.121	0.461	-5.092	0.677-	1.348	0.205	1.885	0.829	0.860	0.472	4.733	0.734
66	73.98	4	COMRF	RIO	CCET-	6.024	1.210	0.440	0.078-	6.733	0.963	3.599	0.545	3.755	0.802-	2.621	0.504	-0.935	0.189-	1.965	0.484	1.703	0.493	1.302	0.758	0.908	0.372
67	70.56	4	COMRF	RIO	WEST-	4.062	1.225	0.274	0.085-	5.708	0.823	6.392	0.527-	1.787	0.670-	0.906	0.439	-0.707	0.299	0.991	0.499	4.758	0.570-	3.202	0.821-	2.313	0.692
68	**75.02**	**4**	**COMRF**	**RIO**	**SSDSac-**	**2.434**	**1.093**	**0.207**	**0.075-**	**6.649**	**0.733**	**10.366**	**1.046-**	**2.706**	**0.426-**	**2.885**	**0.426**	**-9.293**	**0.871-**	**0.255**	**0.070**	**3.662**	**0.938-**	**0.584**	**0.329**	**4.318**	**0.465**
69	72.69	4	COMRF	RIO	SSDSJ-	6.022	1.394	0.357	0.090-	8.589	1.062	5.738	0.526	1.447	0.451-	2.929	0.553	-0.825	0.193	0.135	0.131	4.301	0.556	0.827	0.403-	2.514	0.339
70	67.64	4	COMRF	SJR	XGEO-	1.649	1.264	0.247	0.089-	5.018	0.720	4.489	0.812	2.046	0.326-	1.831	0.584	-6.233	1.317-	0.237	0.059	6.109	1.343	2.951	0.304-	4.514	0.522
71	71.88	4	COMRF	SJR	CCET-	1.445	1.264	0.145	0.086-	0.616	0.625-	8.714	1.718	11.719	1.063-	1.275	0.563	-8.110	2.498-	6.425	0.592	4.091	1.562	0.695	1.120	9.408	1.877
72	51.37	4	COMRF	SJR	WEST	0.455	1.179	0.112	0.085-	5.472	0.835	0.607	0.792	4.342	0.765-	2.772	0.681	-1.866	1.359-	3.531	0.474	3.916	1.340	5.452	0.940-	1.996	1.135
73	61.77	4	COMRF	SJR	SSDSac-	4.274	1.397	0.348	0.094-	5.445	0.803	3.578	0.990	1.919	0.223-	0.947	0.657	-2.183	1.302-	0.257	0.032	3.312	1.529	1.645	0.205-	2.158	0.317
74	36.68	4	COMRF	SJR	SSDSJ	1.627	1.348-	0.112	0.084-	1.312	0.923	-19.829	4.266	9.799	1.635	0.193	0.613	-34.400	7.716-	5.609	1.009	2.371	3.247	1.003	1.053	24.164	5.219
75	74.11	4	COMRF	XGEO	CCET-	9.957	1.211	0.777	0.079-	6.049	0.713	1.901	0.259	5.703	0.682-	2.073	0.372	-0.224	0.049-	3.074	0.402	1.247	0.266	1.564	0.709	0.183	0.185

76	69.82	4	COMRF	XGEO	WEST-	1.346	1.191	0.082	0.083-	6.389	0.873	2.475	0.244	1.438	0.658-	1.398	0.622	0.729	0.085	0.776	0.426	3.827	0.253-	0.116	0.871-	3.133	0.240
77	59.72	4	COMRF	XGEO	SSDSac-	7.569	1.351	0.480	0.085-	7.716	0.946	1.855	0.427	1.508	0.280-	2.004	0.465	-0.315	0.162-	0.220	0.065	1.375	0.459	0.805	0.280	0.174	0.195
78	70.07	4	COMRF	XGEO	SSDSJ-	3.518	1.227	0.255	0.085-	6.535	0.768	2.817	0.274	2.538	0.430-	1.629	0.468	-0.098	0.057-	0.334	0.148	2.877	0.281	1.644	0.459-	2.190	0.215
79	73.72	4	COMRF	CCET	WEST-	5.977	1.144	0.657	0.084-	2.776	0.481	9.347	0.616-	0.088	0.492-	0.603	0.286	-6.220	0.459-	3.003	0.317	3.965	0.689	1.079	0.662	0.971	0.530
80	69.55	4	COMRF	CCET	SSDSac-	7.261	1.249	0.540	0.079-	6.200	0.936	5.183	0.849	1.260	0.247-	1.931	0.476	-3.226	0.508-	0.158	0.032	1.682	0.825	0.683	0.208	0.474	0.167
81	71.22	4	COMRF	CCET	SSDSJ-	0.547	1.099	0.171	0.081-	2.884	0.506	11.628	0.883-	2.164	0.405-	1.231	0.419	-7.316	0.656-	0.572	0.184	4.459	1.001-	0.445	0.431	2.743	0.589
82	62.26	4	COMRF	WEST	SSDSac-	4.790	1.227	0.356	0.086-	4.973	0.545	0.540	0.736	2.230	0.270	0.272	0.422	-0.964	0.520-	0.147	0.039-	0.114	0.903	1.713	0.216-	0.676	0.188
83	51.93	4	COMRF	WEST	SSDSJ	0.027	1.120	0.123	0.082-	5.820	0.822	4.191	0.724	0.507	0.414-	1.977	0.683	-3.188	0.536	0.014	0.155	4.055	1.058	1.581	0.476-	0.729	0.441
84	64.77	4	COMRF	SSDSac	SSDSJ-	5.734	1.332	0.361	0.089-	7.009	0.883	2.532	0.230	2.195	0.481-	1.345	0.477	-0.260	0.032-	0.147	0.152	1.779	0.207	1.371	0.436-	1.062	0.124
85	74.70	5	COMRF	RIO	SJR-	5.519	1.415	0.435	0.097-	5.861	0.781	3.691	0.537	3.568	0.951-	1.122	0.540	-0.652	0.214	1.514	0.968	4.395	0.490	1.032	1.347-	7.470	0.984
86	72.24	5	COMRF	RIO	XGEO-	7.261	1.233	0.523	0.084-	7.060	0.840	4.889	0.833	0.754	0.446-	2.208	0.453	-5.339	0.687-	1.380	0.202	1.719	0.853	1.155	0.479	4.865	0.726
87	74.65	5	COMRF	RIO	CCET-	6.142	1.221	0.449	0.079-	6.686	0.963	3.843	0.581	3.437	0.818-	2.579	0.500	-1.078	0.218-	1.759	0.494	1.816	0.531	1.150	0.769	1.044	0.390
88	71.42	5	COMRF	RIO	WEST-	4.668	1.257	0.340	0.087-	5.530	0.993	6.453	0.552-	1.579	0.788-	1.010	0.668	-1.068	0.367-	0.044	0.595	4.320	0.662-	2.166	1.053-	1.445	0.800
89	75.33	5	COMRF	RIO	SSDSac-	3.088	1.130	0.252	0.077-	6.683	0.742	10.532	1.061-	2.589	0.426-	2.813	0.428	-9.940	0.915-	0.277	0.073	3.925	0.944-	0.629	0.327	4.498	0.478
90	73.90	5	COMRF	RIO	SSDSJ-	6.437	1.434	0.405	0.093-	8.120	1.008	5.858	0.530	1.265	0.449-	2.626	0.522	-0.918	0.213	0.204	0.139	4.440	0.566	0.525	0.413-	2.758	0.354
91	68.70	5	COMRF	SJR	XGEO-	2.144	1.295	0.280	0.091-	5.085	0.688	3.978	0.801	2.275	0.328-	1.747	0.563	-6.144	1.341-	0.267	0.062	5.395	1.358	3.136	0.305-	4.425	0.527
92	73.18	5	COMRF	SJR	CCET-	0.980	1.294	0.081	0.085	0.169	0.649	-11.906	2.347	12.817	1.222-	1.309	0.601	-13.135	3.204-	6.437	0.605	5.688	1.673	0.316	1.163	12.549	2.323
93	54.42	5	COMRF	SJR	WEST-	0.142	1.204	0.160	0.086-	6.199	0.944	1.016	0.813	4.947	0.833-	3.600	0.753	-1.779	1.418-	4.421	0.528	4.496	1.437	7.075	1.035-	2.904	1.205
94	64.83	5	COMRF	SJR	SSDSac-	5.379	1.426	0.419	0.096-	5.658	0.800	3.665	0.994	2.028	0.228-	0.813	0.665	-1.797	1.306-	0.270	0.034	2.872	1.563	1.819	0.210-	2.373	0.323
95	36.66	5	COMRF	SJR	SSDSJ	1.569	1.367-	0.123	0.084-	1.381	0.998	-21.679	4.550	10.345	1.697-	0.030	0.638	-38.951	8.402-	6.057	1.060	3.036	3.556	0.774	1.182	27.092	5.637
96	75.03	5	COMRF	XGEO	CCET	-10.438	1.216	0.811	0.079-	6.114	0.706	2.027	0.266	5.508	0.677-	2.114	0.371	-0.234	0.050-	2.941	0.399	1.339	0.275	1.397	0.711	0.183	0.183
97	71.17	5	COMRF	XGEO	WEST-	2.015	1.209	0.125	0.084-	7.357	0.938	2.525	0.249	2.271	0.709-	2.203	0.671	0.747	0.089	0.134	0.520	3.953	0.262	1.079	0.991-	3.102	0.266
98	61.69	5	COMRF	XGEO	SSDSac-	8.896	1.383	0.559	0.086-	8.035	0.943	2.109	0.429	1.576	0.281-	2.043	0.461	-0.195	0.167-	0.186	0.067	1.694	0.461	0.743	0.277-	0.004	0.200
99	70.89	5	COMRF	XGEO	SSDSJ-	3.654	1.232	0.268	0.086-	6.538	0.738	3.038	0.273	2.257	0.420-	1.641	0.466	-0.127	0.059-	0.288	0.154	3.058	0.284	1.303	0.455-	2.112	0.201
100	**75.34**	**5**	**COMRF**	**CCET**	**WEST-**	**6.201**	**1.167**	**0.677**	**0.085-**	**3.026**	**0.500**	**9.118**	**0.597**	**0.411**	**0.518-**	**0.906**	**0.308**	**-6.069**	**0.440-**	**3.752**	**0.350**	**3.862**	**0.684**	**2.120**	**0.721**	**0.947**	**0.541**
101	70.64	5	COMRF	CCET	SSDSac-	7.933	1.279	0.570	0.078-	6.577	1.001	5.003	0.853	1.424	0.261-	2.042	0.504	-2.961	0.498-	0.172	0.034	1.696	0.835	0.772	0.222	0.430	0.165
102	72.19	5	COMRF	CCET	SSDSJ	0.077	1.083	0.130	0.080-	2.686	0.482	11.878	0.756-	2.312	0.391-	1.189	0.295	-7.553	0.697-	0.737	0.197	4.538	0.750-	0.429	0.375	3.130	0.630
103	65.49	5	COMRF	WEST	SSDSac-	5.464	1.246	0.401	0.087-	5.364	0.574	0.873	0.783	2.248	0.277	0.018	0.448	-1.819	0.597-	0.137	0.041	0.808	0.978	1.771	0.222-	0.591	0.207
104	54.89	5	COMRF	WEST	SSDSJ-	0.621	1.143	0.165	0.084-	6.730	0.919	5.152	0.765	0.525	0.450-	2.809	0.754	-4.043	0.584	0.050	0.169	5.775	1.123	1.651	0.518-	1.007	0.465
105	67.81	5	COMRF	SSDSac	SSDSJ-	6.764	1.330	0.424	0.091-	7.182	0.761	2.717	0.224	2.192	0.484-	1.246	0.405	-0.277	0.034-	0.094	0.141	1.976	0.204	1.269	0.447-	1.160	0.124
106	75.51	6	COMRF	RIO	SJR-	6.297	1.454	0.486	0.100-	5.720	0.672	4.038	0.548	2.862	0.906-	0.721	0.460	-0.798	0.235	2.435	0.976	4.550	0.491-	0.431	1.315-	7.347	0.956
107	73.56	6	COMRF	RIO	XGEO-	7.866	1.264	0.576	0.087-	7.075	0.831	4.872	0.845	0.939	0.449-	2.278	0.441	-5.648	0.691-	1.435	0.200	1.536	0.876	1.376	0.487	5.054	0.717
108	75.45	6	COMRF	RIO	CCET-	6.300	1.223	0.469	0.080-	6.363	0.932	4.039	0.619	2.976	0.836-	2.392	0.486	-1.306	0.256-	1.489	0.505	1.802	0.566	0.868	0.782	1.325	0.415
109	72.72	6	COMRF	RIO	WEST-	5.686	1.293	0.445	0.091-	5.196	0.947	6.680	0.585-	1.446	0.844-	1.372	0.670	-1.902	0.417-	2.016	0.707	3.180	0.701-	0.101	1.175	0.528	0.899
110	75.55	6	COMRF	RIO	SSDSac-	3.656	1.161	0.298	0.079-	6.517	0.764	10.031	1.101-	2.236	0.438-	2.657	0.442	-10.402	0.959-	0.339	0.082	3.626	0.993-	0.536	0.342	4.686	0.505
111	74.63	6	COMRF	RIO	SSDSJ-	6.622	1.438	0.444	0.095-	7.402	0.899	5.926	0.528	0.955	0.439-	2.238	0.469	-1.059	0.235	0.265	0.142	4.364	0.554	0.127	0.412-	2.807	0.360
112	69.18	6	COMRF	SJR	XGEO-	2.648	1.331	0.311	0.093-	5.122	0.643	3.272	0.780	2.512	0.330-	1.550	0.528	-5.610	1.351-	0.299	0.066	4.145	1.353	3.253	0.307-	4.178	0.519
113	74.29	6	COMRF	SJR	CCET-	0.597	1.309	0.023	0.084	0.723	0.679	-14.554	2.644	13.750	1.305-	1.311	0.637	-17.017	3.550-	6.366	0.601	6.759	1.792	0.194	1.204	14.965	2.556
114	57.90	6	COMRF	SJR	WEST-	1.087	1.246	0.225	0.089-	7.310	1.041	1.266	0.823	5.911	0.888-	4.656	0.796	-1.718	1.408-	5.666	0.594	4.667	1.531	9.191	1.127-	3.336	1.253
115	67.69	6	COMRF	SJR	SSDSac-	6.671	1.454	0.504	0.098-	5.665	0.731	3.412	0.928	2.160	0.232-	0.423	0.615	-0.926	1.245-	0.288	0.037	1.724	1.491	1.934	0.211-	2.492	0.319
116	37.12	6	COMRF	SJR	SSDSJ	1.398	1.373-	0.128	0.084-	1.339	1.051	-23.779	4.771	11.011	1.756-	0.173	0.656	-44.159	9.040-	6.607	1.104	3.987	3.777	0.432	1.281	30.525	6.015
117	76.01	6	COMRF	XGEO	CCET	-10.694	1.205	0.838	0.079-	5.937	0.682	2.041	0.269	5.253	0.666-	2.073	0.369	-0.251	0.051-	2.838	0.391	1.305	0.280	1.120	0.710	0.236	0.182
118	71.79	6	COMRF	XGEO	WEST-	2.841	1.229	0.185	0.085-	8.339	0.993	2.576	0.258	3.234	0.762-	3.035	0.724	0.717	0.096-	0.967	0.635	4.007	0.284	2.676	1.135-	2.880	0.305

119	63.74	6	COMRF	XGEO	SSDSac-	9.766	1.390	0.624	0.087-	7.933	0.929	2.188	0.440	1.652	0.284-	1.940	0.474	-0.153	0.175-	0.177	0.071	1.840	0.473	0.650	0.278-	0.101	0.210
120	71.05	6	COMRF	XGEO	SSDSJ-	3.712	1.243	0.278	0.087-	6.448	0.700	3.248	0.276	1.896	0.397-	1.593	0.448	-0.162	0.063-	0.239	0.154	3.200	0.295	0.844	0.435-	1.983	0.187
121	**77.31**	**6**	**COMRF**	**CCET**	**WEST-**	**6.811**	**1.185**	**0.721**	**0.086-**	**3.444**	**0.538**	**8.887**	**0.577**	**1.034**	**0.552-**	**1.291**	**0.351**	**-5.793**	**0.412-**	**4.609**	**0.382**	**3.870**	**0.680**	**3.345**	**0.796**	**0.778**	**0.545**
122	72.20	6	COMRF	CCET	SSDSac-	8.472	1.283	0.600	0.078-	6.661	1.030	4.608	0.849	1.559	0.271-	2.010	0.519	-2.614	0.485-	0.195	0.036	1.554	0.838	0.801	0.234	0.463	0.164
123	72.96	6	COMRF	CCET	SSDSJ	0.600	1.070	0.097	0.079-	2.527	0.472	11.889	0.733-	2.364	0.402-	1.150	0.265	-7.558	0.698-	0.812	0.204	4.553	0.728-	0.444	0.397	3.217	0.634
124	68.70	6	COMRF	WEST	SSDSac-	6.091	1.266	0.446	0.089-	5.768	0.618	1.358	0.835	2.211	0.283-	0.402	0.495	-2.994	0.687-	0.124	0.044	2.235	1.088	1.732	0.230-	0.432	0.229
125	58.25	6	COMRF	WEST	SSDSJ-	1.562	1.182	0.221	0.086-	8.000	0.997	6.395	0.817	0.477	0.466-	3.940	0.799	-5.293	0.647	0.081	0.184	8.069	1.206	1.565	0.528-	1.080	0.497
126	70.51	6	COMRF	SSDSac	SSDSJ-	7.586	1.328	0.487	0.092-	6.888	0.653	2.864	0.227	1.988	0.468-	0.893	0.347	-0.295	0.036-	0.028	0.144	2.105	0.204	0.900	0.419-	1.227	0.126
127	75.84	7	COMRF	RIO	SJR-	6.882	1.497	0.528	0.103-	5.601	0.616	4.312	0.568	2.232	0.870-	0.486	0.414	-0.951	0.260	3.167	0.986	4.492	0.513-	1.674	1.295-	7.025	0.915
128	74.49	7	COMRF	RIO	XGEO-	8.226	1.290	0.627	0.090-	6.625	0.776	4.561	0.829	1.160	0.449-	2.185	0.415	-5.781	0.681-	1.445	0.199	0.919	0.875	1.648	0.493	5.049	0.704
129	76.07	7	COMRF	RIO	CCET-	6.313	1.224	0.495	0.081-	5.584	0.860	3.945	0.635	2.639	0.846-	2.001	0.470	-1.525	0.282-	1.295	0.516	1.408	0.576	0.710	0.793	1.604	0.435
130	74.14	7	COMRF	RIO	WEST-	6.883	1.360	0.566	0.098-	4.611	0.845	6.983	0.614-	1.543	0.863-	1.658	0.652	-2.878	0.456-	3.998	0.808	1.807	0.735	1.925	1.281	2.722	0.988
131	75.89	7	COMRF	RIO	SSDSac-	4.036	1.190	0.345	0.081-	5.912	0.745	9.020	1.147-	1.823	0.456-	2.298	0.443	-10.832	0.999-	0.427	0.095	2.743	1.058-	0.354	0.369	4.976	0.544
132	74.89	7	COMRF	RIO	SSDSJ-	6.650	1.434	0.477	0.097-	6.592	0.782	5.870	0.528	0.697	0.434-	1.888	0.419	-1.200	0.261	0.285	0.144	4.039	0.540-	0.163	0.413-	2.707	0.363
133	69.14	7	COMRF	SJR	XGEO-	3.016	1.369	0.339	0.096-	5.096	0.604	2.717	0.771	2.660	0.334-	1.394	0.500	-5.166	1.364-	0.331	0.071	3.094	1.362	3.298	0.316-	4.018	0.513
134	74.70	7	COMRF	SJR	CCET	0.275	1.311-	0.038	0.083	1.214	0.704	-15.033	2.722	13.684	1.322-	1.435	0.694	-18.690	3.683-	6.207	0.589	8.129	1.967-	0.259	1.265	15.781	2.647
135	60.60	7	COMRF	SJR	WEST-	1.901	1.291	0.278	0.091-	8.223	1.135	1.413	0.853	6.641	0.940-	5.481	0.834	-1.553	1.410-	6.686	0.653	4.639	1.641	10.789	1.212-	3.468	1.302
136	69.87	7	COMRF	SJR	SSDSac-	7.916	1.489	0.593	0.101-	5.464	0.629	3.042	0.829	2.270	0.240	0.071	0.533	0.018	1.168-	0.310	0.040	0.358	1.372	1.991	0.217-	2.578	0.312
137	37.86	7	COMRF	SJR	SSDSJ	1.071	1.399-	0.128	0.084-	1.379	1.157	-25.916	4.973	11.711	1.810-	0.292	0.681	-48.815	9.582-	7.103	1.152	4.691	4.106	0.201	1.401	33.570	6.341
138	76.49	7	COMRF	XGEO	CCET	-10.602	1.198	0.852	0.080-	5.444	0.648	1.883	0.268	5.058	0.653-	1.893	0.368	-0.258	0.053-	2.841	0.380	1.078	0.281	0.874	0.712	0.295	0.185
139	71.80	7	COMRF	XGEO	WEST-	3.325	1.246	0.232	0.087-	8.780	1.018	2.584	0.267	3.838	0.803-	3.541	0.765	0.674	0.104-	1.949	0.735	3.967	0.313	3.855	1.266-	2.656	0.347
140	65.46	7	COMRF	XGEO	SSDSac	-10.181	1.383	0.677	0.089-	7.286	0.882	2.170	0.456	1.643	0.285-	1.657	0.480	-0.125	0.184-	0.167	0.077	1.874	0.490	0.452	0.280-	0.186	0.223
141	70.66	7	COMRF	XGEO	SSDSJ-	3.712	1.262	0.289	0.089-	6.313	0.674	3.381	0.285	1.647	0.385-	1.577	0.435	-0.197	0.067-	0.227	0.154	3.272	0.314	0.499	0.430-	1.901	0.182
142	**78.38**	**7**	**COMRF**	**CCET**	**WEST-**	**7.027**	**1.201**	**0.734**	**0.086-**	**3.720**	**0.583**	**8.727**	**0.568**	**1.381**	**0.592-**	**1.480**	**0.399**	**-5.544**	**0.395-**	**5.161**	**0.408**	**4.084**	**0.681**	**3.991**	**0.872**	**0.477**	**0.549**
143	73.52	7	COMRF	CCET	SSDSac-	8.539	1.260	0.624	0.078-	5.960	0.958	4.287	0.830	1.510	0.272-	1.624	0.487	-2.362	0.474-	0.209	0.038	1.484	0.825	0.628	0.236	0.516	0.164
144	72.98	7	COMRF	CCET	SSDSJ	1.187	1.065	0.060	0.079-	2.347	0.460	11.556	0.703-	2.289	0.405-	1.092	0.258	-7.347	0.674-	0.777	0.209	4.388	0.722-	0.416	0.415	3.010	0.618
145	70.81	7	COMRF	WEST	SSDSac-	6.347	1.281	0.471	0.091-	5.901	0.651	1.725	0.874	2.134	0.293-	0.719	0.539	-3.689	0.757-	0.108	0.049	3.219	1.193	1.645	0.247-	0.372	0.249
146	60.90	7	COMRF	WEST	SSDSJ-	2.279	1.222	0.264	0.089-	8.906	1.085	7.218	0.859	0.469	0.469-	4.759	0.875	-6.287	0.704	0.102	0.188	9.683	1.299	1.546	0.561-	1.065	0.520
147	72.41	7	COMRF	SSDSac	SSDSJ-	8.436	1.365	0.555	0.095-	6.558	0.594	3.003	0.241	1.729	0.451-	0.582	0.310	-0.313	0.039	0.064	0.148	2.207	0.219	0.499	0.400-	1.273	0.126
148	76.32	8	COMRF	RIO	SJR-	7.716	1.545	0.585	0.106-	5.716	0.619	4.585	0.597	1.745	0.877-	0.408	0.402	-1.109	0.284	3.822	1.009	4.449	0.552-	2.784	1.323-	6.781	0.892
149	75.53	8	COMRF	RIO	XGEO-	8.735	1.331	0.685	0.094-	6.295	0.747	4.430	0.829	1.265	0.456-	2.135	0.405	-5.977	0.678-	1.462	0.198	0.461	0.893	1.795	0.506	5.089	0.695
150	76.83	8	COMRF	RIO	CCET-	6.631	1.239	0.532	0.084-	5.137	0.827	3.946	0.650	2.216	0.857-	1.765	0.484	-1.746	0.303-	1.010	0.522	1.085	0.589	0.525	0.817	1.868	0.448
151	75.38	8	COMRF	RIO	WEST-	7.601	1.393	0.635	0.101-	4.199	0.790	7.259	0.647-	1.720	0.878-	1.875	0.658	-3.621	0.492-	5.331	0.893	0.809	0.797	3.311	1.389	4.294	1.072
152	76.68	8	COMRF	RIO	SSDSac-	4.553	1.225	0.396	0.084-	5.478	0.737	7.986	1.207-	1.421	0.489-	2.016	0.452	-11.440	1.047-	0.557	0.109	1.861	1.137-	0.161	0.409	5.479	0.595
153	75.41	8	COMRF	RIO	SSDSJ-	7.245	1.461	0.536	0.100-	6.212	0.717	5.951	0.544	0.445	0.438-	1.695	0.394	-1.317	0.287	0.325	0.148	3.906	0.551-	0.494	0.425-	2.649	0.369
154	69.09	8	COMRF	SJR	XGEO-	3.434	1.401	0.369	0.099-	5.168	0.597	2.337	0.782	2.790	0.342-	1.329	0.497	-4.888	1.375-	0.365	0.076	2.306	1.387	3.342	0.334-	3.919	0.511
155	74.62	8	COMRF	SJR	CCET	1.277	1.305-	0.094	0.084	1.645	0.745	-14.541	2.674	13.277	1.333-	1.605	0.777	-19.528	3.686-	6.021	0.578	9.721	2.195-	0.741	1.378	15.972	2.625
156	62.43	8	COMRF	SJR	WEST-	2.454	1.323	0.300	0.092-	9.141	1.262	1.310	0.915	7.268	1.004-	6.140	0.887	-1.168	1.438-	7.403	0.704	4.125	1.787	11.975	1.307-	3.214	1.342
157	71.71	8	COMRF	SJR	SSDSac-	9.176	1.534	0.684	0.104-	5.426	0.633	2.844	0.796	2.390	0.255	0.364	0.499	0.829	1.136-	0.338	0.045-	0.740	1.365	2.035	0.232-	2.663	0.317
158	38.78	8	COMRF	SJR	SSDSJ	0.637	1.450-	0.117	0.084-	1.637	1.319	-27.037	5.175	12.015	1.854-	0.495	0.729	-51.289	9.941-	7.291	1.179	5.234	4.554	0.026	1.564	35.009	6.535
159	76.94	8	COMRF	XGEO	CCET	-10.528	1.196	0.864	0.082-	4.971	0.624	1.672	0.267	4.882	0.645-	1.693	0.378	-0.256	0.055-	2.870	0.369	0.801	0.283	0.650	0.722	0.379	0.191
160	71.81	8	COMRF	XGEO	WEST-	3.577	1.252	0.260	0.088-	8.991	1.048	2.606	0.277	4.143	0.836-	3.838	0.810	0.647	0.114-	2.555	0.814	3.964	0.350	4.507	1.380-	2.565	0.389
161	67.39	8	COMRF	XGEO	SSDSac	-10.627	1.385	0.729	0.092-	6.766	0.846	2.194	0.471	1.623	0.289-	1.498	0.497	-0.044	0.189-	0.152	0.084	1.928	0.510	0.242	0.290-	0.319	0.234

162	70.32	8	COMRF	XGEO	SSDSJ-	3.846	1.279	0.308	0.090-	6.232	0.662	3.497	0.294	1.436	0.382-	1.572	0.433	-0.231	0.072-	0.227	0.155	3.334	0.335	0.168	0.442-	1.857	0.181
163	**78.70**	**8**	**COMRF**	**CCET**	**WEST-**	**6.838**	**1.212**	**0.715**	**0.087-**	**3.854**	**0.631**	**8.604**	**0.573**	**1.475**	**0.635-**	**1.514**	**0.446**	**-5.357**	**0.390-**	**5.442**	**0.432**	**4.301**	**0.697**	**4.205**	**0.948**	**0.268**	**0.557**
164	74.95	8	COMRF	CCET	SSDSac-	8.713	1.241	0.655	0.079-	5.305	0.882	4.001	0.811	1.447	0.273-	1.259	0.459	-2.092	0.465-	0.229	0.041	1.535	0.815	0.417	0.238	0.602	0.164
165	72.65	8	COMRF	CCET	SSDSJ	1.695	1.071	0.028	0.080-	2.201	0.452	11.234	0.690-	2.246	0.416-	1.014	0.259	-7.195	0.661-	0.697	0.212	4.251	0.730-	0.455	0.442	2.779	0.604
166	72.21	8	COMRF	WEST	SSDSac-	6.345	1.284	0.476	0.092-	5.888	0.721	1.956	0.924	2.063	0.311-	0.894	0.613	-3.727	0.817-	0.095	0.056	3.573	1.315	1.567	0.274-	0.461	0.272
167	62.75	8	COMRF	WEST	SSDSJ-	2.712	1.241	0.277	0.089-	9.825	1.186	7.902	0.910	0.298	0.486-	5.527	0.948	-6.976	0.756	0.158	0.190	10.976	1.394	1.326	0.602-	0.956	0.537
168	73.90	8	COMRF	SSDSac	SSDSJ-	9.392	1.417	0.630	0.098-	6.296	0.553	3.148	0.263	1.485	0.434-	0.334	0.270	-0.335	0.044	0.152	0.152	2.294	0.244	0.122	0.389-	1.309	0.127
169	76.89	9	COMRF	RIO	SJR-	8.683	1.606	0.650	0.110-	6.000	0.667	4.785	0.634	1.341	0.940-	0.448	0.413	-1.256	0.308	4.388	1.060	4.413	0.601-	3.835	1.440-	6.711	0.907
170	76.52	9	COMRF	RIO	XGEO-	9.235	1.374	0.736	0.097-	6.093	0.740	4.350	0.846	1.341	0.471-	2.151	0.411	-6.195	0.682-	1.467	0.197	0.058	0.934	1.914	0.530	5.127	0.690
171	77.60	9	COMRF	RIO	CCET-	7.031	1.259	0.566	0.086-	5.011	0.841	3.976	0.666	1.831	0.874-	1.715	0.529	-1.957	0.321-	0.713	0.525	0.807	0.612	0.397	0.858	2.100	0.459
172	76.35	9	COMRF	RIO	WEST-	7.826	1.388	0.660	0.101-	3.816	0.765	7.566	0.689-	2.134	0.911-	1.945	0.688	-4.222	0.536-	6.306	0.993	0.135	0.891	4.079	1.526	5.504	1.184
173	77.65	9	COMRF	RIO	SSDSac-	5.076	1.255	0.441	0.086-	5.312	0.746	7.301	1.285-	1.168	0.534-	1.938	0.475	-12.286	1.109-	0.713	0.126	1.335	1.230-	0.088	0.460	6.166	0.656
174	76.06	9	COMRF	RIO	SSDSJ-	8.064	1.503	0.604	0.103-	6.127	0.690	6.085	0.573	0.272	0.452-	1.632	0.389	-1.397	0.314	0.343	0.152	3.936	0.584-	0.821	0.451-	2.703	0.383
175	69.12	9	COMRF	SJR	XGEO-	3.814	1.429	0.395	0.101-	5.328	0.616	2.052	0.817	2.910	0.357-	1.356	0.520	-4.835	1.396-	0.393	0.081	1.788	1.446	3.409	0.362-	3.870	0.516
176	74.90	9	COMRF	SJR	CCET	2.125	1.306-	0.152	0.085	2.139	0.821	-14.971	2.688	13.203	1.395-	2.099	0.897	-22.398	3.715-	5.847	0.569	12.497	2.460-	1.589	1.516	17.611	2.632
177	63.85	9	COMRF	SJR	WEST-	2.907	1.356	0.312	0.091-	9.976	1.415	1.153	1.015	7.680	1.077-	6.686	0.956	-0.817	1.484-	7.937	0.760	3.566	1.984	12.794	1.413-	2.938	1.381
178	73.17	9	COMRF	SJR	SSDSac	-10.373	1.590	0.768	0.107-	5.605	0.668	2.679	0.817	2.517	0.276	0.423	0.502	1.588	1.176-	0.376	0.050-	1.751	1.439	2.065	0.255-	2.744	0.325
179	40.09	9	COMRF	SJR	SSDSJ	0.025	1.519-	0.102	0.085-	2.150	1.535	-28.119	5.358	12.419	1.905-	0.838	0.819	-53.100	10.264-	7.503	1.208	5.615	5.043-	0.040	1.755	36.218	6.724
180	77.45	9	COMRF	XGEO	CCET	-10.454	1.193	0.868	0.082-	4.660	0.624	1.451	0.268	4.721	0.649-	1.544	0.404	-0.239	0.057-	2.877	0.359	0.532	0.289	0.478	0.747	0.502	0.198
181	72.06	9	COMRF	XGEO	WEST-	3.721	1.253	0.276	0.087-	9.069	1.082	2.697	0.289	4.163	0.865-	3.944	0.854	0.660	0.125-	2.776	0.886	4.131	0.394	4.562	1.481-	2.666	0.435
182	69.23	9	COMRF	XGEO	SSDSac	-10.974	1.386	0.770	0.094-	6.472	0.838	2.303	0.488	1.561	0.302-	1.563	0.535	0.072	0.193-	0.139	0.093	2.063	0.536-	0.006	0.312-	0.473	0.245
183	70.20	9	COMRF	XGEO	SSDSJ-	4.149	1.295	0.335	0.092-	6.292	0.667	3.640	0.307	1.288	0.389-	1.635	0.444	-0.259	0.077-	0.258	0.158	3.442	0.360-	0.118	0.468-	1.839	0.183
184	**78.87**	**9**	**COMRF**	**CCET**	**WEST-**	**6.582**	**1.223**	**0.690**	**0.086-**	**3.844**	**0.683**	**8.624**	**0.591**	**1.285**	**0.689-**	**1.376**	**0.497**	**-5.231**	**0.390-**	**5.623**	**0.456**	**4.641**	**0.726**	**4.023**	**1.031**	**0.096**	**0.564**
185	76.34	9	COMRF	CCET	SSDSac-	8.908	1.228	0.683	0.080-	4.781	0.829	3.903	0.800	1.345	0.277-	0.972	0.448	-1.840	0.458-	0.248	0.044	1.851	0.821	0.164	0.245	0.704	0.165
186	72.46	9	COMRF	CCET	SSDSJ	2.150	1.080-	0.005	0.080-	2.167	0.457	11.051	0.701-	2.217	0.438-	0.991	0.275	-7.090	0.655-	0.677	0.214	4.226	0.773-	0.459	0.488	2.671	0.601
187	73.22	9	COMRF	WEST	SSDSac-	6.351	1.288	0.481	0.092-	5.718	0.785	1.937	0.985	2.039	0.337-	0.856	0.686	-3.491	0.888-	0.087	0.065	3.402	1.452	1.533	0.313-	0.598	0.304
188	64.16	9	COMRF	WEST	SSDSJ-	3.052	1.256	0.283	0.088	-10.667	1.301	8.360	0.971	0.143	0.517-	6.211	1.030	-7.457	0.814	0.188	0.192	11.924	1.500	1.091	0.659-	0.900	0.558
189	74.96	9	COMRF	SSDSac	SSDSJ	-10.184	1.456	0.696	0.101-	6.093	0.511	3.259	0.287	1.357	0.439-	0.199	0.218	-0.359	0.049	0.182	0.154	2.341	0.274-	0.150	0.402-	1.352	0.133
190	77.18	10	COMRF	RIO	SJR-	9.444	1.678	0.704	0.113-	6.294	0.731	4.972	0.681	1.031	1.012-	0.582	0.438	-1.468	0.338	4.647	1.148	4.393	0.664-	4.582	1.595-	6.735	0.952
191	77.14	10	COMRF	RIO	XGEO-	9.678	1.426	0.780	0.101-	5.934	0.748	4.530	0.891	1.268	0.498-	2.156	0.428	-6.542	0.707-	1.468	0.198-	0.043	1.000	1.852	0.568	5.203	0.697
192	78.03	10	COMRF	RIO	CCET-	7.364	1.293	0.597	0.089-	4.824	0.869	3.905	0.686	1.825	0.901-	1.606	0.581	-2.187	0.341-	0.549	0.530	0.410	0.644	0.670	0.915	2.218	0.473
193	77.11	10	COMRF	RIO	WEST-	8.040	1.387	0.682	0.101-	3.497	0.754	7.951	0.742-	2.613	0.954-	2.108	0.736	-4.947	0.591-	7.416	1.105-	0.582	1.016	4.950	1.688	6.888	1.313
194	78.65	10	COMRF	RIO	SSDSac-	5.543	1.275	0.484	0.088-	5.243	0.743	7.322	1.369-	1.207	0.580-	1.966	0.498	-13.646	1.201-	0.896	0.146	1.580	1.328-	0.309	0.511	7.128	0.737
195	76.53	10	COMRF	RIO	SSDSJ-	8.838	1.554	0.666	0.107-	6.148	0.681	6.275	0.615	0.179	0.469-	1.623	0.394	-1.509	0.346	0.335	0.155	4.078	0.640-	1.093	0.488-	2.843	0.405
196	69.02	10	COMRF	SJR	XGEO-	3.967	1.450	0.409	0.102-	5.398	0.643	1.872	0.867	2.936	0.375-	1.430	0.554	-5.160	1.428-	0.405	0.087	1.681	1.529	3.409	0.396-	3.864	0.529
197	75.40	10	COMRF	SJR	CCET	2.876	1.307-	0.214	0.086	3.006	0.901	-16.457	2.752	13.835	1.491-	2.418	1.013	-26.986	3.789-	5.619	0.557	15.899	2.747-	2.027	1.655	20.340	2.683
198	65.09	10	COMRF	SJR	WEST-	3.336	1.395	0.331	0.091	-10.557	1.556	1.240	1.128	7.817	1.144-	7.160	1.039	-0.794	1.529-	8.348	0.813	3.617	2.191	13.307	1.516-	2.945	1.426
199	74.33	10	COMRF	SJR	SSDSac	-11.314	1.646	0.840	0.110-	5.713	0.699	2.622	0.858	2.571	0.298	0.414	0.516	2.057	1.234-	0.406	0.055-	2.446	1.532	2.049	0.283-	2.865	0.343
200	41.59	10	COMRF	SJR	SSDSJ-	0.644	1.585-	0.090	0.085-	2.559	1.773	-30.109	5.564	13.137	1.973-	1.238	0.934	-57.243	10.831-	7.966	1.262	6.677	5.630-	0.312	1.985	38.930	7.078
201	77.73	10	COMRF	XGEO	CCET	-10.251	1.197	0.860	0.084-	4.330	0.626	1.168	0.272	4.742	0.669-	1.322	0.429	-0.210	0.060-	2.897	0.355	0.199	0.300	0.565	0.787	0.624	0.207
202	72.13	10	COMRF	XGEO	WEST-	3.966	1.266	0.301	0.088-	9.070	1.119	2.778	0.305	4.154	0.901-	3.983	0.903	0.682	0.138-	3.053	0.972	4.301	0.453	4.594	1.601-	2.764	0.490
203	70.68	10	COMRF	XGEO	SSDSac	-11.032	1.384	0.795	0.095-	6.028	0.825	2.267	0.498	1.478	0.319-	1.561	0.562	0.160	0.198-	0.129	0.105	2.035	0.553-	0.249	0.339-	0.582	0.260
204	70.00	10	COMRF	XGEO	SSDSJ-	4.495	1.318	0.366	0.094-	6.319	0.679	3.737	0.325	1.189	0.401-	1.679	0.463	-0.271	0.082-	0.307	0.162	3.518	0.393-	0.342	0.501-	1.836	0.188

205	**79.00**	**10**	**COMRF**	**CCET**	**WEST-**	**6.581**	**1.246**	**0.685**	**0.087-**	**3.817**	**0.740**	**8.783**	**0.612**	**0.988**	**0.749-**	**1.138**	**0.550**	**-5.101**	**0.390-**	**5.789**	**0.476**	**5.220**	**0.757**	**3.625**	**1.113-**	**0.177**	**0.562**
206	77.44	10	COMRF	CCET	SSDSac-	9.062	1.223	0.711	0.082-	4.155	0.713	4.190	0.767	1.134	0.276-	0.616	0.357	-1.653	0.454-	0.253	0.048	2.628	0.781-	0.201	0.244	0.775	0.166
207	72.27	10	COMRF	CCET	SSDSJ	2.615	1.094-	0.040	0.082-	2.225	0.472	10.961	0.709-	2.167	0.458-	1.032	0.287	-6.977	0.651-	0.697	0.219	4.315	0.810-	0.398	0.537	2.618	0.602
208	74.04	10	COMRF	WEST	SSDSac-	6.474	1.303	0.496	0.093-	5.469	0.845	1.804	1.059	2.016	0.366-	0.732	0.768	-3.316	0.964-	0.077	0.076	3.129	1.611	1.496	0.361-	0.696	0.345
209	65.36	10	COMRF	WEST	SSDSJ-	3.502	1.286	0.300	0.088	-11.424	1.422	8.671	1.041	0.064	0.556-	6.813	1.120	-7.802	0.870	0.205	0.193	12.629	1.611	0.961	0.728-	0.967	0.579
210	75.77	10	COMRF	SSDSac	SSDSJ	-10.885	1.496	0.759	0.103-	5.890	0.522	3.316	0.314	1.238	0.462-	0.105	0.226	-0.375	0.055	0.190	0.157	2.343	0.307-	0.444	0.448-	1.398	0.140
211	77.49	11	COMRF	RIO	SJR	-10.530	1.757	0.766	0.117-	6.697	0.800	5.399	0.741	0.326	1.094-	0.516	0.448	-1.772	0.370	5.267	1.239	4.489	0.735-	5.995	1.765-	6.508	0.994
212	77.75	11	COMRF	RIO	XGEO	-10.227	1.481	0.833	0.106-	5.639	0.732	4.646	0.930	1.293	0.525-	1.986	0.431	-6.980	0.737-	1.479	0.200-	0.231	1.053	1.896	0.605	5.306	0.707
213	78.28	11	COMRF	RIO	CCET-	7.617	1.320	0.622	0.092-	4.480	0.868	3.994	0.707	1.624	0.932-	1.310	0.609	-2.497	0.365-	0.292	0.531	0.137	0.678	0.750	0.981	2.311	0.488
214	77.79	11	COMRF	RIO	WEST-	8.313	1.392	0.707	0.102-	3.066	0.728	8.478	0.807-	3.321	1.007-	2.019	0.771	-5.682	0.650-	8.389	1.214-	1.017	1.139	5.347	1.855	8.084	1.436
215	**79.76**	**11**	**COMRF**	**RIO**	**SSDSac-**	**5.876**	**1.288**	**0.518**	**0.089-**	**5.010**	**0.708**	**7.704**	**1.442-**	**1.441**	**0.615-**	**1.809**	**0.498**	**-15.594**	**1.324-**	**1.092**	**0.170**	**2.165**	**1.417-**	**0.642**	**0.552**	**8.401**	**0.843**
216	76.93	11	COMRF	RIO	SSDSJ-	9.784	1.610	0.736	0.111-	6.167	0.668	6.572	0.670-	0.061	0.490-	1.495	0.392	-1.660	0.382	0.359	0.156	4.317	0.716-	1.548	0.532-	2.956	0.427
217	69.11	11	COMRF	SJR	XGEO-	4.471	1.474	0.438	0.104-	5.470	0.647	1.430	0.912	3.079	0.401-	1.242	0.557	-5.134	1.436-	0.411	0.092	0.987	1.582	3.494	0.438-	3.738	0.533
218	75.48	11	COMRF	SJR	CCET	3.417	1.292-	0.254	0.088	4.029	0.930	-17.384	2.749	14.557	1.578-	2.335	1.069	-30.020	3.850-	5.498	0.559	18.586	2.991-	2.097	1.764	22.558	2.755
219	66.02	11	COMRF	SJR	WEST-	3.860	1.442	0.358	0.091	-10.873	1.664	1.186	1.232	7.877	1.206-	7.264	1.101	-0.532	1.569-	8.700	0.865	3.297	2.369	13.578	1.614-	2.795	1.474
220	75.49	11	COMRF	SJR	SSDSac	-12.516	1.718	0.919	0.114-	5.827	0.727	2.209	0.929	2.599	0.324	0.689	0.501	2.910	1.283-	0.402	0.061-	3.868	1.654	2.056	0.312-	2.915	0.351
221	43.24	11	COMRF	SJR	SSDSJ-	1.356	1.643-	0.081	0.086-	2.552	1.964	-33.225	5.779	14.175	2.051-	1.383	1.014	-63.582	11.614-	8.702	1.335	8.211	6.293-	0.888	2.242	43.273	7.571
222	77.94	11	COMRF	XGEO	CCET	-10.011	1.198	0.846	0.084-	3.948	0.608	0.984	0.278	4.464	0.692-	0.975	0.439	-0.180	0.064-	2.810	0.352-	0.026	0.312	0.333	0.828	0.752	0.215
223	72.20	11	COMRF	XGEO	WEST-	4.208	1.281	0.330	0.089-	8.744	1.128	2.915	0.330	3.894	0.937-	3.710	0.934	0.658	0.152-	3.397	1.067	4.445	0.522	4.382	1.726-	2.732	0.550
224	71.83	11	COMRF	XGEO	SSDSac	-10.911	1.377	0.805	0.095-	5.408	0.796	2.036	0.503	1.411	0.334-	1.298	0.567	0.156	0.207-	0.123	0.117	1.782	0.560-	0.396	0.358-	0.584	0.280
225	70.04	11	COMRF	XGEO	SSDSJ-	5.094	1.343	0.411	0.096-	6.299	0.673	3.897	0.351	0.989	0.412-	1.567	0.468	-0.276	0.087-	0.324	0.166	3.672	0.435-	0.712	0.526-	1.831	0.193
226	78.92	11	COMRF	CCET	WEST-	6.535	1.261	0.680	0.088-	3.560	0.766	8.791	0.634	0.568	0.810-	0.734	0.590	-4.937	0.392-	5.992	0.501	5.578	0.787	3.101	1.196-	0.367	0.562
227	78.16	11	COMRF	CCET	SSDSac-	8.952	1.215	0.711	0.082-	3.778	0.591	4.033	0.714	0.958	0.275-	0.434	0.228	-1.380	0.448-	0.241	0.052	2.817	0.702-	0.474	0.242	0.822	0.167
228	71.74	11	COMRF	CCET	SSDSJ	2.971	1.114-	0.066	0.083-	2.158	0.469	10.738	0.718-	2.162	0.476-	0.966	0.291	-6.942	0.657-	0.696	0.225	4.143	0.837-	0.366	0.582	2.631	0.611
229	74.98	11	COMRF	WEST	SSDSac-	6.569	1.304	0.505	0.093-	5.212	0.808	1.518	1.130	1.967	0.397-	0.321	0.773	-3.139	1.033-	0.021	0.090	2.394	1.760	1.630	0.416-	0.862	0.393
230	66.29	11	COMRF	WEST	SSDSJ-	3.999	1.325	0.325	0.089	-11.821	1.515	8.856	1.117-	0.091	0.601-	7.055	1.188	-8.074	0.927	0.249	0.194	13.102	1.722	0.741	0.798-	1.049	0.599
231	76.65	11	COMRF	SSDSac	SSDSJ	-11.843	1.541	0.831	0.106-	5.783	0.527	3.349	0.340	0.928	0.478	0.090	0.212	-0.352	0.061	0.244	0.159	2.419	0.344-	1.030	0.495-	1.438	0.144
232	77.41	12	COMRF	RIO	SJR	-11.140	1.844	0.799	0.120-	7.169	0.915	5.776	0.817-	0.439	1.202-	0.760	0.496	-2.250	0.408	5.502	1.379	4.328	0.816-	7.070	1.991-	6.044	1.060
233	78.04	12	COMRF	RIO	XGEO	-10.666	1.523	0.876	0.109-	5.543	0.754	4.952	0.983	1.234	0.562-	2.023	0.467	-7.533	0.773-	1.482	0.204-	0.274	1.126	1.846	0.653	5.380	0.722
234	78.19	12	COMRF	RIO	CCET-	7.768	1.347	0.641	0.095-	4.477	0.929	4.082	0.737	1.420	0.976-	1.413	0.694	-2.868	0.391-	0.203	0.532-	0.155	0.733	0.616	1.071	2.194	0.501
235	78.24	12	COMRF	RIO	WEST-	8.566	1.408	0.734	0.103-	2.936	0.746	8.960	0.888-	3.822	1.068-	2.455	0.849	-6.594	0.721-	9.580	1.338-	1.676	1.288	6.262	2.053	9.355	1.566
236	**80.58**	**12**	**COMRF**	**RIO**	**SSDSac-**	**5.963**	**1.301**	**0.533**	**0.090-**	**5.121**	**0.730**	**7.839**	**1.549-**	**1.619**	**0.663-**	**2.027**	**0.537**	**-18.095**	**1.469-**	**1.278**	**0.201**	**2.001**	**1.553-**	**0.661**	**0.609**	**9.894**	**0.969**
237	77.03	12	COMRF	RIO	SSDSJ	-10.227	1.661	0.771	0.114-	6.297	0.688	6.896	0.739-	0.364	0.525-	1.604	0.422	-1.986	0.423	0.361	0.157	4.438	0.822-	1.982	0.597-	2.939	0.446
238	68.66	12	COMRF	SJR	XGEO-	4.462	1.488	0.434	0.105-	5.541	0.685	0.993	0.986	3.116	0.425-	1.273	0.603	-5.499	1.451-	0.390	0.097	0.710	1.667	3.481	0.483-	3.541	0.544
239	75.57	12	COMRF	SJR	CCET	3.808	1.280-	0.277	0.088	4.771	1.022	-17.954	2.785	14.952	1.678-	3.103	1.184	-33.787	3.962-	5.453	0.572	22.858	3.306-	3.098	1.874	25.600	2.912
240	66.71	12	COMRF	SJR	WEST-	4.505	1.505	0.385	0.092	-11.700	1.836	0.945	1.370	8.124	1.280-	7.820	1.220	-0.400	1.609-	9.212	0.925	2.782	2.596	14.197	1.732-	2.580	1.542
241	75.87	12	COMRF	SJR	SSDSac	-13.395	1.829	0.970	0.119-	6.140	0.815	1.723	1.064	2.583	0.352	0.800	0.530	3.502	1.375-	0.367	0.066-	5.209	1.869	2.114	0.341-	2.966	0.361
242	44.56	12	COMRF	SJR	SSDSJ-	2.239	1.732-	0.077	0.087-	2.652	2.297	-38.048	6.085	15.742	2.159-	1.871	1.161	-73.651	12.963-	9.821	1.461	10.605	7.339-	1.772	2.631	50.012	8.427
243	77.75	12	COMRF	XGEO	CCET-	9.444	1.200	0.807	0.085-	3.730	0.630	0.798	0.288	4.171	0.730-	0.818	0.492	-0.151	0.068-	2.798	0.353-	0.262	0.330	0.036	0.890	0.804	0.223
244	71.97	12	COMRF	XGEO	WEST-	4.720	1.305	0.378	0.091-	8.887	1.187	2.898	0.353	4.216	0.989-	4.012	1.008	0.551	0.162-	4.579	1.169	4.213	0.578	5.593	1.869-	2.289	0.602
245	71.95	12	COMRF	XGEO	SSDSac	-10.814	1.391	0.806	0.096-	5.152	0.831	1.649	0.538	1.507	0.365-	1.172	0.602	0.047	0.224-	0.182	0.133	1.429	0.602-	0.352	0.397-	0.408	0.312
246	69.45	12	COMRF	XGEO	SSDSJ-	5.391	1.377	0.436	0.098-	6.344	0.703	3.959	0.379	0.880	0.432-	1.621	0.505	-0.263	0.092-	0.394	0.170	3.721	0.479-	0.896	0.566-	1.744	0.198
247	78.66	12	COMRF	CCET	WEST-	6.458	1.273	0.676	0.089-	3.296	0.791	8.810	0.663	0.181	0.874-	0.387	0.640	-4.775	0.393-	6.344	0.535	5.936	0.830	2.748	1.291-	0.539	0.568

248	77.88	12	COMRF	CCET	SSDSac-	8.599	1.225	0.692	0.084-	3.527	0.577	3.982	0.737	0.812	0.293-	0.342	0.229	-1.261	0.451-	0.221	0.058	2.923	0.747-	0.668	0.267	0.781	0.169
249	71.20	12	COMRF	CCET	SSDSJ	3.441	1.137-	0.101	0.085-	2.187	0.521	10.537	0.804-	2.082	0.509-	1.031	0.406	-6.882	0.661-	0.752	0.235	3.983	1.004-	0.165	0.667	2.724	0.628
250	75.51	12	COMRF	WEST	SSDSac-	6.440	1.299	0.494	0.093-	5.350	0.851	1.502	1.241	1.834	0.428	0.146	0.861	-3.159	1.128	0.123	0.105	1.525	1.986	2.093	0.489-	1.241	0.454
251	66.97	12	COMRF	WEST	SSDSJ-	4.625	1.374	0.349	0.090	-12.843	1.665	9.365	1.216-	0.408	0.667-	7.883	1.305	-8.530	0.995	0.301	0.198	14.137	1.861	0.291	0.893-	1.100	0.625
252	77.01	12	COMRF	SSDSac	SSDSJ	-12.799	1.599	0.896	0.109-	5.852	0.560	3.374	0.358	0.540	0.496	0.273	0.251	-0.289	0.066	0.296	0.161	2.619	0.377-	1.803	0.554-	1.504	0.148
253	77.58	13	COMRF	RIO	SJR	-11.809	1.893	0.837	0.122-	7.209	0.952	6.141	0.892-	0.999	1.282-	0.470	0.495	-2.628	0.447	5.764	1.476	4.296	0.885-	7.961	2.128-	5.701	1.117
254	78.67	13	COMRF	RIO	XGEO	-11.261	1.563	0.938	0.113-	5.025	0.699	4.592	0.971	1.668	0.573-	1.694	0.449	-7.961	0.791-	1.462	0.204-	1.108	1.125	2.375	0.668	5.324	0.718
255	78.28	13	COMRF	RIO	CCET-	7.810	1.363	0.652	0.098-	3.878	0.878	4.241	0.757	1.177	1.011-	0.825	0.683	-3.214	0.417	0.045	0.530-	0.337	0.767	0.602	1.141	2.244	0.515
256	78.46	13	COMRF	RIO	WEST-	8.663	1.406	0.740	0.103-	2.494	0.712	9.690	0.982-	4.816	1.151-	1.665	0.869	-6.855	0.780-	9.392	1.419-	0.604	1.362	4.606	2.190	8.811	1.630
257	**80.90**	**13**	**COMRF**	**RIO**	**SSDSac-**	**5.969**	**1.327**	**0.538**	**0.093-**	**4.678**	**0.698**	**7.037**	**1.615-**	**1.349**	**0.686-**	**1.547**	**0.534**	**-19.226**	**1.608-**	**1.347**	**0.236**	**1.097**	**1.661-**	**0.273**	**0.646**	**10.568**	**1.099**
258	77.28	13	COMRF	RIO	SSDSJ	-10.924	1.691	0.821	0.117-	6.183	0.686	7.079	0.801-	0.729	0.578-	1.348	0.426	-2.241	0.466	0.384	0.159	4.383	0.895-	2.521	0.677-	2.873	0.459
259	69.08	13	COMRF	SJR	XGEO-	5.178	1.511	0.466	0.106-	5.628	0.661	0.236	1.051	3.438	0.450-	0.845	0.586	-5.652	1.444-	0.380	0.100-	0.266	1.716	3.731	0.522-	3.246	0.547
260	75.52	13	COMRF	SJR	CCET	3.689	1.259-	0.280	0.090	5.912	0.986	-19.666	2.565	16.391	1.716-	2.812	1.164	-37.051	4.006-	5.471	0.593	25.133	3.381-	2.718	1.894	28.649	3.086
261	67.07	13	COMRF	SJR	WEST-	4.451	1.496	0.392	0.092	-10.948	1.805	0.900	1.428	7.753	1.320-	7.155	1.201	-0.227	1.618-	9.521	0.986	2.600	2.663	13.844	1.813-	2.345	1.617
262	76.70	13	COMRF	SJR	SSDSac	-14.644	1.907	1.033	0.123-	6.384	0.806	0.910	1.089	2.649	0.367	1.373	0.496	4.267	1.420-	0.308	0.070-	7.156	1.921	2.302	0.358-	2.973	0.347
263	46.33	13	COMRF	SJR	SSDSJ-	2.507	1.744-	0.086	0.087-	1.019	2.371	-43.055	6.364	17.215	2.256-	1.607	1.152	-87.045	14.560	-11.266	1.610	15.838	8.387-	3.803	3.019	58.936	9.442
264	77.83	13	COMRF	XGEO	CCET-	9.072	1.197	0.774	0.086-	3.423	0.596	0.816	0.295	3.493	0.751-	0.385	0.484	-0.129	0.072-	2.632	0.351-	0.260	0.339-	0.657	0.923	0.898	0.228
265	72.29	13	COMRF	XGEO	WEST-	4.856	1.297	0.404	0.091-	8.151	1.125	3.056	0.372	3.749	0.990-	3.411	0.992	0.443	0.168-	5.217	1.234	4.195	0.601	5.439	1.922-	1.990	0.639
266	72.42	13	COMRF	XGEO	SSDSac	-10.849	1.402	0.813	0.097-	4.746	0.784	1.331	0.555	1.624	0.382-	0.710	0.575	-0.127	0.239-	0.262	0.147	1.178	0.620-	0.271	0.410-	0.150	0.338
267	69.61	13	COMRF	XGEO	SSDSJ-	6.154	1.407	0.486	0.100-	6.307	0.692	4.148	0.404	0.688	0.443-	1.348	0.503	-0.259	0.097-	0.446	0.172	3.889	0.513-	1.226	0.583-	1.638	0.203
268	78.42	13	COMRF	CCET	WEST-	6.290	1.266	0.669	0.089-	2.749	0.779	8.779	0.688-	0.501	0.929	0.238	0.674	-4.615	0.393-	6.685	0.572	6.169	0.865	1.993	1.370-	0.607	0.576
269	77.60	13	COMRF	CCET	SSDSac-	8.259	1.230	0.662	0.085-	3.353	0.557	3.363	0.748	0.892	0.301-	0.122	0.223	-1.034	0.448-	0.221	0.063	2.329	0.765-	0.624	0.276	0.720	0.171
270	70.46	13	COMRF	CCET	SSDSJ	3.597	1.163-	0.114	0.087-	2.124	0.528	9.993	0.820-	1.921	0.510-	0.938	0.445	-6.865	0.675-	0.799	0.245	3.334	1.055	0.118	0.703	2.849	0.654
271	76.64	13	COMRF	WEST	SSDSac-	6.485	1.273	0.482	0.091-	5.083	0.833	0.290	1.345	2.033	0.456	1.881	0.925	-2.180	1.204	0.325	0.120-	2.284	2.206	3.323	0.561-	2.025	0.516
272	67.32	13	COMRF	WEST	SSDSJ-	4.615	1.379	0.360	0.091	-12.147	1.662	9.040	1.289-	0.487	0.720-	7.300	1.312	-8.882	1.068	0.321	0.202	13.950	1.966	0.168	0.972-	1.025	0.657
273	77.88	13	COMRF	SSDSac	SSDSJ	-14.218	1.645	0.977	0.112-	6.097	0.556	3.441	0.364-	0.092	0.510	0.604	0.232	-0.187	0.071	0.395	0.161	2.938	0.397-	2.917	0.607-	1.543	0.146
274	77.64	14	COMRF	RIO	SJR	-12.162	1.942	0.855	0.124-	7.323	1.004	6.470	0.969-	1.578	1.370-	0.400	0.510	-3.085	0.486	5.850	1.598	4.220	0.964-	8.660	2.278-	5.395	1.189
275	79.21	14	COMRF	RIO	XGEO	-11.896	1.589	1.002	0.115-	4.758	0.673	4.421	0.976	2.070	0.591-	1.611	0.450	-8.601	0.819-	1.448	0.206-	1.824	1.143	2.882	0.692	5.315	0.720
276	78.36	14	COMRF	RIO	CCET-	7.979	1.389	0.671	0.101-	3.674	0.881	4.389	0.779	0.999	1.047-	0.645	0.715	-3.644	0.446	0.152	0.528-	0.531	0.806	0.516	1.216	2.217	0.529
277	78.53	14	COMRF	RIO	WEST-	8.750	1.411	0.752	0.103-	2.344	0.722	10.014	1.061-	5.229	1.222-	1.616	0.930	-7.281	0.837-	9.755	1.530-	0.477	1.461	4.423	2.360	8.829	1.710
278	**80.66**	**14**	**COMRF**	**RIO**	**SSDSac-**	**6.223**	**1.364**	**0.555**	**0.096-**	**4.597**	**0.715**	**5.970**	**1.706-**	**0.845**	**0.713-**	**1.382**	**0.569**	**-18.692**	**1.725-**	**1.181**	**0.266-**	**0.307**	**1.822**	**0.394**	**0.707**	**9.875**	**1.211**
279	77.37	14	COMRF	RIO	SSDSJ	-11.208	1.702	0.842	0.118-	6.156	0.702	7.257	0.861-	1.227	0.659-	1.284	0.446	-2.647	0.509	0.405	0.166	4.164	0.966-	3.131	0.789-	2.659	0.472
280	69.33	14	COMRF	SJR	XGEO-	5.626	1.527	0.479	0.107-	5.744	0.663-	0.639	1.160	3.700	0.477-	0.517	0.597	-6.025	1.456-	0.347	0.103-	1.200	1.827	3.941	0.566-	2.937	0.561
281	75.56	14	COMRF	SJR	CCET	3.382	1.271-	0.272	0.090	6.636	1.040	-21.553	2.673	17.523	1.809-	3.261	1.223	-41.208	4.208-	5.491	0.615	28.183	3.513-	3.105	1.934	32.339	3.338
282	67.44	14	COMRF	SJR	WEST-	4.600	1.498	0.398	0.092	-10.898	1.828	0.675	1.507	7.748	1.380-	7.049	1.228	-0.001	1.630-	9.814	1.056	2.204	2.752	14.002	1.927-	2.215	1.700
283	77.18	14	COMRF	SJR	SSDSac	-15.426	1.973	1.062	0.127-	6.708	0.800	0.084	1.110	2.730	0.374	1.763	0.487	4.820	1.471-	0.251	0.072-	8.841	1.954	2.532	0.377-	2.991	0.339
284	48.21	14	COMRF	SJR	SSDSJ-	2.869	1.768-	0.097	0.088	0.678	2.502	-48.983	6.654	19.044	2.362-	1.868	1.198	-103.855	16.180	-13.099	1.766	23.319	9.538-	6.526	3.441	70.149	10.478
285	77.77	14	COMRF	XGEO	CCET-	8.510	1.194	0.727	0.086-	3.345	0.603	0.822	0.303	2.897	0.778-	0.216	0.512	-0.106	0.076-	2.540	0.353-	0.266	0.350-	1.280	0.964	0.922	0.230
286	72.43	14	COMRF	XGEO	WEST-	5.221	1.303	0.440	0.092-	8.009	1.116	3.138	0.395	3.794	1.019-	3.474	1.020	0.322	0.176-	6.370	1.316	4.002	0.635	6.428	2.030-	1.460	0.682
287	72.72	14	COMRF	XGEO	SSDSac	-10.734	1.414	0.804	0.098-	4.539	0.771	1.028	0.587	1.729	0.402-	0.426	0.567	-0.255	0.254-	0.321	0.155	0.932	0.653-	0.180	0.436	0.048	0.361
288	69.63	14	COMRF	XGEO	SSDSJ-	6.733	1.436	0.525	0.102-	6.276	0.698	4.264	0.434	0.512	0.467-	1.155	0.516	-0.231	0.101-	0.532	0.176	3.975	0.556-	1.508	0.615-	1.475	0.210
289	78.06	14	COMRF	CCET	WEST-	6.247	1.270	0.667	0.090-	2.390	0.799	8.761	0.714-	0.951	0.989	0.665	0.734	-4.440	0.394-	7.159	0.624	6.384	0.898	1.653	1.460-	0.603	0.592
290	77.24	14	COMRF	CCET	SSDSac-	7.994	1.248	0.639	0.086-	3.254	0.549	2.873	0.761	1.039	0.304	0.026	0.226	-0.889	0.449-	0.246	0.066	1.838	0.784-	0.544	0.284	0.642	0.174

291	69.88	14	COMRF	CCET	SSDSJ	3.674	1.206-	0.122	0.090-	2.299	0.885	9.225	1.355-	1.594	0.697-	1.115	0.978	-6.884	0.702-	0.895	0.259	2.326	1.900	0.672	1.036	3.064	0.697
292	77.26	14	COMRF	WEST	SSDSac-	6.570	1.263	0.477	0.091-	4.513	0.835-	1.251	1.404	2.404	0.463	3.351	1.029	-1.745	1.295	0.428	0.126-	5.336	2.440	4.265	0.635-	2.380	0.575
293	67.66	14	COMRF	WEST	SSDSJ-	4.788	1.388	0.370	0.091	-12.187	1.697	9.169	1.383-	0.686	0.779-	7.352	1.352	-9.274	1.150	0.345	0.206	14.403	2.098-	0.127	1.054-	0.957	0.691
294	78.30	14	COMRF	SSDSac	SSDSJ	-15.164	1.686	1.024	0.114-	6.318	0.582	3.516	0.369-	0.818	0.546	0.876	0.273	-0.086	0.073	0.490	0.164	3.235	0.418-	4.016	0.679-	1.521	0.143

Appendix D, Models for Banks Salvage Three Days Ahead with All Daily Data

There were 210 models examined for predicting the Banks daily salvage numbers, with 15 models for each of the moving averages (MA) from 1 (no averaging of explanatory variables) to 14 days (averaging for 14 days). In this appendix the percentage of variation explained (% Exp), the estimated parameter values (b0 to b10), and estimated standard errors for the parameter values (SE) are given for each model in the order in which the models were estimated. For each order of averaging the model that accounts for the most variation in the salvage numbers is shown with bold, red type. These estimates were obtained with the dependent variable being the salvage number three days ahead of the other variables, using all of the daily data, excluding CCET with missing values. For example, with no averaging the models predict the daily salvage numbers three days ahead of the day when the flow and other variables were measured.

Model	% Exp	MA	X1	X2	X3	b0	SE	b1	SE	b2	SE	b3	SE	b4	SE	b5	SE	b6	SE	b7	SE	b8	SE	b9	SE	b10	SE
1	61.79	1CO	MRF	RIO	SJR-	3.186	1.085	0.366	0.070-	4.004	0.572	2.861	0.511	1.198	0.837-	1.030	0.357-	1.004	0.186	0.521	1.048	1.559	0.349-	0.491	1.063-	3.802	0.901
2	60.62	1CO	MRF	RIO	XGEO-	2.089	0.928	0.257	0.067-	4.242	0.617	3.741	0.661	0.296	0.368-	1.651	0.354-	1.823	0.562-	0.243	0.201-	0.191	0.683	0.738	0.387	0.600	0.692
3	**64.46**	**1**	**COMRF**	**RIO**	**WEST-**	**3.444**	**0.885**	**0.364**	**0.062-**	**3.607**	**0.538**	**4.809**	**0.414-**	**1.661**	**0.544-**	**0.170**	**0.283-**	**0.608**	**0.225**	**0.370**	**0.315**	**3.486**	**0.387-**	**3.302**	**0.568-**	**2.427**	**0.452**
4	63.56	1CO	MRF	RIO	SSDSac-	3.951	0.931	0.406	0.065-	4.523	0.554	6.255	0.584-	1.068	0.225-	1.804	0.341-	3.604	0.435-	0.007	0.013	1.515	0.485-	0.194	0.136	1.090	0.187
5	62.12	1CO	MRF	RIO	SSDSJ-	3.491	0.956	0.374	0.067-	4.368	0.578	3.580	0.392	0.943	0.376-	1.420	0.338-	1.001	0.186-	0.046	0.107	1.485	0.352	0.041	0.298-	1.868	0.330
6	53.15	1CO	MRF	SJR	XGEO-	0.297	1.067	0.276	0.077-	3.118	0.496	2.624	0.738	0.592	0.273-	1.311	0.389-	6.400	1.241-	0.203	0.057	3.640	1.049	1.254	0.230-	3.785	0.510
7	48.43	1CO	MRF	SJR	WEST	0.811	0.954	0.154	0.066-	4.232	0.645-	0.545	0.865	3.115	0.618-	1.954	0.456-	4.217	1.380-	2.955	0.360	2.227	1.140	2.199	0.650	1.635	1.105
8	48.42	1CO	MRF	SJR	SSDSac-	2.049	1.096	0.329	0.074-	3.999	0.612	2.214	0.808	0.889	0.156-	1.458	0.435-	3.611	1.279-	0.096	0.014	2.178	1.093	0.638	0.111-	1.090	0.257
9	38.18	1CO	MRF	SJR	SSDSJ-	0.228	1.222	0.065	0.072-	2.699	0.896	-15.899	3.645	7.651	1.292-	0.886	0.413	-23.372	5.512-	3.582	0.661	0.180	2.973	1.075	0.912	15.069	3.488
10	57.63	1CO	MRF	XGEO	WEST-	1.526	0.949	0.259	0.068-	4.136	0.596	1.523	0.201	0.771	0.474-	0.872	0.448	0.328	0.069-	0.058	0.356	2.139	0.215-	0.841	0.610-	2.121	0.194
11	48.70	1CO	MRF	XGEO	SSDSac-	3.700	1.070	0.366	0.075-	4.629	0.616	0.896	0.273	0.984	0.152-	1.357	0.375-	0.206	0.096-	0.080	0.014	0.291	0.280	0.471	0.128-	0.051	0.076
12	55.62	1CO	MRF	XGEO	SSDSJ-	2.456	0.979	0.351	0.070-	3.929	0.513	1.282	0.223	2.140	0.311-	1.078	0.333-	0.087	0.056-	0.575	0.121	1.095	0.225	0.821	0.316-	1.604	0.174
13	54.33	1CO	MRF	WEST	SSDSac-	3.074	0.927	0.362	0.066-	4.237	0.629	0.896	0.535	1.097	0.138-	0.516	0.476-	0.941	0.363-	0.048	0.016-	0.650	0.637	0.929	0.120-	0.607	0.137
14	48.58	1CO	MRF	WEST	SSDSJ	0.338	0.882	0.186	0.064-	4.437	0.618	2.369	0.563	0.851	0.382-	1.605	0.477-	3.223	0.430-	0.514	0.158	1.898	0.733	0.874	0.425	0.913	0.423
15	50.17	1CO	MRF	SSDSac	SSDSJ-	3.171	1.004	0.361	0.070-	4.381	0.594	1.069	0.131	1.731	0.359-	1.282	0.377-	0.077	0.014-	0.428	0.131	0.586	0.111	0.611	0.314-	0.459	0.074
16	64.49	2CO	MRF	RIO	SJR-	4.362	1.125	0.431	0.072-	4.751	0.695	2.983	0.538	2.235	0.921-	1.184	0.453-	0.868	0.188	0.265	1.153	2.442	0.392	0.379	1.208-	5.062	0.994
17	62.54	2CO	MRF	RIO	XGEO-	3.709	0.981	0.327	0.069-	5.450	0.802	4.246	0.739	0.324	0.407-	1.999	0.452-	2.277	0.591-	0.376	0.205	0.505	0.762	0.804	0.427	1.196	0.711
18	**67.62**	**2**	**COMRF**	**RIO**	**WEST-**	**4.694**	**0.910**	**0.399**	**0.060-**	**5.269**	**0.749**	**5.188**	**0.441-**	**1.694**	**0.578-**	**0.578**	**0.377-**	**0.200**	**0.240**	**0.905**	**0.373**	**4.838**	**0.483-**	**4.246**	**0.660-**	**3.394**	**0.522**
19	66.31	2CO	MRF	RIO	SSDSac-	5.136	0.949	0.452	0.065-	5.749	0.672	7.964	0.678-	1.638	0.263-	2.327	0.411-	4.431	0.478	0.003	0.014	3.058	0.556-	0.548	0.163	1.469	0.203
20	64.96	2CO	MRF	RIO	SSDSJ-	4.978	1.008	0.435	0.067-	5.580	0.753	4.049	0.430	1.244	0.403-	1.705	0.422-	0.879	0.190-	0.069	0.125	2.396	0.406	0.111	0.322-	2.342	0.350
21	56.57	2CO	MRF	SJR	XGEO-	1.708	1.099	0.355	0.078-	3.689	0.582	3.387	0.816	0.926	0.297-	1.495	0.466-	7.285	1.339-	0.176	0.056	5.061	1.197	1.841	0.256-	4.202	0.537
22	51.87	2CO	MRF	SJR	WEST	0.329	0.966	0.184	0.067-	4.061	0.660	0.037	0.859	3.015	0.666-	1.682	0.487-	3.743	1.407-	3.079	0.384	3.163	1.198	2.439	0.703	0.436	1.138
23	51.18	2CO	MRF	SJR	SSDSac-	2.749	1.128	0.373	0.076-	3.981	0.664	2.720	0.876	0.917	0.164-	1.226	0.534-	4.051	1.424-	0.103	0.015	2.912	1.264	0.722	0.120-	1.307	0.276
24	40.61	2CO	MRF	SJR	SSDSJ	0.336	1.188	0.056	0.073-	1.322	0.852	-15.582	3.482	8.174	1.276-	0.519	0.484	-27.582	5.946-	4.742	0.743	4.398	3.073-	0.149	0.953	19.091	3.850
25	61.95	2CO	MRF	XGEO	WEST-	2.892	0.952	0.329	0.068-	5.054	0.675	1.628	0.216	1.493	0.528-	1.174	0.508	0.441	0.073-	0.500	0.368	2.507	0.216-	0.003	0.671-	2.230	0.204
26	51.03	2CO	MRF	XGEO	SSDSac-	5.277	1.113	0.448	0.076-	5.207	0.699	1.264	0.308	0.960	0.165-	1.337	0.422-	0.182	0.097-	0.084	0.015	0.734	0.321	0.425	0.147-	0.046	0.078
27	59.25	2CO	MRF	XGEO	SSDSJ-	3.898	1.006	0.415	0.070-	4.744	0.589	1.701	0.245	2.402	0.334-	1.150	0.371-	0.058	0.054-	0.655	0.135	1.648	0.249	1.038	0.343-	1.725	0.176
28	57.86	2CO	MRF	WEST	SSDSac-	3.867	0.935	0.404	0.066-	4.142	0.665	0.899	0.604	1.230	0.151	0.058	0.529-	1.101	0.385-	0.052	0.017-	0.727	0.699	1.092	0.128-	0.618	0.143
29	51.99	2CO	MRF	WEST	SSDSJ-	0.160	0.892	0.212	0.064-	4.184	0.642	2.357	0.607	0.995	0.401-	0.989	0.513-	3.091	0.466-	0.429	0.165	1.667	0.816	1.295	0.448	0.321	0.442
30	53.27	2CO	MRF	SSDSac	SSDSJ-	3.828	1.020	0.397	0.070-	4.346	0.596	1.118	0.142	2.008	0.383-	0.893	0.396-	0.076	0.015-	0.534	0.150	0.659	0.123	0.781	0.332-	0.554	0.082

31	66.65	3CO	MRF	RIO	SJR-	5.331	1.153	0.491	0.073-	5.004	0.725	3.124	0.564	2.823	0.998-	1.062	0.481-	0.874	0.199	0.191	1.235	3.100	0.425	0.797	1.343-	6.161	1.075
32	64.48	3CO	MRF	RIO	XGEO-	5.106	1.022	0.418	0.071-	5.677	0.822	4.055	0.776	0.679	0.422-	1.887	0.457-	3.031	0.639-	0.583	0.209	0.282	0.801	1.259	0.442	2.057	0.735
33	**68.87**	**3**	**COMRF**	**RIO**	**WEST-**	**5.637**	**0.937**	**0.432**	**0.060-**	**6.179**	**0.822**	**5.620**	**0.488-**	**1.666**	**0.641-**	**0.815**	**0.397-**	**0.240**	**0.263**	**0.451**	**0.416**	**5.364**	**0.554-**	**3.996**	**0.729-**	**3.102**	**0.578**
34	68.63	3CO	MRF	RIO	SSDSac-	6.155	0.961	0.506	0.065-	6.194	0.707	9.221	0.776-	2.023	0.296-	2.333	0.423-	5.687	0.542-	0.009	0.015	4.006	0.644-	0.753	0.191	1.996	0.225
35	66.89	3CO	MRF	RIO	SSDSJ-	6.013	1.047	0.484	0.068-	6.176	0.835	4.459	0.468	1.433	0.414-	1.736	0.456-	0.897	0.202-	0.098	0.135	3.009	0.454	0.153	0.348-	2.680	0.366
36	59.09	3CO	MRF	SJR	XGEO-	2.976	1.137	0.419	0.079-	4.214	0.644	3.459	0.899	1.363	0.316-	1.579	0.523-	7.861	1.447-	0.179	0.056	5.587	1.350	2.350	0.274-	4.253	0.559
37	54.76	3CO	MRF	SJR	WEST-	0.024	0.969	0.209	0.067-	4.128	0.685	0.526	0.853	3.065	0.711-	1.794	0.511-	3.289	1.431-	3.419	0.407	3.962	1.292	3.185	0.768-	0.953	1.170
38	54.25	3CO	MRF	SJR	SSDSac-	3.820	1.162	0.430	0.077-	4.091	0.694	2.752	0.923	1.075	0.174-	0.908	0.562-	3.931	1.516-	0.118	0.016	2.820	1.369	0.918	0.134-	1.498	0.288
39	42.17	3CO	MRF	SJR	SSDSJ	0.557	1.162	0.050	0.074-	0.863	0.800	-15.118	3.193	8.544	1.251-	0.309	0.520	-27.330	5.831-	5.364	0.784	5.569	2.979-	0.343	0.975	20.042	3.902
40	65.02	3CO	MRF	XGEO	WEST-	3.961	0.946	0.382	0.067-	6.083	0.747	1.769	0.222	2.267	0.568-	1.712	0.556	0.508	0.076-	1.103	0.392	2.828	0.221	1.074	0.726-	2.283	0.219
41	53.80	3CO	MRF	XGEO	SSDSac-	6.894	1.154	0.527	0.076-	6.034	0.767	1.530	0.334	1.059	0.184-	1.508	0.430-	0.179	0.099-	0.095	0.017	1.048	0.349	0.496	0.172-	0.036	0.081
42	61.63	3CO	MRF	XGEO	SSDSJ-	5.133	1.044	0.471	0.071-	5.462	0.640	2.138	0.261	2.436	0.359-	1.265	0.400-	0.058	0.054-	0.678	0.151	2.137	0.265	1.055	0.382-	1.727	0.177
43	61.07	3CO	MRF	WEST	SSDSac-	4.604	0.934	0.436	0.065-	4.291	0.696	0.721	0.672	1.499	0.163	0.344	0.557-	1.604	0.425-	0.069	0.018-	0.583	0.763	1.352	0.142-	0.529	0.158
44	54.91	3CO	MRF	WEST	SSDSJ-	0.511	0.895	0.233	0.064-	4.301	0.667	2.591	0.649	1.166	0.427-	0.937	0.536-	3.252	0.490-	0.397	0.173	2.048	0.888	1.657	0.484-	0.209	0.462
45	56.19	3CO	MRF	SSDSac	SSDSJ-	4.702	1.037	0.438	0.071-	4.560	0.617	1.320	0.153	2.068	0.408-	0.653	0.410-	0.087	0.016-	0.600	0.164	0.851	0.139	0.814	0.365-	0.588	0.086
46	68.01	4CO	MRF	RIO	SJR-	5.910	1.163	0.533	0.074-	5.076	0.716	3.202	0.581	3.263	1.042-	1.017	0.489-	0.918	0.214	0.152	1.280	3.558	0.451	1.191	1.430-	7.038	1.129
47	65.99	4CO	MRF	RIO	XGEO-	6.170	1.059	0.498	0.074-	5.664	0.798	3.899	0.810	0.942	0.432-	1.769	0.443-	3.842	0.698-	0.787	0.216	0.040	0.838	1.608	0.456	2.898	0.765
48	69.18	4CO	MRF	RIO	WEST-	6.044	0.946	0.457	0.060-	6.410	0.836	5.789	0.528-	1.474	0.709-	0.905	0.407-	0.402	0.302-	0.206	0.477	5.395	0.608-	3.306	0.812-	2.609	0.678
49	**69.87**	**4**	**COMRF**	**RIO**	**SSDSac-**	**6.862**	**0.978**	**0.553**	**0.065-**	**6.200**	**0.714**	**9.390**	**0.860-**	**1.996**	**0.326-**	**2.143**	**0.411-**	**6.688**	**0.623-**	**0.039**	**0.016**	**3.958**	**0.723-**	**0.654**	**0.220**	**2.420**	**0.256**
50	67.78	4CO	MRF	RIO	SSDSJ-	6.600	1.087	0.511	0.070-	6.592	0.894	4.798	0.503	1.567	0.435-	1.860	0.487-	0.963	0.219-	0.111	0.144	3.399	0.501	0.304	0.391-	2.799	0.378
51	60.52	4CO	MRF	SJR	XGEO-	3.915	1.175	0.468	0.081-	4.606	0.687	3.295	0.945	1.713	0.327-	1.670	0.572-	8.098	1.518-	0.187	0.057	5.685	1.469	2.693	0.287-	4.145	0.571
52	57.20	4CO	MRF	SJR	WEST-	0.238	0.968	0.233	0.066-	4.303	0.724	1.279	0.831	3.055	0.751-	2.256	0.550-	3.030	1.432-	3.821	0.433	5.248	1.388	4.171	0.843-	2.721	1.206
53	57.88	4CO	MRF	SJR	SSDSac-	4.829	1.170	0.487	0.077-	4.595	0.785	3.381	0.990	1.229	0.183-	1.048	0.641-	4.089	1.586-	0.134	0.017	3.438	1.512	1.198	0.151-	1.861	0.305
54	42.36	4CO	MRF	SJR	SSDSJ	0.242	1.204	0.061	0.075-	1.380	0.880	-14.869	3.293	8.688	1.302-	0.334	0.555	-24.671	5.802-	5.240	0.816	3.945	3.070	0.504	1.015	18.527	3.962
55	66.54	4CO	MRF	XGEO	WEST-	4.764	0.949	0.422	0.066-	7.058	0.815	1.861	0.228	3.013	0.609-	2.358	0.603	0.551	0.080-	1.785	0.432	3.041	0.232	2.217	0.798-	2.253	0.238
56	56.49	4CO	MRF	XGEO	SSDSac-	8.457	1.201	0.600	0.077-	6.975	0.852	1.493	0.354	1.334	0.207-	1.780	0.453-	0.177	0.104-	0.116	0.018	1.026	0.372	0.745	0.204-	0.022	0.088
57	62.67	4CO	MRF	XGEO	SSDSJ-	5.983	1.084	0.509	0.073-	6.193	0.709	2.481	0.273	2.534	0.389-	1.592	0.450-	0.066	0.056-	0.693	0.161	2.508	0.282	1.210	0.429-	1.693	0.179
58	63.90	4CO	MRF	WEST	SSDSac-	5.443	0.938	0.468	0.064-	4.630	0.775	0.155	0.751	1.865	0.176	0.419	0.605-	2.427	0.492-	0.104	0.019-	0.447	0.843	1.626	0.155-	0.270	0.183
59	57.41	4CO	MRF	WEST	SSDSJ-	0.755	0.896	0.250	0.063-	4.656	0.713	2.862	0.688	1.500	0.446-	1.249	0.574-	3.549	0.511-	0.409	0.177	2.656	0.960	2.209	0.519-	0.720	0.482
60	59.38	4CO	MRF	SSDSac	SSDSJ-	5.639	1.050	0.475	0.071-	5.224	0.707	1.566	0.158	2.236	0.440-	0.804	0.461-	0.101	0.016-	0.625	0.169	1.093	0.149	0.991	0.408-	0.648	0.088
61	69.25	5CO	MRF	RIO	SJR-	6.815	1.180	0.585	0.075-	5.180	0.685	3.494	0.601	3.024	1.058-	0.765	0.463-	1.006	0.231	0.899	1.297	3.925	0.470	0.459	1.478-	7.299	1.148
62	67.49	5CO	MRF	RIO	XGEO-	7.157	1.090	0.574	0.076-	5.653	0.774	3.779	0.833	1.184	0.441-	1.668	0.429-	4.514	0.732-	0.941	0.218-	0.161	0.869	1.900	0.468	3.531	0.778
63	70.02	5CO	MRF	RIO	WEST-	6.365	0.946	0.486	0.060-	6.185	0.839	6.046	0.571-	1.643	0.772-	0.818	0.418-	0.776	0.348-	1.128	0.543	5.123	0.650-	2.629	0.903-	1.688	0.764
64	**70.56**	**5**	**COMRF**	**RIO**	**SSDSac-**	**7.475**	**0.989**	**0.591**	**0.065-**	**6.274**	**0.727**	**9.689**	**0.937-**	**1.988**	**0.348-**	**2.041**	**0.414-**	**7.300**	**0.688-**	**0.063**	**0.018**	**4.321**	**0.799-**	**0.729**	**0.246**	**2.647**	**0.282**
65	68.88	5CO	MRF	RIO	SSDSJ-	7.312	1.111	0.558	0.072-	6.612	0.865	5.077	0.520	1.346	0.446-	1.718	0.472-	1.053	0.237-	0.040	0.152	3.693	0.519	0.024	0.417-	2.937	0.389
66	61.57	5CO	MRF	SJR	XGEO-	4.918	1.210	0.520	0.082-	4.899	0.696	2.778	0.955	2.043	0.334-	1.538	0.581-	7.638	1.542-	0.194	0.058	4.854	1.514	2.934	0.295-	3.863	0.568
67	59.69	5CO	MRF	SJR	WEST-	0.675	0.969	0.266	0.065-	4.696	0.703	1.762	0.699	3.239	0.725-	2.784	0.555-	2.765	1.359-	4.400	0.449	5.971	1.382	5.335	0.855-	3.947	1.180
68	60.90	5CO	MRF	SJR	SSDSac-	5.862	1.170	0.551	0.077-	4.555	0.750	3.411	0.963	1.325	0.193-	0.706	0.621-	3.246	1.574-	0.154	0.019	2.855	1.516	1.292	0.160-	2.073	0.320
69	42.53	5CO	MRF	SJR	SSDSJ	0.064	1.214	0.074	0.076-	1.486	0.921	-14.510	3.364	8.553	1.333-	0.491	0.585	-25.088	6.086-	5.290	0.848	4.640	3.214	0.298	1.091	18.900	4.163
70	67.80	5CO	MRF	XGEO	WEST-	5.443	0.951	0.464	0.066-	7.594	0.839	1.994	0.238	3.376	0.644-	2.693	0.628	0.547	0.084-	2.538	0.486	3.185	0.249	3.026	0.872-	2.065	0.261
71	58.98	5CO	MRF	XGEO	SSDSac-	9.438	1.209	0.665	0.077-	7.014	0.846	1.563	0.376	1.398	0.219-	1.678	0.458-	0.215	0.109-	0.139	0.021	1.171	0.398	0.705	0.224	0.022	0.095
72	63.35	5CO	MRF	XGEO	SSDSJ-	6.668	1.113	0.545	0.075-	6.477	0.723	2.745	0.279	2.256	0.395-	1.630	0.468-	0.074	0.057-	0.630	0.165	2.767	0.294	0.918	0.447-	1.600	0.174
73	66.08	5CO	MRF	WEST	SSDSac-	5.978	0.941	0.494	0.063-	4.685	0.813-	0.268	0.810	2.096	0.189	0.452	0.636-	3.362	0.574-	0.133	0.021	0.049	0.931	1.723	0.172-	0.003	0.210

74	59.60	5CO	MRF	WEST	SSDSJ-	1.293	0.902	0.281	0.063-	5.278	0.776	3.504	0.723	1.456	0.458-	1.772	0.622-	4.114	0.540-	0.343	0.179	3.899	1.026	2.249	0.547-	1.048	0.507
75	62.09	5CO	MRF	SSDSac	SSDSJ-	6.333	1.053	0.517	0.071-	5.124	0.693	1.687	0.166	2.059	0.446-	0.566	0.455-	0.114	0.018-	0.531	0.168	1.161	0.159	0.799	0.418-	0.708	0.092
76	69.53	6CO	MRF	RIO	SJR-	7.515	1.201	0.617	0.076-	5.268	0.662	3.903	0.627	2.245	1.059-	0.483	0.430-	1.147	0.253	1.972	1.291	4.064	0.496-	0.927	1.509-	6.852	1.136
77	68.33	6CO	MRF	RIO	XGEO-	7.765	1.110	0.633	0.077-	5.458	0.737	3.684	0.851	1.317	0.452-	1.565	0.412-	5.151	0.763-	1.069	0.222-	0.404	0.902	2.082	0.486	4.073	0.792
78	**70.65**	**6 CO**	**MRF**	**RIO**	**WEST-**	**6.303**	**0.922**	**0.509**	**0.060-**	**5.428**	**0.790**	**6.174**	**0.598-**	**1.814**	**0.822-**	**0.628**	**0.435-**	**1.269**	**0.379-**	**2.261**	**0.620**	**4.488**	**0.666-**	**1.655**	**1.018-**	**0.593**	**0.837**
79	70.22	6CO	MRF	RIO	SSDSac-	7.739	1.002	0.615	0.066-	6.006	0.749	8.694	0.985-	1.501	0.363-	1.816	0.431-	7.005	0.734-	0.100	0.021	3.752	0.867-	0.545	0.272	2.514	0.303
80	69.18	6CO	MRF	RIO	SSDSJ-	7.580	1.113	0.588	0.073-	6.267	0.789	5.180	0.531	1.074	0.450-	1.472	0.438-	1.165	0.260	0.010	0.155	3.723	0.524-	0.290	0.434-	2.961	0.401
81	61.48	6CO	MRF	SJR	XGEO-	5.624	1.247	0.557	0.084-	5.020	0.680	2.085	0.945	2.278	0.340-	1.297	0.568-	6.789	1.553-	0.192	0.060	3.539	1.525	3.011	0.305-	3.433	0.553
82	61.68	6CO	MRF	SJR	WEST-	1.203	0.972	0.302	0.065-	5.294	0.792	2.026	0.756	3.720	0.783-	3.423	0.606-	2.474	1.396-	5.216	0.490	6.197	1.491	6.757	0.944-	4.455	1.244
83	63.53	6CO	MRF	SJR	SSDSac-	7.049	1.172	0.623	0.076-	4.521	0.691	3.142	0.913	1.473	0.204-	0.278	0.568-	1.929	1.494-	0.183	0.021	1.624	1.473	1.365	0.168-	2.187	0.328
84	42.80	6CO	MRF	SJR	SSDSJ-	0.243	1.234	0.087	0.076-	1.643	0.984	-15.038	3.583	8.750	1.400-	0.678	0.617	-26.761	6.483-	5.521	0.887	5.250	3.415	0.064	1.185	20.267	4.425
85	68.33	6CO	MRF	XGEO	WEST-	5.870	0.952	0.498	0.066-	7.934	0.847	2.037	0.247	3.758	0.681-	3.047	0.649	0.516	0.090-	3.625	0.561	3.161	0.275	4.145	0.968-	1.741	0.295
86	61.06	6CO	MRF	XGEO	SSDSac	-10.070	1.207	0.718	0.078-	6.724	0.833	1.417	0.397	1.518	0.232-	1.473	0.467-	0.261	0.116-	0.177	0.025	1.117	0.424	0.670	0.243	0.085	0.106
87	63.09	6CO	MRF	XGEO	SSDSJ-	7.001	1.137	0.570	0.076-	6.433	0.710	2.858	0.286	1.939	0.396-	1.550	0.469-	0.074	0.060-	0.572	0.166	2.867	0.307	0.561	0.458-	1.506	0.172
88	68.06	6CO	MRF	WEST	SSDSac-	6.309	0.942	0.512	0.064-	4.658	0.821-	0.452	0.861	2.278	0.205	0.380	0.656-	4.124	0.655-	0.159	0.024	0.737	1.030	1.775	0.192	0.147	0.237
89	61.44	6CO	MRF	WEST	SSDSJ-	1.888	0.910	0.314	0.063-	6.113	0.852	4.312	0.760	1.339	0.467-	2.537	0.678-	4.979	0.581-	0.292	0.182	5.562	1.103	2.110	0.573-	1.144	0.530
90	64.34	6CO	MRF	SSDSac	SSDSJ-	7.042	1.056	0.565	0.071-	4.911	0.645	1.835	0.177	1.768	0.442-	0.291	0.426-	0.136	0.020-	0.408	0.165	1.220	0.171	0.483	0.414-	0.749	0.097
91	69.07	7CO	MRF	RIO	SJR-	7.744	1.216	0.627	0.076-	5.308	0.671	4.143	0.656	1.572	1.068-	0.398	0.422-	1.284	0.278	2.651	1.292	3.970	0.535-	1.923	1.560-	6.270	1.119
92	68.52	7CO	MRF	RIO	XGEO-	7.890	1.115	0.662	0.078-	5.139	0.706	3.457	0.854	1.420	0.463-	1.529	0.406-	5.485	0.778-	1.098	0.225-	0.882	0.937	2.254	0.510	4.258	0.800
93	**70.58**	**7 CO**	**MRF**	**RIO**	**WEST-**	**6.204**	**0.910**	**0.527**	**0.061-**	**4.779**	**0.765**	**6.172**	**0.617-**	**1.858**	**0.858-**	**0.459**	**0.462-**	**1.593**	**0.412-**	**2.915**	**0.689**	**4.026**	**0.702-**	**1.003**	**1.128-**	**0.002**	**0.906**
94	69.75	7CO	MRF	RIO	SSDSac-	7.911	1.015	0.639	0.067-	5.594	0.763	7.200	1.023-	0.893	0.384-	1.579	0.453-	6.439	0.766-	0.145	0.027	2.745	0.940-	0.269	0.312	2.321	0.323
95	68.75	7CO	MRF	RIO	SSDSJ-	7.518	1.110	0.600	0.073-	5.903	0.736	5.138	0.549	0.902	0.462-	1.333	0.419-	1.250	0.287	0.024	0.158	3.559	0.543-	0.424	0.460-	2.846	0.416
96	60.54	7CO	MRF	SJR	XGEO-	5.837	1.274	0.570	0.086-	5.090	0.693	1.675	0.954	2.359	0.347-	1.269	0.583-	6.262	1.576-	0.179	0.063	2.797	1.566	2.984	0.321-	3.090	0.545
97	62.63	7CO	MRF	SJR	WEST-	1.646	0.987	0.331	0.066-	5.789	0.916	2.290	0.850	3.976	0.851-	3.974	0.672-	2.243	1.442-	5.743	0.531	6.474	1.663	7.624	1.040-	4.658	1.328
98	65.51	7CO	MRF	SJR	SSDSac-	7.985	1.168	0.684	0.076-	4.568	0.662	3.022	0.885	1.592	0.216-	0.069	0.540-	0.999	1.410-	0.213	0.023	0.752	1.469	1.421	0.182-	2.312	0.336
99	42.98	7CO	MRF	SJR	SSDSJ-	0.782	1.284	0.104	0.077-	2.146	1.107	-15.732	3.923	9.040	1.502-	0.956	0.667	-27.378	6.847-	5.599	0.924	4.982	3.683	0.226	1.285	20.832	4.665
100	67.95	7CO	MRF	XGEO	WEST-	6.079	0.959	0.521	0.067-	8.145	0.868	2.000	0.259	4.023	0.715-	3.384	0.683	0.496	0.097-	4.503	0.641	3.059	0.310	5.063	1.074-	1.452	0.334
101	62.57	7CO	MRF	XGEO	SSDSac	-10.473	1.207	0.760	0.079-	6.352	0.837	1.166	0.420	1.668	0.249-	1.316	0.490-	0.286	0.123-	0.224	0.030	0.975	0.453	0.631	0.268	0.143	0.117
102	62.04	7CO	MRF	XGEO	SSDSJ-	7.058	1.159	0.582	0.078-	6.391	0.717	2.855	0.294	1.779	0.405-	1.588	0.485-	0.061	0.063-	0.556	0.167	2.868	0.327	0.389	0.482-	1.423	0.174
103	68.92	7CO	MRF	WEST	SSDSac-	6.619	0.955	0.533	0.065-	4.501	0.828-	0.713	0.914	2.439	0.227	0.406	0.685-	4.285	0.724-	0.182	0.028	0.851	1.134	1.829	0.223	0.164	0.264
104	62.35	7CO	MRF	WEST	SSDSJ-	2.388	0.925	0.340	0.064-	6.770	0.937	4.723	0.799	1.315	0.487-	3.137	0.744-	5.545	0.620-	0.257	0.186	6.530	1.184	2.111	0.613-	1.127	0.550
105	65.95	7CO	MRF	SSDSac	SSDSJ-	7.689	1.061	0.611	0.071-	4.812	0.615	1.957	0.191	1.590	0.446-	0.187	0.409-	0.160	0.022-	0.307	0.164	1.251	0.189	0.279	0.424-	0.794	0.102
106	68.48	8CO	MRF	RIO	SJR-	7.974	1.237	0.635	0.077-	5.471	0.719	4.338	0.687	0.844	1.109-	0.426	0.433-	1.438	0.304	3.253	1.306	3.765	0.581-	2.944	1.662-	5.565	1.107
107	68.55	8CO	MRF	RIO	XGEO-	7.925	1.116	0.683	0.079-	4.888	0.699	3.300	0.863	1.434	0.476-	1.556	0.417-	5.780	0.793-	1.104	0.228-	1.326	0.985	2.343	0.537	4.380	0.808
108	**70.09**	**8 CO**	**MRF**	**RIO**	**WEST-**	**6.188**	**0.913**	**0.541**	**0.062-**	**4.383**	**0.746**	**6.131**	**0.641-**	**1.882**	**0.885-**	**0.305**	**0.494-**	**1.760**	**0.449-**	**3.173**	**0.767**	**3.816**	**0.769-**	**0.758**	**1.247**	**0.195**	**0.991**
109	69.56	8CO	MRF	RIO	SSDSac-	8.233	1.030	0.671	0.069-	5.326	0.775	5.969	1.065-	0.412	0.412-	1.453	0.478-	5.950	0.791-	0.194	0.033	2.022	1.023-	0.109	0.362	2.190	0.346
110	68.30	8CO	MRF	RIO	SSDSJ-	7.568	1.114	0.616	0.074-	5.678	0.709	5.077	0.574	0.721	0.482-	1.270	0.416-	1.308	0.315	0.040	0.162	3.402	0.576-	0.590	0.494-	2.722	0.433
111	59.35	8CO	MRF	SJR	XGEO-	5.923	1.296	0.576	0.087-	5.200	0.738	1.417	0.986	2.370	0.356-	1.346	0.626-	5.913	1.591-	0.159	0.066	2.347	1.618	2.892	0.343-	2.765	0.539
112	62.86	8CO	MRF	SJR	WEST-	2.164	1.025	0.356	0.067-	6.338	1.074	2.399	0.962	4.137	0.920-	4.378	0.749-	1.768	1.497-	6.010	0.574	6.352	1.876	8.044	1.134-	4.494	1.400
113	66.89	8CO	MRF	SJR	SSDSac-	8.708	1.164	0.733	0.075-	4.632	0.663	2.891	0.877	1.658	0.230	0.025	0.535-	0.222	1.348-	0.241	0.025-	0.002	1.495	1.397	0.201-	2.381	0.346
114	43.38	8CO	MRF	SJR	SSDSJ-	1.437	1.355	0.128	0.077-	2.842	1.300	-15.982	4.311	9.185	1.609-	1.373	0.741	-27.209	7.194-	5.634	0.967	4.860	4.056	0.296	1.410	21.013	4.907
115	67.16	8CO	MRF	XGEO	WEST-	6.202	0.974	0.534	0.068-	8.319	0.913	1.920	0.274	4.191	0.750-	3.656	0.734	0.492	0.107-	5.092	0.730	2.937	0.355	5.704	1.189-	1.244	0.380
116	63.93	8CO	MRF	XGEO	SSDSac	-10.782	1.211	0.798	0.081-	5.959	0.836	0.964	0.444	1.767	0.267-	1.216	0.514-	0.289	0.130-	0.275	0.034	0.904	0.486	0.508	0.296	0.192	0.129

117	60.90	8CO	MRF	XGEO	SSDSJ-	7.109	1.180	0.593	0.080-	6.361	0.741	2.790	0.304	1.670	0.419-	1.644	0.513-	0.040	0.066-	0.564	0.170	2.808	0.349	0.257	0.515-	1.349	0.178
118	68.95	8CO	MRF	WEST	SSDSac-	6.929	0.974	0.557	0.066-	4.299	0.852-	0.863	0.958	2.509	0.252	0.424	0.737-	3.991	0.794-	0.203	0.032	0.725	1.254	1.781	0.265	0.093	0.293
119	62.59	8CO	MRF	WEST	SSDSJ-	2.913	0.954	0.362	0.065-	7.472	1.054	5.002	0.848	1.173	0.523-	3.675	0.830-	5.878	0.666-	0.195	0.192	7.156	1.277	1.959	0.669-	0.993	0.572
120	67.04	8CO	MRF	SSDSac	SSDSJ-	8.222	1.068	0.653	0.072-	4.692	0.626	2.020	0.210	1.416	0.462-	0.136	0.426-	0.185	0.024-	0.218	0.165	1.210	0.214	0.087	0.454-	0.821	0.109
121	68.02	9CO	MRF	RIO	SJR-	8.365	1.275	0.651	0.077-	5.724	0.798	4.453	0.722	0.086	1.184-	0.461	0.456-	1.600	0.329	3.834	1.352	3.447	0.627-	4.060	1.831-	4.856	1.110
122	68.64	9CO	MRF	RIO	XGEO-	8.096	1.120	0.713	0.080-	4.655	0.699	3.037	0.860	1.490	0.487-	1.569	0.437-	6.054	0.809-	1.100	0.230-	1.880	1.028	2.463	0.563	4.467	0.815
123	**69.65**	**9**	**COMRF**	**RIO**	**WEST-**	**6.303**	**0.923**	**0.559**	**0.063-**	**4.031**	**0.742**	**6.139**	**0.672-**	**2.108**	**0.923-**	**0.049**	**0.549-**	**1.893**	**0.490-**	**3.295**	**0.860**	**3.728**	**0.855-**	**0.887**	**1.388**	**0.310**	**1.099**
124	69.53	9CO	MRF	RIO	SSDSac-	8.617	1.042	0.706	0.070-	5.095	0.775	5.128	1.107-	0.117	0.442-	1.353	0.503-	5.461	0.812-	0.240	0.040	1.755	1.109-	0.156	0.416	2.061	0.371
125	68.00	9CO	MRF	RIO	SSDSJ-	7.759	1.120	0.640	0.075-	5.503	0.694	4.937	0.603	0.556	0.507-	1.180	0.422-	1.323	0.345	0.040	0.168	3.220	0.621-	0.816	0.539-	2.668	0.452
126	58.49	9CO	MRF	SJR	XGEO-	6.118	1.317	0.588	0.089-	5.312	0.792	1.190	1.037	2.353	0.365-	1.384	0.679-	5.735	1.598-	0.135	0.069	1.995	1.678	2.768	0.368-	2.460	0.535
127	62.93	9CO	MRF	SJR	WEST-	2.765	1.075	0.385	0.068-	6.759	1.223	2.480	1.075	4.060	0.973-	4.551	0.822-	1.244	1.558-	6.096	0.618	6.109	2.093	8.007	1.212-	4.269	1.451
128	67.89	9CO	MRF	SJR	SSDSac-	9.205	1.164	0.770	0.074-	4.617	0.678	2.727	0.882	1.642	0.246	0.098	0.540	0.394	1.336-	0.268	0.027-	0.653	1.544	1.262	0.224-	2.400	0.357
129	44.39	9CO	MRF	SJR	SSDSJ-	2.187	1.439	0.156	0.077-	3.526	1.519	-16.283	4.703	9.380	1.720-	1.821	0.825	-27.525	7.561-	5.839	1.016	5.243	4.477	0.101	1.562	21.800	5.169
130	66.45	9CO	MRF	XGEO	WEST-	6.355	0.992	0.549	0.069-	8.308	0.968	1.854	0.293	4.128	0.783-	3.717	0.789	0.481	0.119-	5.551	0.833	2.808	0.409	6.009	1.308-	1.035	0.437
131	65.30	9CO	MRF	XGEO	SSDSac	-11.068	1.217	0.837	0.082-	5.476	0.812	0.865	0.467	1.748	0.284-	1.100	0.535-	0.294	0.136-	0.328	0.039	0.968	0.518	0.239	0.327	0.254	0.139
132	60.16	9CO	MRF	XGEO	SSDSJ-	7.308	1.201	0.614	0.082-	6.298	0.772	2.700	0.317	1.574	0.437-	1.614	0.546-	0.013	0.070-	0.600	0.175	2.710	0.375	0.111	0.552-	1.271	0.184
133	68.86	9CO	MRF	WEST	SSDSac-	7.216	0.990	0.583	0.067-	3.959	0.874-	1.076	1.008	2.514	0.282	0.542	0.800-	3.485	0.871-	0.225	0.037	0.358	1.390	1.644	0.315-	0.001	0.331
134	62.69	9CO	MRF	WEST	SSDSJ-	3.518	0.988	0.388	0.066-	8.058	1.184	4.999	0.902	1.035	0.572-	4.032	0.923-	5.993	0.719-	0.144	0.200	7.342	1.374	1.770	0.743-	0.946	0.599
135	67.83	9CO	MRF	SSDSac	SSDSJ-	8.566	1.069	0.686	0.071-	4.486	0.634	1.996	0.231	1.267	0.486-	0.073	0.443-	0.208	0.027-	0.165	0.170	1.068	0.243-	0.082	0.498-	0.833	0.117
136	67.24	10CO	MRF	RIO	SJR-	8.459	1.319	0.651	0.078-	6.047	0.894	4.589	0.766-	0.543	1.279-	0.702	0.495-	1.870	0.358	4.103	1.446	3.197	0.683-	4.769	2.038-	4.283	1.156
137	68.32	10CO	MRF	RIO	XGEO-	8.190	1.126	0.734	0.081-	4.582	0.720	2.912	0.875	1.533	0.502-	1.725	0.471-	6.453	0.843-	1.082	0.235-	2.307	1.083	2.574	0.592	4.555	0.834
138	68.86	10CO	MRF	RIO	WEST-	6.331	0.934	0.570	0.064-	3.828	0.804	6.273	0.737-	2.342	0.992	0.018	0.741-	2.146	0.543-	3.493	0.980	3.674	1.055-	0.895	1.641	0.552	1.253
139	**69.15**	**10**	**COMRF**	**RIO**	**SSDSac-**	**8.893**	**1.063**	**0.729**	**0.072-**	**5.110**	**0.816**	**4.185**	**1.174**	**0.245**	**0.484-**	**1.435**	**0.543-**	**5.254**	**0.839-**	**0.289**	**0.047**	**1.173**	**1.231-**	**0.021**	**0.489**	**2.036**	**0.398**
140	67.30	10CO	MRF	RIO	SSDSJ-	7.708	1.126	0.646	0.076-	5.469	0.705	4.867	0.644	0.446	0.541-	1.261	0.450-	1.438	0.381	0.019	0.173	3.080	0.689-	0.936	0.598-	2.604	0.475
141	57.33	10CO	MRF	SJR	XGEO-	6.019	1.332	0.581	0.090-	5.438	0.873	1.024	1.110	2.294	0.376-	1.579	0.754-	5.885	1.616-	0.102	0.072	2.022	1.765	2.637	0.396-	2.207	0.545
142	62.58	10CO	MRF	SJR	WEST-	3.293	1.132	0.409	0.069-	7.301	1.403	2.595	1.216	3.980	1.029-	4.936	0.923-	0.974	1.622-	6.123	0.667	6.130	2.341	8.011	1.301-	4.184	1.517
143	68.05	10CO	MRF	SJR	SSDSac-	9.411	1.176	0.785	0.074-	4.774	0.739	2.662	0.936	1.631	0.263-	0.062	0.581	0.695	1.384-	0.289	0.029-	0.900	1.650	1.199	0.251-	2.443	0.379
144	45.20	10CO	MRF	SJR	SSDSJ-	3.175	1.552	0.183	0.077-	4.599	1.788	-17.336	5.154	9.833	1.862-	2.390	0.921	-27.735	7.942-	6.002	1.070	4.683	4.963	0.295	1.747	22.408	5.449
145	65.49	10CO	MRF	XGEO	WEST-	6.530	1.011	0.564	0.070-	8.535	1.071	1.764	0.315	4.214	0.831-	4.058	0.881	0.464	0.133-	6.179	0.947	2.623	0.472	6.658	1.455-	0.747	0.503
146	65.85	10CO	MRF	XGEO	SSDSac	-11.330	1.243	0.864	0.085-	5.312	0.855	0.625	0.495	1.813	0.312-	1.136	0.576-	0.311	0.143-	0.383	0.044	0.868	0.557	0.117	0.370	0.341	0.150
147	59.18	10CO	MRF	XGEO	SSDSJ-	7.408	1.223	0.626	0.083-	6.341	0.831	2.590	0.332	1.587	0.463-	1.716	0.601	0.025	0.073-	0.672	0.182	2.601	0.404	0.116	0.601-	1.187	0.193
148	68.41	10CO	MRF	WEST	SSDSac-	7.487	1.009	0.601	0.068-	3.845	0.948-	1.405	1.087	2.580	0.319	0.593	0.903-	3.041	0.957-	0.247	0.044-	0.182	1.567	1.625	0.380-	0.073	0.379
149	62.36	10CO	MRF	WEST	SSDSJ-	4.108	1.025	0.413	0.066-	8.787	1.328	4.951	0.970	0.994	0.632-	4.555	1.031-	6.040	0.774-	0.127	0.207	7.485	1.486	1.695	0.834-	0.968	0.627
150	67.78	10CO	MRF	SSDSac	SSDSJ-	8.760	1.078	0.703	0.072-	4.567	0.695	2.018	0.255	1.120	0.527-	0.207	0.491-	0.230	0.030-	0.140	0.176	1.019	0.277-	0.234	0.566-	0.829	0.127
151	66.71	11CO	MRF	RIO	SJR-	8.899	1.378	0.664	0.079-	6.404	0.972	4.896	0.816-	1.411	1.381-	0.703	0.504-	2.173	0.387	4.765	1.540	3.127	0.739-	6.063	2.242-	3.715	1.207
152	68.27	11CO	MRF	RIO	XGEO-	8.528	1.140	0.776	0.082-	4.369	0.702	2.715	0.877	1.702	0.514-	1.722	0.478-	7.112	0.884-	1.126	0.240-	2.847	1.117	2.841	0.616	4.878	0.857
153	68.26	11CO	MRF	RIO	WEST-	6.463	0.942	0.585	0.065-	3.521	0.782	6.505	0.787-	2.763	1.030	0.304	0.784-	2.417	0.592-	3.608	1.076	3.758	1.180-	1.255	1.789	0.772	1.371
154	**68.83**	**11**	**COMRF**	**RIO**	**SSDSac-**	**9.173**	**1.091**	**0.752**	**0.074-**	**4.959**	**0.828**	**3.083**	**1.239**	**0.687**	**0.519-**	**1.289**	**0.560-**	**5.473**	**0.878-**	**0.347**	**0.053**	**0.218**	**1.347**	**0.324**	**0.551**	**2.222**	**0.428**
155	66.67	11CO	MRF	RIO	SSDSJ-	7.767	1.136	0.659	0.077-	5.333	0.698	4.819	0.683	0.294	0.575-	1.199	0.460-	1.581	0.417	0.016	0.177	2.933	0.754-	1.110	0.656-	2.534	0.497
156	56.56	11CO	MRF	SJR	XGEO-	6.220	1.352	0.589	0.092-	5.374	0.859	0.443	1.157	2.352	0.391-	1.369	0.739-	5.788	1.616-	0.067	0.076	1.287	1.787	2.620	0.426-	1.942	0.552
157	62.17	11CO	MRF	SJR	WEST-	3.895	1.182	0.440	0.070-	7.451	1.503	2.505	1.319	3.827	1.070-	4.805	0.973-	0.266	1.677-	5.987	0.714	5.646	2.510	7.728	1.369-	4.128	1.574
158	68.02	11CO	MRF	SJR	SSDSac-	9.789	1.204	0.800	0.075-	4.887	0.768	2.240	1.002	1.700	0.280	0.115	0.573	1.376	1.429-	0.307	0.032-	1.858	1.751	1.253	0.275-	2.470	0.399
159	46.05	11CO	MRF	SJR	SSDSJ-	4.396	1.639	0.215	0.077-	5.428	1.944	-19.544	5.478	10.631	1.982-	2.449	0.959	-27.939	8.271-	6.185	1.120	2.738	5.248	0.836	1.879	23.141	5.700

160	64.84	11CO	MRF	XGEO	WEST	-6.749	1.030	0.586	0.071	-8.329	1.096	1.798	0.340	3.984	0.868	-3.962	0.922	0.434	0.147	-6.663	1.048	2.557	0.534	6.796	1.583	-0.442	0.569
161	66.19	11CO	MRF	XGEO	SSDSac	-11.776	1.281	0.900	0.087	-5.089	0.861	0.335	0.515	1.899	0.336	-0.979	0.582	-0.374	0.146	-0.433	0.049	0.710	0.585	0.073	0.405	0.478	0.156
162	58.62	11CO	MRF	XGEO	SSDSJ	-7.722	1.246	0.654	0.085	-6.210	0.840	2.545	0.348	1.506	0.482	-1.588	0.621	0.067	0.077	-0.722	0.188	2.560	0.435	-0.031	0.638	-1.117	0.202
163	68.04	11CO	MRF	WEST	SSDSac	-7.754	1.022	0.614	0.070	-3.263	0.951	-2.477	1.205	2.861	0.367	1.312	0.974	-2.881	1.054	-0.283	0.052	-1.397	1.766	1.824	0.455	0.023	0.439
164	61.98	11CO	MRF	WEST	SSDSJ	-4.564	1.052	0.441	0.068	-8.764	1.397	4.623	1.030	1.027	0.688	-4.419	1.088	-5.918	0.825	-0.107	0.215	7.066	1.579	1.758	0.918	-1.006	0.653
165	67.56	11CO	MRF	SSDSac	SSDSJ	-9.035	1.089	0.719	0.072	-4.568	0.701	2.132	0.278	0.805	0.557	-0.107	0.492	-0.251	0.032	-0.079	0.180	1.111	0.311	-0.625	0.620	-0.831	0.137
166	66.10	12CO	MRF	RIO	SJR	-9.335	1.457	0.666	0.080	-7.001	1.075	5.429	0.883	-2.557	1.510	-0.813	0.515	-2.600	0.416	5.549	1.668	3.237	0.807	-7.694	2.493	-3.049	1.280
167	68.09	12CO	MRF	RIO	XGEO	-8.805	1.151	0.812	0.083	-4.271	0.698	2.582	0.885	1.940	0.532	-1.856	0.494	-7.908	0.931	-1.158	0.248	-3.375	1.155	3.198	0.645	5.190	0.885
168	67.41	12CO	MRF	RIO	WEST	-6.472	0.950	0.591	0.066	-3.348	0.779	6.800	0.846	-3.116	1.073	0.383	0.847	-2.796	0.646	-3.731	1.179	3.829	1.330	-1.460	1.960	1.023	1.490
169	68.29	12	COMRF	RIO	SSDSac	-9.597	1.138	0.771	0.076	-5.251	0.919	1.244	1.305	1.551	0.551	-1.368	0.611	-6.002	0.917	-0.431	0.060	-1.822	1.462	1.250	0.606	2.549	0.458
170	65.90	12CO	MRF	RIO	SSDSJ	-7.670	1.147	0.657	0.078	-5.355	0.705	4.957	0.726	0.022	0.621	-1.290	0.475	-1.887	0.453	0.025	0.182	2.909	0.826	-1.370	0.730	-2.414	0.518
171	55.55	12CO	MRF	SJR	XGEO	-6.289	1.377	0.584	0.094	-5.408	0.867	-0.340	1.240	2.477	0.410	-1.251	0.733	-5.787	1.629	-0.024	0.080	0.423	1.847	2.685	0.463	-1.647	0.569
172	61.39	12CO	MRF	SJR	WEST	-4.497	1.243	0.461	0.072	-7.919	1.630	2.115	1.450	3.913	1.122	-4.899	1.038	0.484	1.739	-5.857	0.770	4.754	2.709	7.765	1.458	-4.069	1.650
173	67.59	12CO	MRF	SJR	SSDSac	-10.296	1.262	0.813	0.076	-5.307	0.851	1.627	1.152	1.902	0.305	0.204	0.581	2.138	1.522	-0.333	0.035	-3.116	1.947	1.501	0.298	-2.547	0.432
174	46.73	12CO	MRF	SJR	SSDSJ	-5.732	1.713	0.242	0.078	-6.378	2.090	-22.870	5.780	11.773	2.102	-2.585	0.993	-29.674	8.728	-6.498	1.180	0.556	5.528	1.457	2.014	24.791	6.033
175	64.01	12CO	MRF	XGEO	WEST	-6.961	1.050	0.606	0.072	-8.372	1.142	1.853	0.368	3.913	0.916	-4.189	0.980	0.392	0.162	-7.397	1.154	2.468	0.601	7.380	1.731	-0.010	0.637
176	65.93	12CO	MRF	XGEO	SSDSac	-12.347	1.336	0.930	0.090	-5.321	0.934	-0.121	0.546	2.193	0.368	-1.006	0.604	-0.442	0.149	-0.491	0.054	0.339	0.627	0.317	0.445	0.626	0.163
177	57.78	12CO	MRF	XGEO	SSDSJ	-7.906	1.273	0.671	0.088	-6.141	0.855	2.551	0.370	1.376	0.505	-1.551	0.647	0.116	0.081	-0.790	0.195	2.580	0.472	-0.218	0.680	-1.016	0.212
178	67.48	12CO	MRF	WEST	SSDSac	-8.091	1.041	0.621	0.071	-2.672	0.984	-4.149	1.365	3.410	0.425	2.230	1.072	-2.994	1.171	-0.342	0.062	-3.051	2.016	2.285	0.538	0.251	0.513
179	61.19	12CO	MRF	WEST	SSDSJ	-4.951	1.082	0.462	0.069	-8.978	1.475	4.544	1.101	0.949	0.751	-4.536	1.157	-5.827	0.886	-0.078	0.223	7.002	1.690	1.681	1.013	-1.048	0.685
180	67.01	12CO	MRF	SSDSac	SSDSJ	-9.479	1.115	0.734	0.073	-4.900	0.724	2.450	0.304	0.260	0.600	-0.088	0.489	-0.280	0.035	0.018	0.186	1.478	0.346	-1.351	0.694	-0.859	0.148
181	65.55	13CO	MRF	RIO	SJR	-9.877	1.549	0.670	0.082	-7.567	1.165	6.113	0.959	-3.898	1.647	-0.747	0.505	-3.038	0.442	6.462	1.810	3.517	0.882	-9.669	2.746	-2.348	1.363
182	68.07	13	COMRF	RIO	XGEO	-9.155	1.164	0.859	0.085	-4.031	0.659	2.247	0.854	2.387	0.539	-1.911	0.488	-8.774	0.971	-1.191	0.254	-4.174	1.150	3.801	0.662	5.512	0.906
183	66.60	13CO	MRF	RIO	WEST	-6.526	0.960	0.600	0.067	-3.027	0.746	7.217	0.900	-3.703	1.114	0.867	0.887	-3.015	0.695	-3.359	1.273	4.449	1.458	-2.602	2.118	0.677	1.590
184	67.98	13CO	MRF	RIO	SSDSac	-10.203	1.183	0.801	0.078	-5.406	0.975	-1.022	1.326	2.651	0.562	-1.235	0.643	-6.548	0.950	-0.541	0.068	-4.323	1.519	2.408	0.633	2.929	0.487
185	65.11	13CO	MRF	RIO	SSDSJ	-7.540	1.160	0.655	0.079	-5.247	0.695	5.095	0.768	-0.248	0.674	-1.255	0.468	-2.205	0.486	0.023	0.190	2.876	0.888	-1.643	0.810	-2.285	0.538
186	54.86	13CO	MRF	SJR	XGEO	-6.550	1.411	0.586	0.095	-5.404	0.830	-1.536	1.353	2.737	0.434	-0.910	0.683	-5.782	1.648	0.023	0.084	-1.057	1.931	2.896	0.504	-1.340	0.595
187	60.38	13CO	MRF	SJR	WEST	-4.883	1.282	0.478	0.074	-7.760	1.653	1.671	1.535	3.819	1.159	-4.454	1.042	1.285	1.789	-5.578	0.833	3.801	2.813	7.440	1.531	-4.083	1.729
188	67.38	13CO	MRF	SJR	SSDSac	-11.061	1.315	0.833	0.077	-5.736	0.881	0.638	1.264	2.225	0.326	0.541	0.553	3.118	1.608	-0.371	0.039	-5.011	2.096	1.849	0.315	-2.585	0.460
189	47.50	13CO	MRF	SJR	SSDSJ	-6.969	1.759	0.272	0.078	-6.574	2.141	-26.638	6.042	13.113	2.216	-2.231	0.972	-32.172	9.284	-6.972	1.247	-1.328	5.718	1.943	2.112	27.148	6.428
190	63.29	13CO	MRF	XGEO	WEST	-7.089	1.068	0.626	0.074	-7.912	1.083	2.101	0.397	3.430	0.944	-3.946	0.974	0.366	0.176	-7.932	1.253	2.637	0.662	7.283	1.847	0.359	0.701
191	65.77	13CO	MRF	XGEO	SSDSac	-12.903	1.377	0.962	0.092	-5.359	0.936	-0.480	0.567	2.492	0.390	-0.883	0.588	-0.502	0.151	-0.554	0.060	0.063	0.657	0.545	0.471	0.760	0.168
192	57.24	13CO	MRF	XGEO	SSDSJ	-8.169	1.303	0.696	0.090	-5.901	0.817	2.627	0.396	1.131	0.523	-1.325	0.637	0.169	0.086	-0.870	0.204	2.669	0.514	-0.587	0.711	-0.897	0.225
193	67.47	13CO	MRF	WEST	SSDSac	-8.637	1.045	0.630	0.072	-1.546	0.775	-6.960	1.519	4.358	0.482	4.075	1.029	-2.799	1.289	-0.424	0.072	-6.362	2.252	3.181	0.618	0.454	0.590
194	60.17	13CO	MRF	WEST	SSDSJ	-4.998	1.095	0.478	0.071	-8.258	1.454	4.063	1.153	1.083	0.793	-3.920	1.165	-5.613	0.956	-0.094	0.231	6.294	1.778	1.882	1.081	-1.090	0.722
195	66.74	13CO	MRF	SSDSac	SSDSJ	-10.099	1.139	0.754	0.074	-5.249	0.703	2.909	0.331	-0.451	0.650	0.063	0.436	-0.320	0.038	0.142	0.192	1.998	0.382	-2.316	0.778	-0.900	0.158
196	64.99	14CO	MRF	RIO	SJR	-10.273	1.632	0.669	0.083	-8.015	1.245	6.638	1.033	-5.062	1.776	-0.679	0.498	-3.397	0.464	7.115	1.958	3.718	0.965	-11.316	2.971	-1.774	1.449
197	68.08	14	COMRF	RIO	XGEO	-9.475	1.177	0.901	0.086	-3.826	0.629	2.001	0.833	2.738	0.549	-1.945	0.485	-9.683	1.013	-1.251	0.260	-4.833	1.151	4.285	0.679	5.926	0.928
198	65.67	14CO	MRF	RIO	WEST	-6.538	0.973	0.606	0.068	-2.817	0.732	7.283	0.940	-3.941	1.152	1.206	0.941	-3.112	0.740	-2.946	1.374	4.737	1.578	-3.405	2.286	0.269	1.685
199	67.87	14CO	MRF	RIO	SSDSac	-10.663	1.203	0.829	0.079	-5.293	0.973	-2.717	1.324	3.472	0.563	-0.973	0.649	-7.197	0.992	-0.651	0.077	-6.096	1.544	3.214	0.645	3.355	0.519
200	64.33	14CO	MRF	RIO	SSDSJ	-7.348	1.172	0.649	0.080	-5.087	0.694	5.088	0.807	-0.460	0.732	-1.198	0.466	-2.490	0.511	-0.004	0.199	2.661	0.953	-1.843	0.893	-2.117	0.555
201	54.35	14CO	MRF	SJR	XGEO	-6.835	1.451	0.587	0.097	-5.492	0.835	-2.877	1.518	2.980	0.461	-0.583	0.659	-5.983	1.687	0.076	0.089	-2.668	2.094	3.079	0.548	-1.022	0.634
202	59.55	14CO	MRF	SJR	WEST	-5.267	1.318	0.493	0.075	-7.656	1.670	1.155	1.619	3.774	1.197	-4.029	1.043	2.042	1.838	-5.180	0.897	2.832	2.902	7.144	1.608	-4.289	1.811

203	67.10	14CO	MRF	SJR	SSDSac	-11.520	1.342	0.838	0.078-	6.019	0.889-	0.337	1.325	2.448	0.338	0.847	0.532	3.845	1.684-	0.403	0.041-	6.653	2.176	2.036	0.328-	2.538	0.478
204	48.49	14CO	MRF	SJR	SSDSJ-	8.152	1.792	0.303	0.080-	6.433	2.186	-30.666	6.328	14.573	2.340-	1.850	0.944	-36.107	10.038-	7.605	1.324-	2.196	5.944	2.119	2.211	30.464	6.939
205	62.64	14CO	MRF	XGEO	WEST-	7.251	1.085	0.648	0.076-	7.585	1.045	2.293	0.429	3.119	0.975-	3.890	0.985	0.312	0.190-	8.756	1.361	2.642	0.728	7.666	1.974	0.910	0.770
206	65.76	14CO	MRF	XGEO	SSDSac	-13.281	1.400	0.987	0.094-	5.230	0.912-	0.831	0.589	2.744	0.408-	0.687	0.569-	0.566	0.154-	0.622	0.067-	0.191	0.689	0.693	0.495	0.898	0.173
207	56.88	14CO	MRF	XGEO	SSDSJ-	8.392	1.329	0.719	0.093-	5.587	0.776	2.646	0.425	0.895	0.538-	1.027	0.624	0.228	0.090-	0.993	0.214	2.661	0.561-	0.955	0.731-	0.728	0.241
208	67.37	14CO	MRF	WEST	SSDSac-	8.948	1.048	0.629	0.073-	0.637	0.740-	9.142	1.657	5.035	0.530	5.182	1.103-	3.119	1.412-	0.524	0.081-	8.134	2.504	3.559	0.691	0.913	0.657
209	59.26	14CO	MRF	WEST	SSDSJ-	5.062	1.105	0.493	0.073-	7.640	1.419	3.724	1.201	1.138	0.822-	3.355	1.166-	5.304	1.028-	0.098	0.239	5.688	1.863	1.990	1.130-	1.195	0.763
210	66.40	14CO	MRF	SSDSac	SSDSJ	-10.424	1.150	0.761	0.074-	5.478	0.706	3.222	0.356-	1.079	0.719	0.163	0.406-	0.357	0.041	0.235	0.201	2.317	0.416-	3.098	0.883-	0.894	0.165

Equations for the Prediction of the Proportion of Delta Smelt in the Southeast of the Sacramento-San Joaquin Delta During 20mm Surveys (Revised 12/17/07)

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Table of Contents

1. Introduction

This note describes the results of some initial analyses aimed at producing an equation that can be used to predict the proportion of the delta smelt population in samples from the southeast of the Sacramento-San Joaquin Delta (Middle River, Old River and Clifton Court Forebay) when 20mm surveys take place between March and August each year.

The variables considered are those described by Metropolitan (2007), with values mainly as supplied by with that report. These variables are as shown in Table 1.

Table 1. The variables considered for the prediction of the proportion of delta smelt in the Southeast Delta. The moving average values used were as supplied by Metropolitan. The other two variables were calculated from the 20mm survey results.

Variable	Description
SACFR10	A ten day moving average of the Sacramento River flow at Freeport (cfs).
SJR10	A ten day moving average of the San Joaquin River flow at Vernalis (cfs).
RIO10	A ten day average of the Sacramento River flow at Rio Vista (cfs).
OUTFL10	A ten day moving average of the Delta outflow (cfs)
QWEST10	A ten day moving average of the San Joaquin River flow at Jersey Point (cfs).
XGEO10	A ten day moving average of the Delta Cross Channel and the Georgiana Slough flow (cfs)
COMR10	A ten day moving average of the combined Old and Middle River flows (cfs)
ANTP10	A ten day moving average of the water temperature at Antioch (°C)
MSTP10	A ten day moving average of the water temperature at Mallard Slough (°C)
RVTP10	A ten day moving average of the water temperature at Rio Vista (°C)
RRTP10	A ten day moving average of the water temperature at Rough and Ready Island (°C)
TopEC	The average Southeast Delta surface electroconductivity measured as part of the 20mm surveys (µS/cm)
Secchi	The average Secchi depth measured as part of the 20mm surveys (cm).

For the fitting of equations the variables were all standardized to have means of approximately zero and standard deviations of approximately one, as shown in Table 2. This was done to avoid rounding problems with the use of large values when fitting models because squares and products of the variables were used in this process.

Table 2. The means and standard deviation used to produce variables with means of approximately zero and standard deviations of approximately one, using X' = (X-Mean)/SD. For the first 11 variables the means and standard deviations are non-averaged variables. For the last two variables they are the means and standard deviations of the calculated variable values.

	Mean	SD
SACFR10	28148.6	18304.3
SJR10	7487.7	7140.6
RIO10	25071.4	27515.9
OUTFL10	32907.3	38866.4
QWEST10	8012.6	12489.0
XGEO10	5859.9	2617.9
COMR10	-2168.7	5525.2
ANTP10	19.11	3.00
MSTP10	18.41	2.85
RVTP10	18.30	3.03
RRTP10	20.18	3.68
TopEC	283.22	79.50
Secchi	68.63	16.85

2. Models Considered

The models initially considered were constrained to include three of the seven river flow variables SACFR10 to COMR10, none or one of the four temperature variables ANTP10 to RRTP10, and none, one, or both of the variables TopEC and Secchi. There are ${}^7C_3$ = 35 ways to choose three of the seven river flow variables for use, five possible choices for the temperature variable, and four selections for TopEC and Secchi. That gives 35 x 5 x 4 = 700 possible equations altogether. These equations were fitted as log-linear models assuming that the estimate of the number of delta smelt in the Southeast Delta is proportional to the estimate of the total delta smelt population, with general quadratic effects of variables. When only flow variables were included in the equation the expected number of delta smelt in the Southeast Delta therefore took the form

$$E(ESDS) = (TotDS).Exp(\beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_1^2 + \beta_5X_2^2 + \beta_6X_3^2 + \beta_7X_1X_2 + \beta_8X_1X_3 + \beta_9X_2X_3),$$

where TotDS is the estimated total number of delta smelt in the whole delta, and X_1 to X_3 are the three flow variables.

When a temperature variable was included this added two more terms to the equation of the form $\beta_{10}(Temp) + \beta_{11}(Temp)^2$. If one or both of the TopEC and Secchi variables were included this again introduced linear and squared terms into the equation, with the largest equation involving nine terms for river flows, two terms for temperature, and four terms for TopEC and Secchi, i.e. 15 terms in the equation altogether, with the equation taking the form

$$\begin{aligned} E(ESDS) = (TotDS).Exp(&\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_1^2 + \beta_5 X_2^2 + \beta_6 X_3^2 \\ &+ \beta_7 X_1 X_2 + \beta_8 X_1 X_3 + \beta_9 X_2 X_3 + \beta_{10} X_4 + \beta_{11} X_4 + \beta_{12} X_5 + \beta_{13} X_5^2 \\ &+ \beta_{14} X_6 + \beta_{15} X_6^2), \end{aligned}$$

where X_4 is a temperature variable, X_5 is TopEC and X_6 is Secchi.

Once any of the equations are fitted the proportion of the delta smelt population in the Southeast Delta can be estimated by E(ESDS)/TotDS. Hence although it is the number of delta smelt in the Southeast Delta that is estimated the estimation of the proportion in this area is straightforward.

Models were fitted using the standard quasi-maximum likelihood method (McCullagh and Nelder, 1989). Although there are questions about the assumptions made with this method it was expected to produce equations with a reasonable fit to the available data. There are missing values for some variables for some of the 20mm surveys. Surveys with missing values for any variables were removed from the data for model fitting, as were four surveys with no delta smelt estimated to be anywhere in the Sacramento-San Joaquin Delta. This reduced the number of surveys used from 102 down to 78.

3. Results from Fitting the 700 Equations

Appendix A gives a summary of the results of fitting the 700 models to the available data. The best model found accounts for 83.37% of the variation in the estimated number of delta smelt in the Southeast Delta. It includes the 15 variables indicated in the left-hand side of Table 3, for what is called the full equation.

4. Reduced Equations

The full equation includes 15 terms with linear, squared and product terms for the three flow variables SJR10, OutFL10 and COMRF10, and linear and squared terms for MSPT10, TopEC and Secchi. Table 3 shows that the coefficients of these terms are not all significant at the 5% level, and non-significant terms were therefore removed one by one to produce the reduced equation shown in Table 3, which includes 12 terms and still accounts for 82.98% of the variation in the data.

Given that only 78 observations are being modeled in the data, 12 terms in the model seems too many. An attempt was therefore made to reduce the model even further by removing all terms with coefficients that are not very highly significant, with p-values shown as 0.000 because they are less than 0.0005. This resulted in the very reduced model shown in Table 3. This includes eight terms but still accounts for 78.2% of the variation in the data.

Table 3. The best fitting model from the 700 considered without removing any insignificant terms (Full Model), the reduced model with effects not significant at the 5% level removed, and the very reduced model with only highly significant terms included. The percentage of variation accounted for by each equation is also shown (% Exp). In reducing the models a term was not removed if there was a square or product involving it that was significant. For the reduced model the 5% level of significance was used to remove terms, while for the very reduced model all terms remaining were required to be very highly significant.

	Full Model			%	Reduced Model			%	Very Reduced Model			%
	Est	SE	P-Value	Exp	Est	SE	P-Value	Exp	Est	SE	P-Value	Exp
Constant	-4.122	0.491		83.37	-4.2	0.460		82.98	-4.43	0.376		78.42
SJR10	-2.075	1.662	0.216		-2.117	1.054	0.049		-1.621	0.768	0.039	
OUTFL10	4.934	1.294	0.000		4.429	0.962	0.000		3.126	0.756	0.000	
COMR10	-2.853	1.201	0.020		-2.500	0.661	0.000		-2.493	0.655	0.000	
$SJR10^2$	-0.996	3.162	0.754									
$OUTFL10^2$	-10.17	2.620	0.000		-8.301	1.489	0.000		-5.821	1.236	0.000	
$COMR10^2$	-2.58	1.482	0.086		-3.242	0.724	0.000		-3.684	0.724	0.000	
SJR10.OUTFL10	14.375	5.309	0.009		10.738	1.636	0.000		8.126	1.346	0.000	
SJR10.COMRF10	-1.856	4.077	0.650									
OUTFL10.COMRF10	0.661	2.723	0.809									
MSTP10	-2.458	0.398	0.000		-2.447	0.374	0.000		-2.654	0.360	0.000	
$MSTP10^2$	-0.780	0.134	0.000		-0.772	0.124	0.000		-0.764	0.125	0.000	
TopEC	1.059	0.425	0.015		1.170	0.377	0.003					
$TopEC^2$	-0.711	0.418	0.094		-0.766	0.372	0.044					
Secchi	0.130	0.163	0.428		0.095	0.157	0.549					
$Secchi^2$	-0.144	0.078	0.069		-0.155	0.076	0.047					

In practice the three equations give rather similar results in terms of prediction the fraction of delta smelt in the Southeast Delta. Figure 1 shows how the observed fraction compares with the predicted fractions for the 77 fractions in the data used to estimate the equations. This figure shows, for example, that if the predicted proportion is 0.05 or less then the observed proportion was always close to the prediction for all three models. However, for higher predicted proportions the difference between the observed and expected proportions is sometimes quite large.

Figure 2 gives a different type of comparison between the predictions for the three models. It shows the predictions plotted against the 20mm survey numbers. This figure shows that the three equations in give more or less the same predictions in practice.

The three equations shown in Table 3 all account for about 80% of the variation in the data. Given the relatively small number of observations used to fit the equations it may be better to use the equation containing eight variables for future prediction purposes, although on the available data the equations give about the same results.

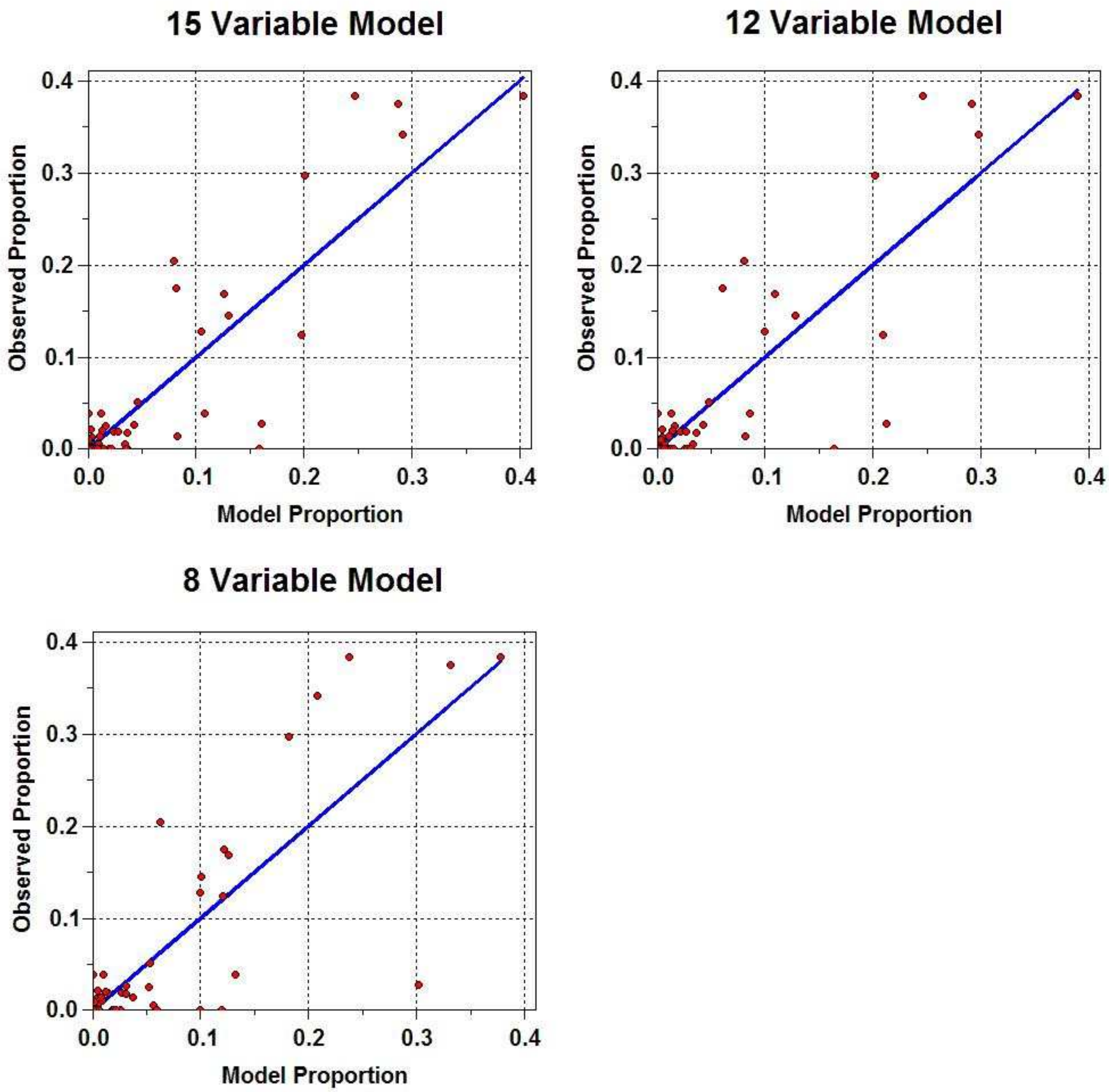

Figure 1. The observed proportion (vertical axes) of delta smelt in the Southeast Delta compared to the predicted proportions (horizontal axes) from the full equation (15 variables), the reduced equation (12 variables) and the very reduced equation (8 variables).

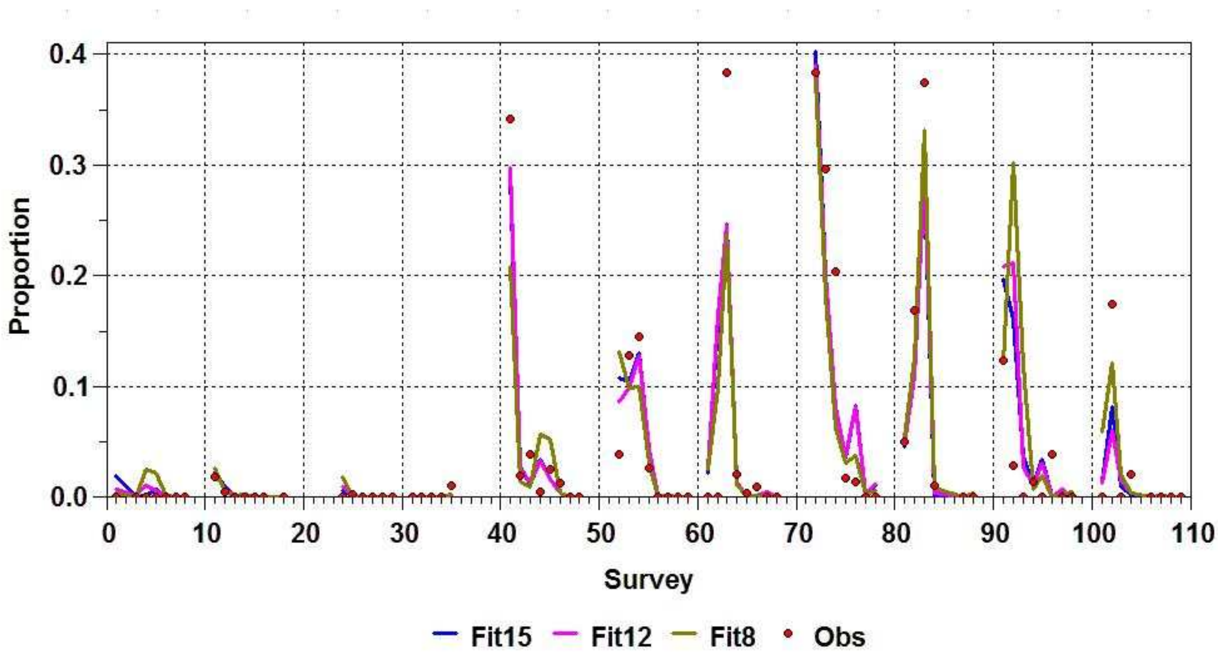

Figure 2. Comparison between the observed fraction of delta smelt in the Southeast Delta (●) and the predicted proportions from the full equation (Fit15), the reduced equation (Fit12) and the very reduced equation (Fit8). The survey numbers shown on the horizontal scale are the actual numbers for the first year of data (1995), the actual survey numbers plus 10 in 1996, and so on up to the actual survey numbers plus 100 in 2005. All observed points are plotted on top of the three lines for fitted values.

5. Dealing with the Missing Data 1

As noted above, there have been 102 20mm surveys, but four of these showed no delta smelt anywhere in the Sacramento-San Joaquin Delta, and there was missing data on one or more temperature variables, TopEC or Secchi in other surveys, resulting in only 78 surveys having all of the data necessary to fit the 700 models that have been considered.

One method to overcome the missing temperature data involves using the Southeast Delta temperature data recorded during the 20mm surveys in place of the four temperatures used when fitting the 700 models. If this is done then there are 88 survey results that can be used for estimation rather than 78. What was done in this case was to consider all possible choices of three river flow variables in the equation (giving 35 possibilities), with one, two or three of the variables Temp (temperature in the Southeast Delta during 20mm surveys), TopEC and Secchi. There are then eight possibilities for the Temp, TopEC and Secchi variables (none, Temp alone, TopEC alone, Secchi alone, Temp and TopEC, Temp and Secchi, TopEC and Secchi, and Temp, TopEC and Secchi), giving 35 x 8 = 280 equations to be considered altogether.

The best fitting equation accounts for 81.84% of the variation in the estimated number of delta smelt in the Southeast Delta. Table 4 shows the coefficients of this equation and also for the reduced equation with non-significant terms removed, which accounts for 81.33% of the variation in the data, using ten variables.

Table 4. The best fitting equation from 280 equations with three flow variables and one, two or three of the variables Temp, TopEC and Secchi.

	Full Equation			%	Reduced Equation			%
	Est	SE	P-Value	Explained	Est	SE	P-Value	Explained
Constant	-4.684	0.387		81.84	-4.928	0.352		81.33
SJR10	-5.091	1.819	0.007		-6.341	1.622	0.000	
QWEST10	3.656	2.267	0.111		5.702	1.718	0.001	
COMR10	-0.532	1.192	0.657		-1.677	0.649	0.012	
$SJR10^2$	-7.898	3.422	0.024		-9.727	3.070	0.002	
$QWEST10^2$	-9.662	5.375	0.076		-14.569	3.598	0.000	
$COMR10^2$	-4.674	2.471	0.063		-5.697	2.137	0.009	
SJR10.QWEST10	15.822	7.978	0.051		22.457	5.854	0.000	
SJR10.COMR10	3.810	4.488	0.399					
QWEST10.COM10	2.665	6.603	0.688		7.844	4.068	0.058	
Temp	-2.258	0.304	0.000		-2.366	0.288	0.000	
$Temp^2$	-0.412	0.146	0.006		-0.474	0.133	0.001	
TopEC	-0.156	0.435	0.721					
$TopEC^2$	-0.169	0.500	0.736					
Secchi	0.124	0.128	0.336					
$Secchi^2$	0.016	0.079	0.840					

The reduced equation accounts for a high percentage of the variation in the data but in some cases the predicted proportions of delta smelt in the Southeast Delta are much lower than the observed proportions, as shown in Figure 3. In this respect the results for the earlier equations that are shown in Figure 1 are better.

Because of the relatively poor prediction of some proportions the second best fitting equation from the 280 equations considered was also investigated. This equation accounts for 81.66% of the variation in the data. Table 5 shows the full equation and the reduced equation with non-significant terms removed, which accounts for 79.56% of the variation in the data using eight variables. In this case there is somewhat better agreement between the observed and predicted proportions of deltas smelt in the Southeast Delta when the predicted proportions are small, as shown in Figure 4. Also, the full equation shown in Table 5 contains the same variables as the full equation shown in Table 3, and the reduced equation in Table 5 contains the same variables as the very reduced equation in Table 3, except that the temperature variable in Table 3 is MSTP10 while in Table 5 it is Temp, the temperature measured during 20mm surveys.

Figure 5 has the same format as Figure 2, but shows the observed fractions of delta smelt in the Southeast Delta and the predictions from the reduced equations in Tables 4 and 5.

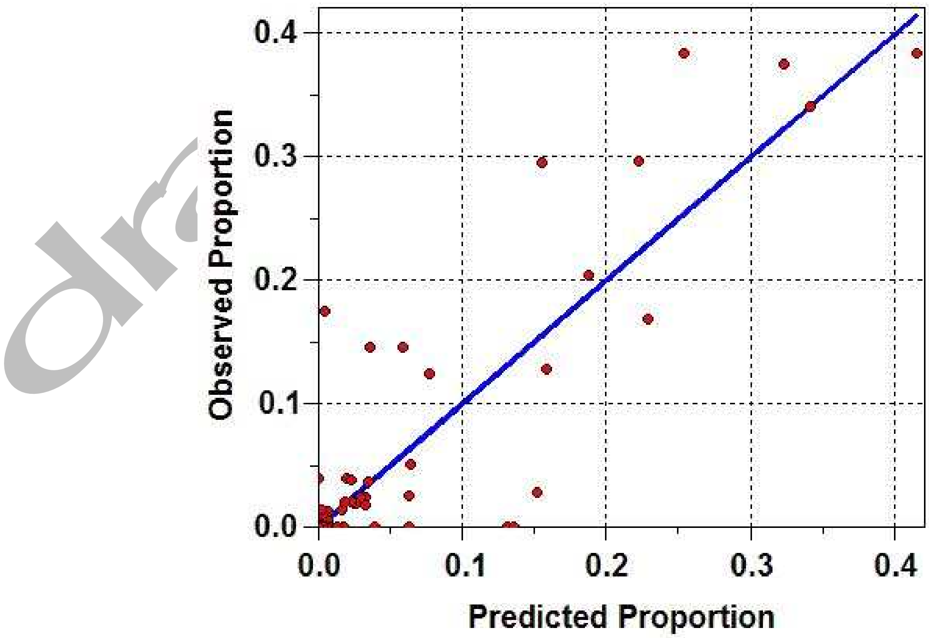

Figure 3. The observed proportions (vertical axes) of delta smelt in the Southeast Delta compared to the predicted proportions (horizontal axes) for the reduced model shown in Table 4.

Table 5. The second best fitting equation from the 280 equations considered, together with the reduced equation obtained by removing insignificant terms.

	Full Equation			%	Reduced Equation			%
	Est	SE	P-Value	Explained	Est	SE	P-Value	Explained
Constant	-3.972	0.340		81.66	-4.350	0.310		79.56
SJR10	-1.329	1.357	0.331		-1.172	0.739	0.117	
OUTFL10	0.779	0.959	0.419		1.035	0.667	0.125	
COMR10	-0.579	1.042	0.580		-1.456	0.572	0.013	
$SJR10^2$	-1.216	2.364	0.609					
$OUTFL10^2$	-4.606	1.961	0.022		-5.263	1.438	0.000	
$COMR10^2$	-4.031	1.490	0.009		-2.621	0.601	0.000	
SJR10.OUTFL10	5.124	2.971	0.089		6.206	1.655	0.000	
SJR10.COMR10	2.685	3.956	0.499					
OUTFL10.COM10	0.993	2.311	0.669					
Temp	-2.008	0.304	0.000		-2.279	0.298	0.000	
$Temp^2$	-0.358	0.142	0.014		-0.448	0.141	0.002	
TopEC	0.030	0.398	0.940					
$TopEC^2$	-0.432	0.461	0.352					
Secchi	0.232	0.132	0.083					
$Secchi^2$	-0.002	0.070	0.977					

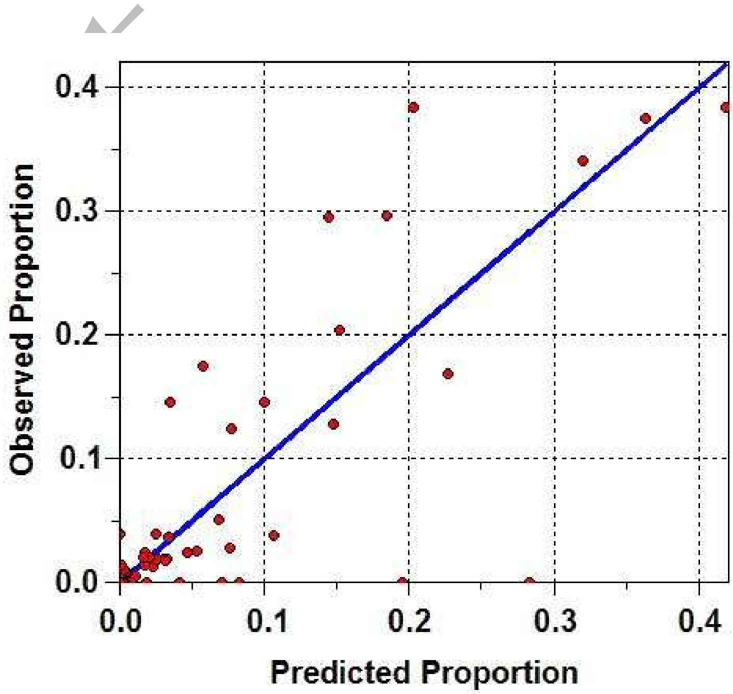

Figure 4. The observed proportions (vertical axes) of delta smelt in the Southeast Delta compared to the predicted proportions (horizontal axes) for the reduced model shown in Table 5.

6. Dealing with the Missing Data 2

Another way to deal with missing values involves estimating missing values for variables using the values for known variables at the same time. There are no missing values for flow variables, 18 missing values for the temperature moving averages ANTP10, MSTP10, RVTP10 and RRTP10, 11 missing values for TopEC, and 10 missing values for Secchi.

To estimate the missing water temperature values, each temperature variable was regressed against the other temperature variables, using all of the available data. Terms not significant at the 5% level were then removed, and any missing values for the dependent variable estimated from the final equation. For example, ANTP10 is only significantly related to RVTP10, so any missing values for ANTP10 were estimated from the regression equation of ANTP10 against RVTP10. This approach allowed all of the missing temperature values to be filled in except for two surveys where three or four of the temperature variables had missing values. Table 6 shows the regression equations used to fill in missing values in this way. The percentages of the variation accounted for by the four equation varied from being quite low at 54.33% to quite high at 79.19%.

For TopEC and Secchi the approach used was different because it was not clear which variables would be best to estimate the missing values. So stepwise regression was used to choose the variables that best accounted for the variation in the available values of these variables. This produced some variables that were not significant at the 5% level. These variables were then removed in order to produce final equations for the estimation of missing values, as shown in Table 6. The percentage of the variation accounted for by the TopEC regression equation was not very high at 45.51%, while the percentage of the variation accounted for by the Secchi regression equation was very low at 20.49%.

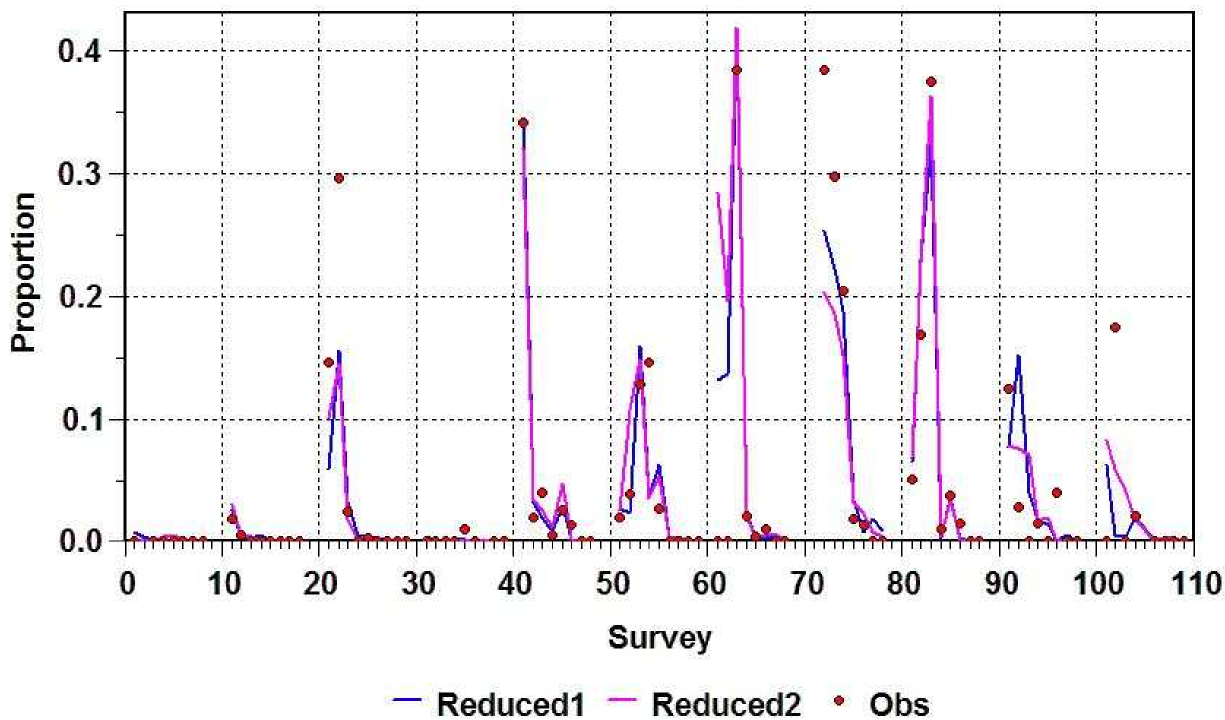

Figure 5. Comparison between the observed fraction of delta smelt in the Southeast Delta (●) and the predicted proportions from the reduced equation shown in Table 4 (Reduced 1), and the reduced equation shown in Table 5 (Reduced2). The survey numbers shown on the horizontal scale are the actual numbers for the first year of data (1995), the actual survey numbers plus 10 in 1996, and so on up to the actual survey numbers plus 100 in 2005. All observed points are plotted on top of the two lines for fitted values.

With the missing values filled in the 700 equations described in Section 2 were estimated again. There were now 94 survey results available in the data set instead of the original 78 survey results that have complete data. There are two equations that account for 82.52% of the variation in the number of delta smelt in the Southeast delta. One involves the three river flow variables SACFR10, OUTFL10 and COMR10, with squares and products, plus the temperature variable ANTP10, TopEC and Secchi, with the squares of these variables. The other equation has the same form but with SJR10 instead of SACFR10 and MSTP10 instead of ANTP10. The second model is the same as the full model shown in Table 3 and is similar to the full model shown in Table 5 except for having a different temperature variable included. Therefore it is the second model that will be considered further here.

Table 6. Regressions used to estimate missing values in the data set. For each regression the estimated coefficients and their standard errors are shown, with significance levels (P-Values) and the percentage of the total variation accounted for.

	Est	SE	P-Value	% Explained
Regression on ANTP10				
Constant	-0.160	0.091		54.33
RVTP10	0.881	0.087	0.000	
Regression for MSTP10				
Constant	-0.239	0.084		61.81
RVTP10	0.956	0.081	0.000	
Regression for RVTP10				
Constant	0.132	0.054		79.19
ANTP10	0.267	0.055	0.000	
MSTP10	0.278	0.060	0.000	
RRTP10	0.305	0.055	0.000	
Regression for RRTP10				
Constant	-0.176	0.088		59.71
RVTP10	0.954	0.084	0.000	
Regression for TopEC				
Constant	0.117	0.086		45.51
SJR10	-1.494	0.219	0.000	
SACFR10	-2.508	0.385	0.000	
OUTFL10	4.492	0.636	0.000	
Regression for Secchi				
Constant	-0.120	0.104		20.49
MSTP10	-0.352	0.087	0.000	
COMR10	-0.422	0.122	0.001	

Table 7 shows the estimated regression coefficients for the second model and for the reduced model with non-significant terms removed. Figure 6 shows how the observed and fitted proportions of delta smelt in the Southeast Delta compare, and Figure 7 shows the observed predicted proportions plotted against the survey numbers. These figures are similar to Figures 1 and 2 that are based only on the results for surveys without any missing data.

Table 7. One of the two best fitting equations from 700 equations including effects for three flow variables, one temperature variable, and none, one or two of the variables TopEC and Secchi. The models were fitted to the data with missing values replaced by estimated values.

	Full Equation			%	Reduced Equation			%
	Est	SE	P-Value	Explained	Est	SE	P-Value	Explained
Constant	-4.038	0.427		82.52	-4.152	0.338		79.70
SJR10	-1.529	1.314	0.248		-1.411	0.662	0.036	
OUTFL10	2.971	0.821	0.001		2.208	0.584	0.000	
COMR10	-2.495	0.938	0.009		-2.035	0.550	0.000	
SJR10S	-0.152	2.594	0.953					
OUTFL10S	-8.321	1.936	0.000		-6.233	1.102	0.000	
COMR10S	-3.382	1.320	0.012		-4.433	0.832	0.000	
SJR10.OUTFL10	8.699	3.508	0.015		5.576	1.389	0.000	
SJR10.COMRF10	-1.296	3.536	0.715					
OUTFL10.COMRF10	3.374	2.209	0.131		3.962	1.641	0.018	
MSTP10	-2.425	0.338	0.000		-2.564	0.307	0.000	
MSTP10S	-0.739	0.112	0.000		-0.743	0.110	0.000	
TopEC	0.827	0.367	0.027					
TopECS	-0.442	0.334	0.190					
Secchi	0.082	0.143	0.568					
SecchiS	-0.121	0.070	0.088					

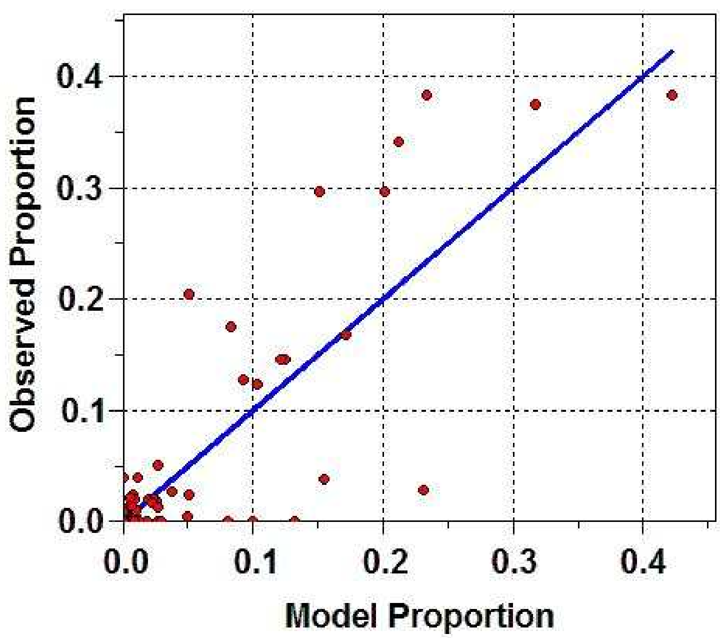

Figure 6. The observed proportions (vertical axes) of delta smelt in the Southeast Delta compared to the predicted proportions (horizontal axes) for the reduced model shown in Table 7.

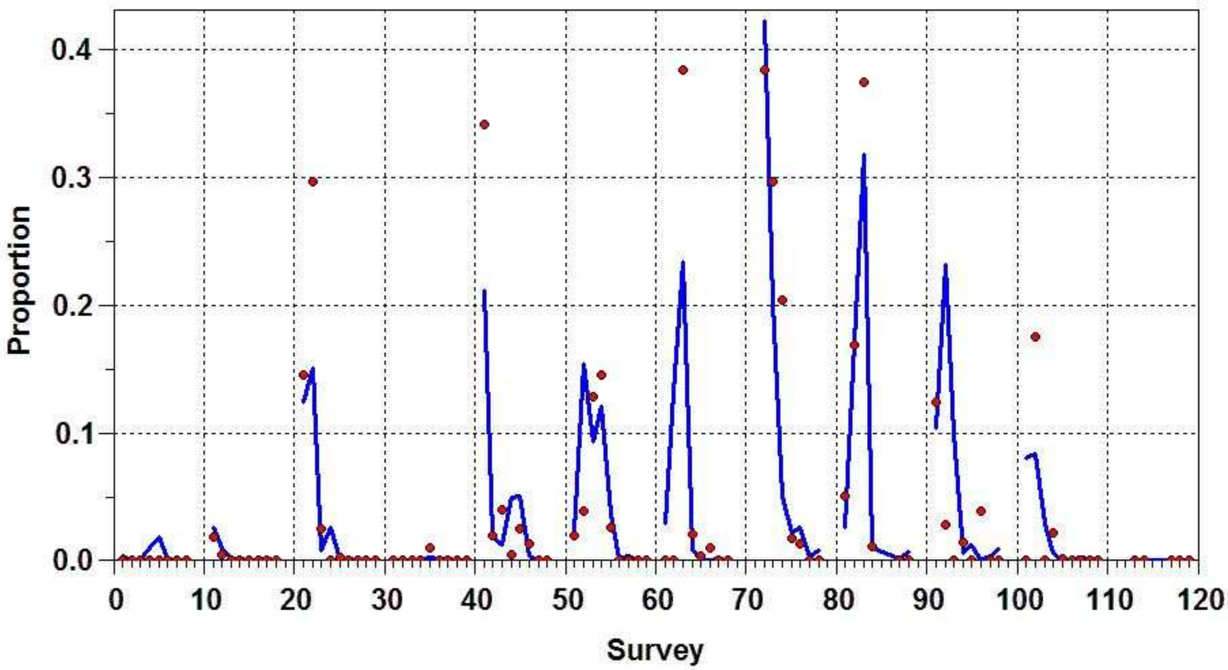

Figure 7. Comparison between the observed fraction of delta smelt in the Southeast Delta (●) and the predicted proportions from the reduced equation shown in Table 7 (—). The survey numbers shown on the horizontal scale are the actual numbers for the first year of data (1995), the actual survey numbers plus 10 in 1996, and so on up to the actual survey numbers plus 110 in 2006. All observed points are plotted on top of the line for fitted values.

7. Conclusion

It appears that the proportion of delta smelt in the Southeast Delta can be estimated with fair accuracy, using the very reduced model in Table 3 or the reduced model in Table 7. Both of these models involve the three river flow variables SJR10, OUTFL10 and COMR10 which have no missing values, and the temperature variable MSTP10, which only has four missing values. Either model appears to account for about 80% of the variation in the data. Given the small number of missing values for MSTP10 it seems that the reduced model in Table 7 is probably the best one to use for prediction purposes.

References

McCullagh, P. and Nelder, J.A. (1989). *Generalized Linear Models*. Chapman and Hall, London.

Metropolitan (2007). *Analysis of Environmental Correlates of Relative Delta Smelt Abundance in Southeast Delta*. Report from the Metropolitan Water District of Southern California.

Appendix A: The 700 Models Considered

There are 45 variables as defined on the left-hand side of the following table, with squared terms shown as SJR10.SJR10, for example. The right-hand side shows the model number, the percentage of variation accounted for (% Exp), and the variable numbers included in the equation. The models are listed in the order of the amount of variation accounted for, with the best model (top row) accounting for 83.37% of the variation in the estimated number of delta smelt in the Southeast Delta.

				Variables in the Model														
	Variable	Model	% Exp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	SACFR10	617	83.37	2	4	7	9	11	14	22	25	32	37	41	44	46	45	47
2	SJR10	600	82.72	1	2	7	8	9	14	15	20	25	37	41	44	46	45	47
3	RIO10	616	82.29	2	4	6	9	11	13	22	24	31	37	41	44	46	45	47
4	OUTFL10	574	82.01	1	5	7	8	12	14	18	20	34	36	40	44	46	45	47
5	QWEST10	614	81.95	2	3	7	9	10	14	21	25	29	37	41	44	46	45	47
6	XGEO10	267	81.76	2	4	7	9	11	14	22	25	32	37	41	44	46		
7	COMR10	442	81.49	2	4	7	9	11	14	22	25	32	37	41	45	47		
8	SACFR10.SACFR10	425	81.30	1	2	7	8	9	14	15	20	25	37	41	45	47		
9	SJR10.SJR10	264	81.07	2	3	7	9	10	14	21	25	29	37	41	44	46		
10	RIO10.RIO10	250	81.01	1	2	7	8	9	14	15	20	25	37	41	44	46		
11	OUTFL10.OUTFL10	598	80.85	1	2	5	8	9	12	15	18	23	37	41	44	46	45	47
12	QWEST10.QWEST10	588	80.82	3	4	7	10	11	14	26	29	32	36	40	44	46	45	47
13	XGEO10.XGEO10	572	80.69	1	4	7	8	11	14	17	20	32	36	40	44	46	45	47
14	COMR10.COMR10	609	80.59	1	5	7	8	12	14	18	20	34	37	41	44	46	45	47
15	SACFR10.SJR10	439	80.37	2	3	7	9	10	14	21	25	29	37	41	45	47		
16	SACFR10.RIO10	224	80.35	1	5	7	8	12	14	18	20	34	36	40	44	46		
17	SACFR10.OUTFL10	611	80.32	2	3	4	9	10	11	21	22	26	37	41	44	46	45	47
18	SACFR10.QWEST10	613	80.32	2	3	6	9	10	13	21	24	28	37	41	44	46	45	47
19	SACFR10.XGEO10	599	80.31	1	2	6	8	9	13	15	19	24	37	41	44	46	45	47
20	SACFR10.COMR10	619	80.27	2	5	7	9	12	14	23	25	34	37	41	44	46	45	47
21	SJR10.RIO10	593	80.24	4	5	7	11	12	14	30	32	34	36	40	44	46	45	47
22	SJR10.OUTFL10	590	80.17	3	5	7	10	12	14	27	29	34	36	40	44	46	45	47
23	SJR10.QWEST10	615	80.08	2	4	5	9	11	12	22	23	30	37	41	44	46	45	47
24	SJR10.XGEO10	612	80.06	2	3	5	9	10	12	21	23	27	37	41	44	46	45	47
25	SJR10.COMR10	92	80.04	2	4	7	9	11	14	22	25	32	37	41				
26	RIO10.OUTFL10	607	80.03	1	4	7	8	11	14	17	20	32	37	41	44	46	45	47
27	RIO10.QWEST10	597	79.98	1	2	4	8	9	11	15	17	22	37	41	44	46	45	47
28	RIO10.XGEO10	238	79.93	3	4	7	10	11	14	26	29	32	36	40	44	46		
29	RIO10.COMR10	75	79.73	1	2	7	8	9	14	15	20	25	37	41				
30	OUTFL10.QWEST10	222	79.65	1	4	7	8	11	14	17	20	32	36	40	44	46		
31	OUTFL10.XGEO10	644	79.62	1	5	7	8	12	14	18	20	34	38	42	44	46	45	47
32	OUTFL10.COMR10	584	79.55	2	5	7	9	12	14	23	25	34	36	40	44	46	45	47

33	QWEST10.XGEO10	621	79.50	3	4	5	10	11	12	26	27	30	37	41	44	46	45	47
34	QWEST10.COMR10	89	79.42	2	3	7	9	10	14	21	25	29	37	41				
35	XGEO10.COMR10	658	79.41	3	4	7	10	11	14	26	29	32	38	42	44	46	45	47
36	ANTP10	432	79.37	1	4	7	8	11	14	17	20	32	37	41	45	47		
37	MSTP10	243	79.33	4	5	7	11	12	14	30	32	34	36	40	44	46		
38	RVTP10	240	79.27	3	5	7	10	12	14	27	29	34	36	40	44	46		
39	RRTP10	623	79.23	3	4	7	10	11	14	26	29	32	37	41	44	46	45	47
40	ANTP10.ANTP10	642	79.10	1	4	7	8	11	14	17	20	32	38	42	44	46	45	47
41	MSTP10.MSTP10	422	79.09	1	2	4	8	9	11	15	17	22	37	41	45	47		
42	RVTP10.RVTP10	397	79.05	1	4	7	8	11	14	17	20	32	36	40	45	47		
43	RRTP10.RRTP10	618	79.05	2	5	6	9	12	13	23	24	33	37	41	44	46	45	47
44	TopEC	575	79.04	1	6	7	8	13	14	19	20	35	36	40	44	46	45	47
45	Secchi	399	79.03	1	5	7	8	12	14	18	20	34	36	40	45	47		
46	TopEC.TopEC	591	79.01	3	6	7	10	13	14	28	29	35	36	40	44	46	45	47
47	Secchi.Secchi	569	78.99	1	3	7	8	10	14	16	20	29	36	40	44	46	45	47
		620	78.92	2	6	7	9	13	14	24	25	35	37	41	44	46	45	47
		423	78.90	1	2	5	8	9	12	15	18	23	37	41	45	47		
		261	78.88	2	3	4	9	10	11	21	22	26	37	41	44	46		
		257	78.87	1	4	7	8	11	14	17	20	32	37	41	44	46		
		259	78.83	1	5	7	8	12	14	18	20	34	37	41	44	46		
		271	78.82	3	4	5	10	11	12	26	27	30	37	41	44	46		
		269	78.78	2	5	7	9	12	14	23	25	34	37	41	44	46		
		444	78.78	2	5	7	9	12	14	23	25	34	37	41	45	47		
		663	78.77	4	5	7	11	12	14	30	32	34	38	42	44	46	45	47
		434	78.67	1	5	7	8	12	14	18	20	34	37	41	45	47		
		656	78.66	3	4	5	10	11	12	26	27	30	38	42	44	46	45	47
		248	78.64	1	2	5	8	9	12	15	18	23	37	41	44	46		
		660	78.62	3	5	7	10	12	14	27	29	34	38	42	44	46	45	47
		265	78.61	2	4	5	9	11	12	22	23	30	37	41	44	46		
		262	78.52	2	3	5	9	10	12	21	23	27	37	41	44	46		
		47	78.52	1	4	7	8	11	14	17	20	32	36	40				
		306	78.47	3	4	5	10	11	12	26	27	30	38	42	44	46		
		270	78.46	2	6	7	9	13	14	24	25	35	37	41	44	46		
		565	78.43	1	2	7	8	9	14	15	20	25	36	40	44	46	45	47
		82	78.42	1	4	7	8	11	14	17	20	32	37	41				
		292	78.41	1	4	7	8	11	14	17	20	32	38	42	44	46		
		234	78.40	2	5	7	9	12	14	23	25	34	36	40	44	46		
		49	78.39	1	5	7	8	12	14	18	20	34	36	40				
		626	78.33	3	6	7	10	13	14	28	29	35	37	41	44	46	45	47
		622	78.30	3	4	6	10	11	13	26	28	31	37	41	44	46	45	47
		604	78.28	1	3	7	8	10	14	16	20	29	37	41	44	46	45	47
		308	78.28	3	4	7	10	11	14	26	29	32	38	42	44	46		
		436	78.24	2	3	4	9	10	11	21	22	26	37	41	45	47		

294	78.22	1	5	7	8	12	14	18	20	34	38	42	44	46		
441	78.22	2	4	6	9	11	13	22	24	31	37	41	45	47		
646	78.21	2	3	4	9	10	11	21	22	26	38	42	44	46	45	47
586	78.15	3	4	5	10	11	12	26	27	30	36	40	44	46	45	47
633	78.10	1	2	5	8	9	12	15	18	23	38	42	44	46	45	47
394	78.09	1	3	7	8	10	14	16	20	29	36	40	45	47		
409	78.06	2	5	7	9	12	14	23	25	34	36	40	45	47		
624	78.05	3	5	6	10	12	13	27	28	33	37	41	44	46	45	47
628	78.01	4	5	7	11	12	14	30	32	34	37	41	44	46	45	47
627	78.01	4	5	6	11	12	13	30	31	33	37	41	44	46	45	47
447	77.96	3	4	6	10	11	13	26	28	31	37	41	45	47		
440	77.94	2	4	5	9	11	12	22	23	30	37	41	45	47		
437	77.93	2	3	5	9	10	12	21	23	27	37	41	45	47		
94	77.93	2	5	7	9	12	14	23	25	34	37	41				
467	77.91	1	4	7	8	11	14	17	20	32	38	42	45	47		
416	77.91	3	6	7	10	13	14	28	29	35	36	40	45	47		
582	77.90	2	4	7	9	11	14	22	25	32	36	40	44	46	45	47
649	77.89	2	3	7	9	10	14	21	25	29	38	42	44	46	45	47
429	77.86	1	3	7	8	10	14	16	20	29	37	41	45	47		
579	77.84	2	3	7	9	10	14	21	25	29	36	40	44	46	45	47
647	77.83	2	3	5	9	10	12	21	23	27	38	42	44	46	45	47
236	77.83	3	4	5	10	11	12	26	27	30	36	40	44	46		
650	77.83	2	4	5	9	11	12	22	23	30	38	42	44	46	45	47
635	77.82	1	2	7	8	9	14	15	20	25	38	42	44	46	45	47
445	77.78	2	6	7	9	13	14	24	25	35	37	41	45	47		
400	77.77	1	6	7	8	13	14	19	20	35	36	40	45	47		
458	77.73	1	2	5	8	9	12	15	18	23	38	42	45	47		
446	77.70	3	4	5	10	11	12	26	27	30	37	41	45	47		
451	77.70	3	6	7	10	13	14	28	29	35	37	41	45	47		
449	77.68	3	5	6	10	12	13	27	28	33	37	41	45	47		
652	77.67	2	4	7	9	11	14	22	25	32	38	42	44	46	45	47
313	77.67	4	5	7	11	12	14	30	32	34	38	42	44	46		
594	77.67	4	6	7	11	13	14	31	32	35	36	40	44	46	45	47
268	77.67	2	5	6	9	12	13	23	24	33	37	41	44	46		
266	77.66	2	4	6	9	11	13	22	24	31	37	41	44	46		
625	77.64	3	5	7	10	12	14	27	29	34	37	41	44	46	45	47
438	77.62	2	3	6	9	10	13	21	24	28	37	41	45	47		
452	77.61	4	5	6	11	12	13	30	31	33	37	41	45	47		
573	77.55	1	5	6	8	12	13	18	19	33	36	40	44	46	45	47
310	77.55	3	5	7	10	12	14	27	29	34	38	42	44	46		
610	77.52	1	6	7	8	13	14	19	20	35	37	41	44	46	45	47
413	77.51	3	4	7	10	11	14	26	29	32	36	40	45	47		
296	77.51	2	3	4	9	10	11	21	22	26	38	42	44	46		

608	77.46	1	5	6	8	12	13	18	19	33	37	41	44	46	45	47
254	77.43	1	3	7	8	10	14	16	20	29	37	41	44	46		
95	77.43	2	6	7	9	13	14	24	25	35	37	41				
117	77.43	1	4	7	8	11	14	17	20	32	38	42				
59	77.42	2	5	7	9	12	14	23	25	34	36	40				
390	77.35	1	2	7	8	9	14	15	20	25	36	40	45	47		
596	77.34	1	2	3	8	9	10	15	16	21	37	41	44	46	45	47
84	77.33	1	5	7	8	12	14	18	20	34	37	41				
273	77.31	3	4	7	10	11	14	26	29	32	37	41	44	46		
443	77.30	2	5	6	9	12	13	23	24	33	37	41	45	47		
283	77.29	1	2	5	8	9	12	15	18	23	38	42	44	46		
471	77.29	2	3	4	9	10	11	21	22	26	38	42	45	47		
587	77.26	3	4	6	10	11	13	26	28	31	36	40	44	46	45	47
589	77.22	3	5	6	10	12	13	27	28	33	36	40	44	46	45	47
79	77.18	1	3	7	8	10	14	16	20	29	37	41				
63	77.17	3	4	7	10	11	14	26	29	32	36	40				
469	77.15	1	5	7	8	12	14	18	20	34	38	42	45	47		
592	77.14	4	5	6	11	12	13	30	31	33	36	40	44	46	45	47
73	77.11	1	2	5	8	9	12	15	18	23	37	41				
108	77.10	1	2	5	8	9	12	15	18	23	38	42				
299	77.09	2	3	7	9	10	14	21	25	29	38	42	44	46		
632	77.06	1	2	4	8	9	11	15	17	22	38	42	44	46	45	47
219	77.05	1	3	7	8	10	14	16	20	29	36	40	44	46		
460	77.05	1	2	7	8	9	14	15	20	25	38	42	45	47		
300	77.02	2	4	5	9	11	12	22	23	30	38	42	44	46		
424	77.01	1	2	6	8	9	13	15	19	24	37	41	45	47		
96	77.00	3	4	5	10	11	12	26	27	30	37	41				
297	76.99	2	3	5	9	10	12	21	23	27	38	42	44	46		
86	76.97	2	3	4	9	10	11	21	22	26	37	41				
418	76.92	4	5	7	11	12	14	30	32	34	36	40	45	47		
229	76.90	2	3	7	9	10	14	21	25	29	36	40	44	46		
419	76.89	4	6	7	11	13	14	31	32	35	36	40	45	47		
472	76.89	2	3	5	9	10	12	21	23	27	38	42	45	47		
415	76.88	3	5	7	10	12	14	27	29	34	36	40	45	47		
563	76.87	1	2	5	8	9	12	15	18	23	36	40	44	46	45	47
475	76.86	2	4	5	9	11	12	22	23	30	38	42	45	47		
645	76.84	1	6	7	8	13	14	19	20	35	38	42	44	46	45	47
474	76.84	2	3	7	9	10	14	21	25	29	38	42	45	47		
654	76.83	2	5	7	9	12	14	23	25	34	38	42	44	46	45	47
435	76.80	1	6	7	8	13	14	19	20	35	37	41	45	47		
433	76.80	1	5	6	8	12	13	18	19	33	37	41	45	47		
215	76.79	1	2	7	8	9	14	15	20	25	36	40	44	46		
448	76.77	3	4	7	10	11	14	26	29	32	37	41	45	47		

44	76.76	1	3	7	8	10	14	16	20	29	36	40				
407	76.73	2	4	7	9	11	14	22	25	32	36	40	45	47		
247	76.73	1	2	4	8	9	11	15	17	22	37	41	44	46		
653	76.72	2	5	6	9	12	13	23	24	33	38	42	44	46	45	47
477	76.71	2	4	7	9	11	14	22	25	32	38	42	45	47		
404	76.68	2	3	7	9	10	14	21	25	29	36	40	45	47		
121	76.67	2	3	4	9	10	11	21	22	26	38	42				
661	76.63	3	6	7	10	13	14	28	29	35	38	42	44	46	45	47
285	76.63	1	2	7	8	9	14	15	20	25	38	42	44	46		
68	76.60	4	5	7	11	12	14	30	32	34	36	40				
90	76.58	2	4	5	9	11	12	22	23	30	37	41				
65	76.57	3	5	7	10	12	14	27	29	34	36	40				
87	76.51	2	3	5	9	10	12	21	23	27	37	41				
478	76.51	2	5	6	9	12	13	23	24	33	38	42	45	47		
119	76.49	1	5	7	8	12	14	18	20	34	38	42				
639	76.46	1	3	7	8	10	14	16	20	29	38	42	44	46	45	47
576	76.46	2	3	4	9	10	11	21	22	26	36	40	44	46	45	47
278	76.43	4	5	7	11	12	14	30	32	34	37	41	44	46		
232	76.41	2	4	7	9	11	14	22	25	32	36	40	44	46		
479	76.38	2	5	7	9	12	14	23	25	34	38	42	45	47		
564	76.36	1	2	6	8	9	13	15	19	24	36	40	44	46	45	47
246	76.36	1	2	3	8	9	10	15	16	21	37	41	44	46		
304	76.35	2	5	7	9	12	14	23	25	34	38	42	44	46		
302	76.34	2	4	7	9	11	14	22	25	32	38	42	44	46		
412	76.32	3	4	6	10	11	13	26	28	31	36	40	45	47		
581	76.25	2	4	6	9	11	13	22	24	31	36	40	44	46	45	47
124	76.24	2	3	7	9	10	14	21	25	29	38	42				
414	76.20	3	5	6	10	12	13	27	28	33	36	40	45	47		
40	76.19	1	2	7	8	9	14	15	20	25	36	40				
580	76.17	2	4	5	9	11	12	22	23	30	36	40	44	46	45	47
275	76.16	3	5	7	10	12	14	27	29	34	37	41	44	46		
122	76.16	2	3	5	9	10	12	21	23	27	38	42				
125	76.14	2	4	5	9	11	12	22	23	30	38	42				
110	76.14	1	2	7	8	9	14	15	20	25	38	42				
577	76.12	2	3	5	9	10	12	21	23	27	36	40	44	46	45	47
457	76.12	1	2	4	8	9	11	15	17	22	38	42	45	47		
417	76.11	4	5	6	11	12	13	30	31	33	36	40	45	47		
651	76.11	2	4	6	9	11	13	22	24	31	38	42	44	46	45	47
93	76.10	2	5	6	9	12	13	23	24	33	37	41				
603	76.08	1	3	6	8	10	13	16	19	28	37	41	44	46	45	47
421	76.06	1	2	3	8	9	10	15	16	21	37	41	45	47		
483	76.03	3	4	7	10	11	14	26	29	32	38	42	45	47		
129	76.02	2	5	7	9	12	14	23	25	34	38	42				

562	76.02	1	2	4	8	9	11	15	17	22	36	40	44	46	45	47
303	75.98	2	5	6	9	12	13	23	24	33	38	42	44	46		
54	75.94	2	3	7	9	10	14	21	25	29	36	40				
91	75.88	2	4	6	9	11	13	22	24	31	37	41				
481	75.87	3	4	5	10	11	12	26	27	30	38	42	45	47		
568	75.78	1	3	6	8	10	13	16	19	28	36	40	44	46	45	47
72	75.78	1	2	4	8	9	11	15	17	22	37	41				
127	75.72	2	4	7	9	11	14	22	25	32	38	42				
411	75.72	3	4	5	10	11	12	26	27	30	36	40	45	47		
226	75.70	2	3	4	9	10	11	21	22	26	36	40	44	46		
583	75.65	2	5	6	9	12	13	23	24	33	36	40	44	46	45	47
128	75.64	2	5	6	9	12	13	23	24	33	38	42				
289	75.63	1	3	7	8	10	14	16	20	29	38	42	44	46		
453	75.63	4	5	7	11	12	14	30	32	34	37	41	45	47		
398	75.59	1	5	6	8	12	13	18	19	33	36	40	45	47		
629	75.59	4	6	7	11	13	14	31	32	35	37	41	44	46	45	47
57	75.57	2	4	7	9	11	14	22	25	32	36	40				
71	75.49	1	2	3	8	9	10	15	16	21	37	41				
263	75.48	2	3	6	9	10	13	21	24	28	37	41	44	46		
213	75.44	1	2	5	8	9	12	15	18	23	36	40	44	46		
131	75.41	3	4	5	10	11	12	26	27	30	38	42				
655	75.41	2	6	7	9	13	14	24	25	35	38	42	44	46	45	47
578	75.40	2	3	6	9	10	13	21	24	28	36	40	44	46	45	47
230	75.38	2	4	5	9	11	12	22	23	30	36	40	44	46		
464	75.38	1	3	7	8	10	14	16	20	29	38	42	45	47		
450	75.34	3	5	7	10	12	14	27	29	34	37	41	45	47		
470	75.33	1	6	7	8	13	14	19	20	35	38	42	45	47		
98	75.30	3	4	7	10	11	14	26	29	32	37	41				
664	75.30	4	6	7	11	13	14	31	32	35	38	42	44	46	45	47
227	75.30	2	3	5	9	10	12	21	23	27	36	40	44	46		
133	75.29	3	4	7	10	11	14	26	29	32	38	42				
567	75.29	1	3	5	8	10	12	16	18	27	36	40	44	46	45	47
225	75.28	1	6	7	8	13	14	19	20	35	36	40	44	46		
249	75.27	1	2	6	8	9	13	15	19	24	37	41	44	46		
585	75.26	2	6	7	9	13	14	24	25	35	36	40	44	46	45	47
566	75.26	1	3	4	8	10	11	16	17	26	36	40	44	46	45	47
61	75.24	3	4	5	10	11	12	26	27	30	36	40				
241	75.19	3	6	7	10	13	14	28	29	35	36	40	44	46		
657	75.18	3	4	6	10	11	13	26	28	31	38	42	44	46	45	47
488	75.15	4	5	7	11	12	14	30	32	34	38	42	45	47		
235	75.12	2	6	7	9	13	14	24	25	35	36	40	44	46		
485	75.11	3	5	7	10	12	14	27	29	34	38	42	45	47		
454	75.11	4	6	7	11	13	14	31	32	35	37	41	45	47		

480	75.09	2	6	7	9	13	14	24	25	35	38	42	45	47		
244	75.05	4	6	7	11	13	14	31	32	35	36	40	44	46		
570	75.02	1	4	5	8	11	12	17	18	30	36	40	44	46	45	47
295	74.97	1	6	7	8	13	14	19	20	35	38	42	44	46		
276	74.93	3	6	7	10	13	14	28	29	35	37	41	44	46		
486	74.91	3	6	7	10	13	14	28	29	35	38	42	45	47		
410	74.90	2	6	7	9	13	14	24	25	35	36	40	45	47		
643	74.89	1	5	6	8	12	13	18	19	33	38	42	44	46	45	47
69	74.89	4	6	7	11	13	14	31	32	35	36	40				
305	74.84	2	6	7	9	13	14	24	25	35	38	42	44	46		
66	74.84	3	6	7	10	13	14	28	29	35	36	40				
388	74.82	1	2	5	8	9	12	15	18	23	36	40	45	47		
50	74.81	1	6	7	8	13	14	19	20	35	36	40				
88	74.75	2	3	6	9	10	13	21	24	28	37	41				
387	74.75	1	2	4	8	9	11	15	17	22	36	40	45	47		
114	74.71	1	3	7	8	10	14	16	20	29	38	42				
659	74.68	3	5	6	10	12	13	27	28	33	38	42	44	46	45	47
662	74.65	4	5	6	11	12	13	30	31	33	38	42	44	46	45	47
606	74.64	1	4	6	8	11	13	17	19	31	37	41	44	46	45	47
602	74.61	1	3	5	8	10	12	16	18	27	37	41	44	46	45	47
60	74.59	2	6	7	9	13	14	24	25	35	36	40				
687	74.57	2	4	7	9	11	14	22	25	32	39	43	44	46	45	47
311	74.55	3	6	7	10	13	14	28	29	35	38	42	44	46		
601	74.55	1	3	4	8	10	11	16	17	26	37	41	44	46	45	47
301	74.49	2	4	6	9	11	13	22	24	31	38	42	44	46		
101	74.48	3	6	7	10	13	14	28	29	35	37	41				
135	74.42	3	5	7	10	12	14	27	29	34	38	42				
138	74.40	4	5	7	11	12	14	30	32	34	38	42				
103	74.39	4	5	7	11	12	14	30	32	34	37	41				
408	74.39	2	5	6	9	12	13	23	24	33	36	40	45	47		
512	74.38	2	4	7	9	11	14	22	25	32	39	43	45	47		
634	74.37	1	2	6	8	9	13	15	19	24	38	42	44	46	45	47
571	74.33	1	4	6	8	11	13	17	19	31	36	40	44	46	45	47
605	74.31	1	4	5	8	11	12	17	18	30	37	41	44	46	45	47
427	74.30	1	3	5	8	10	12	16	18	27	37	41	45	47		
260	74.20	1	6	7	8	13	14	19	20	35	37	41	44	46		
130	74.19	2	6	7	9	13	14	24	25	35	38	42				
426	74.18	1	3	4	8	10	11	16	17	26	37	41	45	47		
100	74.16	3	5	7	10	12	14	27	29	34	37	41				
233	74.16	2	5	6	9	12	13	23	24	33	36	40	44	46		
638	74.13	1	3	6	8	10	13	16	19	28	38	42	44	46	45	47
401	74.13	2	3	4	9	10	11	21	22	26	36	40	45	47		
392	74.11	1	3	5	8	10	12	16	18	27	36	40	45	47		

38	74.10	1	2	5	8	9	12	15	18	23	36	40				
391	74.06	1	3	4	8	10	11	16	17	26	36	40	45	47		
74	74.04	1	2	6	8	9	13	15	19	24	37	41				
282	74.02	1	2	4	8	9	11	15	17	22	38	42	44	46		
482	74.02	3	4	6	10	11	13	26	28	31	38	42	45	47		
430	74.01	1	4	5	8	11	12	17	18	30	37	41	45	47		
696	74.01	3	6	7	10	13	14	28	29	35	39	43	44	46	45	47
681	73.98	2	3	4	9	10	11	21	22	26	39	43	44	46	45	47
595	73.97	5	6	7	12	13	14	33	34	35	36	40	44	46	45	47
684	73.94	2	3	7	9	10	14	21	25	29	39	43	44	46	45	47
395	73.93	1	4	5	8	11	12	17	18	30	36	40	45	47		
648	73.92	2	3	6	9	10	13	21	24	28	38	42	44	46	45	47
561	73.91	1	2	3	8	9	10	15	16	21	36	40	44	46	45	47
631	73.87	1	2	3	8	9	10	15	16	21	38	42	44	46	45	47
489	73.87	4	6	7	11	13	14	31	32	35	38	42	45	47		
405	73.85	2	4	5	9	11	12	22	23	30	36	40	45	47		
402	73.81	2	3	5	9	10	12	21	23	27	36	40	45	47		
670	73.77	1	2	7	8	9	14	15	20	25	39	43	44	46	45	47
279	73.71	4	6	7	11	13	14	31	32	35	37	41	44	46		
431	73.70	1	4	6	8	11	13	17	19	31	37	41	45	47		
667	73.69	1	2	4	8	9	11	15	17	22	39	43	44	46	45	47
509	73.68	2	3	7	9	10	14	21	25	29	39	43	45	47		
636	73.68	1	3	4	8	10	11	16	17	26	38	42	44	46	45	47
85	73.67	1	6	7	8	13	14	19	20	35	37	41				
495	73.66	1	2	7	8	9	14	15	20	25	39	43	45	47		
331	73.65	2	3	4	9	10	11	21	22	26	39	43	44	46		
281	73.60	1	2	3	8	9	10	15	16	21	38	42	44	46		
314	73.58	4	6	7	11	13	14	31	32	35	38	42	44	46		
51	73.57	2	3	4	9	10	11	21	22	26	36	40				
220	73.53	1	4	5	8	11	12	17	18	30	36	40	44	46		
556	73.52	3	6	7	10	13	14	28	29	35	44	46	45	47		
680	73.50	1	6	7	8	13	14	19	20	35	39	43	44	46	45	47
245	73.50	5	6	7	12	13	14	33	34	35	36	40	44	46		
216	73.48	1	3	4	8	10	11	16	17	26	36	40	44	46		
640	73.45	1	4	5	8	11	12	17	18	30	38	42	44	46	45	47
468	73.44	1	5	6	8	12	13	18	19	33	38	42	45	47		
217	73.42	1	3	5	8	10	12	16	18	27	36	40	44	46		
685	73.42	2	4	5	9	11	12	22	23	30	39	43	44	46	45	47
682	73.41	2	3	5	9	10	12	21	23	27	39	43	44	46	45	47
484	73.41	3	5	6	10	12	13	27	28	33	38	42	45	47		
58	73.41	2	5	6	9	12	13	23	24	33	36	40				
120	73.40	1	6	7	8	13	14	19	20	35	38	42				
104	73.39	4	6	7	11	13	14	31	32	35	37	41				

487	73.36	4	5	6	11	12	13	30	31	33	38	42	45	47		
637	73.33	1	3	5	8	10	12	16	18	27	38	42	44	46	45	47
284	73.32	1	2	6	8	9	13	15	19	24	38	42	44	46		
211	73.31	1	2	3	8	9	10	15	16	21	36	40	44	46		
255	73.31	1	4	5	8	11	12	17	18	30	37	41	44	46		
286	73.29	1	3	4	8	10	11	16	17	26	38	42	44	46		
668	73.28	1	2	5	8	9	12	15	18	23	39	43	44	46	45	47
337	73.25	2	4	7	9	11	14	22	25	32	39	43	44	46		
55	73.23	2	4	5	9	11	12	22	23	30	36	40				
252	73.23	1	3	5	8	10	12	16	18	27	37	41	44	46		
52	73.18	2	3	5	9	10	12	21	23	27	36	40				
251	73.17	1	3	4	8	10	11	16	17	26	37	41	44	46		
162	73.17	2	4	7	9	11	14	22	25	32	39	43				
406	73.15	2	4	6	9	11	13	22	24	31	36	40	45	47		
307	73.15	3	4	6	10	11	13	26	28	31	38	42	44	46		
290	73.13	1	4	5	8	11	12	17	18	30	38	42	44	46		
689	73.09	2	5	7	9	12	14	23	25	34	39	43	44	46	45	47
80	73.09	1	4	5	8	11	12	17	18	30	37	41				
231	73.09	2	4	6	9	11	13	22	24	31	36	40	44	46		
293	73.05	1	5	6	8	12	13	18	19	33	38	42	44	46		
692	73.05	3	4	6	10	11	13	26	28	31	39	43	44	46	45	47
420	73.04	5	6	7	12	13	14	33	34	35	36	40	45	47		
287	73.03	1	3	5	8	10	12	16	18	27	38	42	44	46		
45	73.02	1	4	5	8	11	12	17	18	30	36	40				
77	73.02	1	3	5	8	10	12	16	18	27	37	41				
335	73.01	2	4	5	9	11	12	22	23	30	39	43	44	46		
334	72.98	2	3	7	9	10	14	21	25	29	39	43	44	46		
691	72.98	3	4	5	10	11	12	26	27	30	39	43	44	46	45	47
332	72.96	2	3	5	9	10	12	21	23	27	39	43	44	46		
42	72.94	1	3	5	8	10	12	16	18	27	36	40				
107	72.93	1	2	4	8	9	11	15	17	22	38	42				
41	72.92	1	3	4	8	10	11	16	17	26	36	40				
461	72.91	1	3	4	8	10	11	16	17	26	38	42	45	47		
76	72.91	1	3	4	8	10	11	16	17	26	37	41				
514	72.89	2	5	7	9	12	14	23	25	34	39	43	45	47		
339	72.89	2	5	7	9	12	14	23	25	34	39	43	44	46		
298	72.88	2	3	6	9	10	13	21	24	28	38	42	44	46		
159	72.83	2	3	7	9	10	14	21	25	29	39	43				
164	72.79	2	5	7	9	12	14	23	25	34	39	43				
521	72.77	3	6	7	10	13	14	28	29	35	39	43	45	47		
665	72.77	5	6	7	12	13	14	33	34	35	38	42	44	46	45	47
641	72.75	1	4	6	8	11	13	17	19	31	38	42	44	46	45	47
465	72.74	1	4	5	8	11	12	17	18	30	38	42	45	47		

70	72.72	5	6	7	12	13	14	33	34	35	36	40				
540	72.67	1	6	7	8	13	14	19	20	35	44	46	45	47		
312	72.65	4	5	6	11	12	13	30	31	33	38	42	44	46		
694	72.61	3	5	6	10	12	13	27	28	33	39	43	44	46	45	47
686	72.61	2	4	6	9	11	13	22	24	31	39	43	44	46	45	47
309	72.61	3	5	6	10	12	13	27	28	33	38	42	44	46		
462	72.60	1	3	5	8	10	12	16	18	27	38	42	45	47		
136	72.59	3	6	7	10	13	14	28	29	35	38	42				
318	72.58	1	2	5	8	9	12	15	18	23	39	43	44	46		
697	72.58	4	5	6	11	12	13	30	31	33	39	43	44	46	45	47
688	72.52	2	5	6	9	12	13	23	24	33	39	43	44	46	45	47
403	72.44	2	3	6	9	10	13	21	24	28	36	40	45	47		
517	72.40	3	4	6	10	11	13	26	28	31	39	43	45	47		
212	72.39	1	2	4	8	9	11	15	17	22	36	40	44	46		
552	72.39	3	4	6	10	11	13	26	28	31	44	46	45	47		
111	72.38	1	3	4	8	10	11	16	17	26	38	42				
338	72.35	2	5	6	9	12	13	23	24	33	39	43	44	46		
277	72.31	4	5	6	11	12	13	30	31	33	37	41	44	46		
115	72.25	1	4	5	8	11	12	17	18	30	38	42				
272	72.24	3	4	6	10	11	13	26	28	31	37	41	44	46		
505	72.22	1	6	7	8	13	14	19	20	35	39	43	45	47		
677	72.22	1	4	7	8	11	14	17	20	32	39	43	44	46	45	47
386	72.20	1	2	3	8	9	10	15	16	21	36	40	45	47		
679	72.17	1	5	7	8	12	14	18	20	34	39	43	44	46	45	47
112	72.16	1	3	5	8	10	12	16	18	27	38	42				
102	72.09	4	5	6	11	12	13	30	31	33	37	41				
274	72.08	3	5	6	10	12	13	27	28	33	37	41	44	46		
36	72.08	1	2	3	8	9	10	15	16	21	36	40				
97	72.06	3	4	6	10	11	13	26	28	31	37	41				
557	72.06	4	5	6	11	12	13	30	31	33	44	46	45	47		
396	72.04	1	4	6	8	11	13	17	19	31	36	40	45	47		
554	72.01	3	5	6	10	12	13	27	28	33	44	46	45	47		
288	72.00	1	3	6	8	10	13	16	19	28	38	42	44	46		
492	71.98	1	2	4	8	9	11	15	17	22	39	43	45	47		
145	71.97	1	2	7	8	9	14	15	20	25	39	43				
320	71.97	1	2	7	8	9	14	15	20	25	39	43	44	46		
693	71.96	3	4	7	10	11	14	26	29	32	39	43	44	46	45	47
315	71.94	5	6	7	12	13	14	33	34	35	38	42	44	46		
519	71.93	3	5	6	10	12	13	27	28	33	39	43	45	47		
389	71.90	1	2	6	8	9	13	15	19	24	36	40	45	47		
99	71.87	3	5	6	10	12	13	27	28	33	37	41				
522	71.86	4	5	6	11	12	13	30	31	33	39	43	45	47		
674	71.81	1	3	7	8	10	14	16	20	29	39	43	44	46	45	47

139	71.75	4	6	7	11	13	14	31	32	35	38	42				
214	71.66	1	2	6	8	9	13	15	19	24	36	40	44	46		
132	71.66	3	4	6	10	11	13	26	28	31	38	42				
228	71.58	2	3	6	9	10	13	21	24	28	36	40	44	46		
341	71.56	3	4	5	10	11	12	26	27	30	39	43	44	46		
630	71.55	5	6	7	12	13	14	33	34	35	37	41	44	46	45	47
56	71.53	2	4	6	9	11	13	22	24	31	36	40				
118	71.50	1	5	6	8	12	13	18	19	33	38	42				
237	71.50	3	4	6	10	11	13	26	28	31	36	40	44	46		
381	71.47	3	6	7	10	13	14	28	29	35	45	47				
242	71.45	4	5	6	11	12	13	30	31	33	36	40	44	46		
678	71.44	1	5	6	8	12	13	18	19	33	39	43	44	46	45	47
336	71.39	2	4	6	9	11	13	22	24	31	39	43	44	46		
223	71.38	1	5	6	8	12	13	18	19	33	36	40	44	46		
377	71.35	3	4	6	10	11	13	26	28	31	45	47				
239	71.31	3	5	6	10	12	13	27	28	33	36	40	44	46		
258	71.30	1	5	6	8	12	13	18	19	33	37	41	44	46		
698	71.27	4	5	7	11	12	14	30	32	34	39	43	44	46	45	47
280	71.26	5	6	7	12	13	14	33	34	35	37	41	44	46		
37	71.16	1	2	4	8	9	11	15	17	22	36	40				
513	71.14	2	5	6	9	12	13	23	24	33	39	43	45	47		
67	71.11	4	5	6	11	12	13	30	31	33	36	40				
163	71.08	2	5	6	9	12	13	23	24	33	39	43				
695	71.08	3	5	7	10	12	14	27	29	34	39	43	44	46	45	47
62	71.08	3	4	6	10	11	13	26	28	31	36	40				
291	71.07	1	4	6	8	11	13	17	19	31	38	42	44	46		
137	71.03	4	5	6	11	12	13	30	31	33	38	42				
134	71.01	3	5	6	10	12	13	27	28	33	38	42				
493	70.99	1	2	5	8	9	12	15	18	23	39	43	45	47		
64	70.95	3	5	6	10	12	13	27	28	33	36	40				
317	70.95	1	2	4	8	9	11	15	17	22	39	43	44	46		
506	70.94	2	3	4	9	10	11	21	22	26	39	43	45	47		
382	70.92	4	5	6	11	12	13	30	31	33	45	47				
156	70.88	2	3	4	9	10	11	21	22	26	39	43				
143	70.88	1	2	5	8	9	12	15	18	23	39	43				
83	70.88	1	5	6	8	12	13	18	19	33	37	41				
551	70.88	3	4	5	10	11	12	26	27	30	44	46	45	47		
379	70.88	3	5	6	10	12	13	27	28	33	45	47				
53	70.77	2	3	6	9	10	13	21	24	28	36	40				
502	70.75	1	4	7	8	11	14	17	20	32	39	43	45	47		
699	70.68	4	6	7	11	13	14	31	32	35	39	43	44	46	45	47
499	70.66	1	3	7	8	10	14	16	20	29	39	43	45	47		
455	70.61	5	6	7	12	13	14	33	34	35	37	41	45	47		

476	70.52	2	4	6	9	11	13	22	24	31	38	42	45	47		
105	70.41	5	6	7	12	13	14	33	34	35	37	41				
503	70.38	1	5	6	8	12	13	18	19	33	39	43	45	47		
324	70.37	1	3	7	8	10	14	16	20	29	39	43	44	46		
48	70.35	1	5	6	8	12	13	18	19	33	36	40				
516	70.32	3	4	5	10	11	12	26	27	30	39	43	45	47		
510	70.20	2	4	5	9	11	12	22	23	30	39	43	45	47		
507	70.18	2	3	5	9	10	12	21	23	27	39	43	45	47		
666	70.15	1	2	3	8	9	10	15	16	21	39	43	44	46	45	47
316	70.13	1	2	3	8	9	10	15	16	21	39	43	44	46		
490	70.11	5	6	7	12	13	14	33	34	35	38	42	45	47		
160	70.09	2	4	5	9	11	12	22	23	30	39	43				
157	70.06	2	3	5	9	10	12	21	23	27	39	43				
39	69.98	1	2	6	8	9	13	15	19	24	36	40				
524	69.87	4	6	7	11	13	14	31	32	35	39	43	45	47		
534	69.81	1	3	7	8	10	14	16	20	29	44	46	45	47		
365	69.75	1	6	7	8	13	14	19	20	35	45	47				
126	69.74	2	4	6	9	11	13	22	24	31	38	42				
201	69.70	3	4	5	10	11	12	26	27	30	44	46				
466	69.67	1	4	6	8	11	13	17	19	31	38	42	45	47		
511	69.61	2	4	6	9	11	13	22	24	31	39	43	45	47		
538	69.60	1	5	6	8	12	13	18	19	33	44	46	45	47		
683	69.54	2	3	6	9	10	13	21	24	28	39	43	44	46	45	47
149	69.54	1	3	7	8	10	14	16	20	29	39	43				
327	69.44	1	4	7	8	11	14	17	20	32	39	43	44	46		
559	69.43	4	6	7	11	13	14	31	32	35	44	46	45	47		
142	69.42	1	2	4	8	9	11	15	17	22	39	43				
166	69.17	3	4	5	10	11	12	26	27	30	39	43				
161	69.11	2	4	6	9	11	13	22	24	31	39	43				
218	68.88	1	3	6	8	10	13	16	19	28	36	40	44	46		
140	68.77	5	6	7	12	13	14	33	34	35	38	42				
456	68.77	1	2	3	8	9	10	15	16	21	38	42	45	47		
333	68.73	2	3	6	9	10	13	21	24	28	39	43	44	46		
546	68.67	2	4	6	9	11	13	22	24	31	44	46	45	47		
346	68.62	3	6	7	10	13	14	28	29	35	39	43	44	46		
526	68.55	1	2	3	8	9	10	15	16	21	44	46	45	47		
106	68.53	1	2	3	8	9	10	15	16	21	38	42				
671	68.53	1	3	4	8	10	11	16	17	26	39	43	44	46	45	47
690	68.48	2	6	7	9	13	14	24	25	35	39	43	44	46	45	47
543	68.47	2	3	6	9	10	13	21	24	28	44	46	45	47		
669	68.45	1	2	6	8	9	13	15	19	24	39	43	44	46	45	47
176	68.41	1	2	3	8	9	10	15	16	21	44	46				
116	68.32	1	4	6	8	11	13	17	19	31	38	42				

672	68.23	1	3	5	8	10	12	16	18	27	39	43	44	46	45	47
152	68.20	1	4	7	8	11	14	17	20	32	39	43				
515	68.12	2	6	7	9	13	14	24	25	35	39	43	45	47		
675	68.11	1	4	5	8	11	12	17	18	30	39	43	44	46	45	47
343	68.08	3	4	7	10	11	14	26	29	32	39	43	44	46		
184	68.03	1	3	7	8	10	14	16	20	29	44	46				
491	67.98	1	2	3	8	9	10	15	16	21	39	43	45	47		
256	67.92	1	4	6	8	11	13	17	19	31	37	41	44	46		
141	67.88	1	2	3	8	9	10	15	16	21	39	43				
221	67.85	1	4	6	8	11	13	17	19	31	36	40	44	46		
329	67.83	1	5	7	8	12	14	18	20	34	39	43	44	46		
193	67.76	2	3	6	9	10	13	21	24	28	44	46				
340	67.76	2	6	7	9	13	14	24	25	35	39	43	44	46		
206	67.69	3	6	7	10	13	14	28	29	35	44	46				
196	67.58	2	4	6	9	11	13	22	24	31	44	46				
330	67.53	1	6	7	8	13	14	19	20	35	39	43	44	46		
348	67.52	4	5	7	11	12	14	30	32	34	39	43	44	46		
376	67.46	3	4	5	10	11	12	26	27	30	45	47				
673	67.42	1	3	6	8	10	13	16	19	28	39	43	44	46	45	47
504	67.41	1	5	7	8	12	14	18	20	34	39	43	45	47		
253	67.38	1	3	6	8	10	13	16	19	28	37	41	44	46		
496	67.38	1	3	4	8	10	11	16	17	26	39	43	45	47		
319	67.37	1	2	6	8	9	13	15	19	24	39	43	44	46		
676	67.37	1	4	6	8	11	13	17	19	31	39	43	44	46	45	47
345	67.37	3	5	7	10	12	14	27	29	34	39	43	44	46		
171	67.36	3	6	7	10	13	14	28	29	35	39	43				
359	67.33	1	3	7	8	10	14	16	20	29	45	47				
165	67.26	2	6	7	9	13	14	24	25	35	39	43				
81	67.25	1	4	6	8	11	13	17	19	31	37	41				
321	67.13	1	3	4	8	10	11	16	17	26	39	43	44	46		
497	67.10	1	3	5	8	10	12	16	18	27	39	43	45	47		
500	67.08	1	4	5	8	11	12	17	18	30	39	43	45	47		
363	67.07	1	5	6	8	12	13	18	19	33	45	47				
384	67.06	4	6	7	11	13	14	31	32	35	45	47				
322	67.00	1	3	5	8	10	12	16	18	27	39	43	44	46		
325	66.95	1	4	5	8	11	12	17	18	30	39	43	44	46		
544	66.86	2	3	7	9	10	14	21	25	29	44	46	45	47		
393	66.81	1	3	6	8	10	13	16	19	28	36	40	45	47		
349	66.69	4	6	7	11	13	14	31	32	35	39	43	44	46		
428	66.68	1	3	6	8	10	13	16	19	28	37	41	45	47		
459	66.62	1	2	6	8	9	13	15	19	24	38	42	45	47		
109	66.59	1	2	6	8	9	13	15	19	24	38	42				
342	66.55	3	4	6	10	11	13	26	28	31	39	43	44	46		

347	66.55	4	5	6	11	12	13	30	31	33	39	43	44	46
508	66.41	2	3	6	9	10	13	21	24	28	39	43	45	47
473	66.38	2	3	6	9	10	13	21	24	28	38	42	45	47
529	66.33	1	2	6	8	9	13	15	19	24	44	46	45	47
123	66.32	2	3	6	9	10	13	21	24	28	38	42		
158	66.28	2	3	6	9	10	13	21	24	28	39	43		
344	66.27	3	5	6	10	12	13	27	28	33	39	43	44	46
26	66.25	3	4	5	10	11	12	26	27	30				
535	66.06	1	4	5	8	11	12	17	18	30	44	46	45	47
146	66.00	1	3	4	8	10	11	16	17	26	39	43		
553	65.99	3	4	7	10	11	14	26	29	32	44	46	45	47
518	65.96	3	4	7	10	11	14	26	29	32	39	43	45	47
531	65.96	1	3	4	8	10	11	16	17	26	44	46	45	47
147	65.91	1	3	5	8	10	12	16	18	27	39	43		
155	65.88	1	6	7	8	13	14	19	20	35	39	43		
150	65.84	1	4	5	8	11	12	17	18	30	39	43		
190	65.84	1	6	7	8	13	14	19	20	35	44	46		
532	65.81	1	3	5	8	10	12	16	18	27	44	46	45	47
167	65.79	3	4	6	10	11	13	26	28	31	39	43		
174	65.78	4	6	7	11	13	14	31	32	35	39	43		
172	65.75	4	5	6	11	12	13	30	31	33	39	43		
207	65.69	4	5	6	11	12	13	30	31	33	44	46		
46	65.66	1	4	6	8	11	13	17	19	31	36	40		
369	65.63	2	3	7	9	10	14	21	25	29	45	47		
169	65.49	3	5	6	10	12	13	27	28	33	39	43		
202	65.46	3	4	6	10	11	13	26	28	31	44	46		
9	65.34	1	3	7	8	10	14	16	20	29				
558	65.33	4	5	7	11	12	14	30	32	34	44	46	45	47
179	65.32	1	2	6	8	9	13	15	19	24	44	46		
523	65.30	4	5	7	11	12	14	30	32	34	39	43	45	47
204	65.24	3	5	6	10	12	13	27	28	33	44	46		
520	65.20	3	5	7	10	12	14	27	29	34	39	43	45	47
537	65.16	1	4	7	8	11	14	17	20	32	44	46	45	47
209	65.11	4	6	7	11	13	14	31	32	35	44	46		
185	65.09	1	4	5	8	11	12	17	18	30	44	46		
555	64.85	3	5	7	10	12	14	27	29	34	44	46	45	47
182	64.82	1	3	5	8	10	12	16	18	27	44	46		
181	64.81	1	3	4	8	10	11	16	17	26	44	46		
494	64.77	1	2	6	8	9	13	15	19	24	39	43	45	47
547	64.62	2	4	7	9	11	14	22	25	32	44	46	45	47
194	64.59	2	3	7	9	10	14	21	25	29	44	46		
144	64.54	1	2	6	8	9	13	15	19	24	39	43		
154	64.51	1	5	7	8	12	14	18	20	34	39	43		

328	64.41	1	5	6	8	12	13	18	19	33	39	43	44	46		
31	64.37	3	6	7	10	13	14	28	29	35						
463	64.26	1	3	6	8	10	13	16	19	28	38	42	45	47		
700	64.21	5	6	7	12	13	14	33	34	35	39	43	44	46	45	47
360	63.81	1	4	5	8	11	12	17	18	30	45	47				
43	63.67	1	3	6	8	10	13	16	19	28	36	40				
501	63.55	1	4	6	8	11	13	17	19	31	39	43	45	47		
32	63.55	4	5	6	11	12	13	30	31	33						
533	63.49	1	3	6	8	10	13	16	19	28	44	46	45	47		
356	63.33	1	3	4	8	10	11	16	17	26	45	47				
113	63.31	1	3	6	8	10	13	16	19	28	38	42				
371	63.31	2	4	6	9	11	13	22	24	31	45	47				
168	63.30	3	4	7	10	11	14	26	29	32	39	43				
27	63.27	3	4	6	10	11	13	26	28	31						
357	63.23	1	3	5	8	10	12	16	18	27	45	47				
21	63.13	2	4	6	9	11	13	22	24	31						
19	63.08	2	3	7	9	10	14	21	25	29						
372	63.08	2	4	7	9	11	14	22	25	32	45	47				
351	63.05	1	2	3	8	9	10	15	16	21	45	47				
29	62.99	3	5	6	10	12	13	27	28	33						
536	62.98	1	4	6	8	11	13	17	19	31	44	46	45	47		
153	62.96	1	5	6	8	12	13	18	19	33	39	43				
78	62.94	1	3	6	8	10	13	16	19	28	37	41				
173	62.81	4	5	7	11	12	14	30	32	34	39	43				
170	62.73	3	5	7	10	12	14	27	29	34	39	43				
350	62.10	5	6	7	12	13	14	33	34	35	39	43	44	46		
525	61.99	5	6	7	12	13	14	33	34	35	39	43	45	47		
10	61.95	1	4	5	8	11	12	17	18	30						
323	61.88	1	3	6	8	10	13	16	19	28	39	43	44	46		
1	61.85	1	2	3	8	9	10	15	16	21						
203	61.81	3	4	7	10	11	14	26	29	32	44	46				
208	61.65	4	5	7	11	12	14	30	32	34	44	46				
539	61.51	1	5	7	8	12	14	18	20	34	44	46	45	47		
7	61.51	1	3	5	8	10	12	16	18	27						
188	61.47	1	5	6	8	12	13	18	19	33	44	46				
6	61.46	1	3	4	8	10	11	16	17	26						
527	61.17	1	2	4	8	9	11	15	17	22	44	46	45	47		
205	61.14	3	5	7	10	12	14	27	29	34	44	46				
34	61.02	4	6	7	11	13	14	31	32	35						
368	60.95	2	3	6	9	10	13	21	24	28	45	47				
326	60.43	1	4	6	8	11	13	17	19	31	39	43	44	46		
18	60.14	2	3	6	9	10	13	21	24	28						
15	60.12	1	6	7	8	13	14	19	20	35						

175	60.10	5	6	7	12	13	14	33	34	35	39	43		
530	59.78	1	2	7	8	9	14	15	20	25	44	46	45	47
362	59.69	1	4	7	8	11	14	17	20	32	45	47		
197	59.66	2	4	7	9	11	14	22	25	32	44	46		
541	59.27	2	3	4	9	10	11	21	22	26	44	46	45	47
545	59.09	2	4	5	9	11	12	22	23	30	44	46	45	47
355	58.93	1	2	7	8	9	14	15	20	25	45	47		
183	58.45	1	3	6	8	10	13	16	19	28	44	46		
542	58.41	2	3	5	9	10	12	21	23	27	44	46	45	47
187	58.10	1	4	7	8	11	14	17	20	32	44	46		
361	58.08	1	4	6	8	11	13	17	19	31	45	47		
498	57.93	1	3	6	8	10	13	16	19	28	39	43	45	47
191	57.81	2	3	4	9	10	11	21	22	26	44	46		
195	57.73	2	4	5	9	11	12	22	23	30	44	46		
22	57.70	2	4	7	9	11	14	22	25	32				
560	57.50	5	6	7	12	13	14	33	34	35	44	46	45	47
151	57.31	1	4	6	8	11	13	17	19	31	39	43		
186	57.02	1	4	6	8	11	13	17	19	31	44	46		
192	56.88	2	3	5	9	10	12	21	23	27	44	46		
13	56.72	1	5	6	8	12	13	18	19	33				
352	56.60	1	2	4	8	9	11	15	17	22	45	47		
354	55.38	1	2	6	8	9	13	15	19	24	45	47		
189	55.13	1	5	7	8	12	14	18	20	34	44	46		
148	55.00	1	3	6	8	10	13	16	19	28	39	43		
4	53.94	1	2	6	8	9	13	15	19	24				
210	53.66	5	6	7	12	13	14	33	34	35	44	46		
383	53.25	4	5	7	11	12	14	30	32	34	45	47		
550	52.93	2	6	7	9	13	14	24	25	35	44	46	45	47
378	52.76	3	4	7	10	11	14	26	29	32	45	47		
12	52.72	1	4	7	8	11	14	17	20	32				
375	52.70	2	6	7	9	13	14	24	25	35	45	47		
380	52.67	3	5	7	10	12	14	27	29	34	45	47		
358	52.63	1	3	6	8	10	13	16	19	28	45	47		
385	52.13	5	6	7	12	13	14	33	34	35	45	47		
177	52.11	1	2	4	8	9	11	15	17	22	44	46		
180	51.71	1	2	7	8	9	14	15	20	25	44	46		
11	51.42	1	4	6	8	11	13	17	19	31				
5	50.76	1	2	7	8	9	14	15	20	25				
8	50.51	1	3	6	8	10	13	16	19	28				
366	49.99	2	3	4	9	10	11	21	22	26	45	47		
2	49.14	1	2	4	8	9	11	15	17	22				
364	49.09	1	5	7	8	12	14	18	20	34	45	47		
548	48.97	2	5	6	9	12	13	23	24	33	44	46	45	47

370	48.93	2	4	5	9	11	12	22	23	30	45	47		
367	48.18	2	3	5	9	10	12	21	23	27	45	47		
16	47.77	2	3	4	9	10	11	21	22	26				
20	47.01	2	4	5	9	11	12	22	23	30				
33	46.74	4	5	7	11	12	14	30	32	34				
528	46.58	1	2	5	8	9	12	15	18	23	44	46	45	47
549	46.29	2	5	7	9	12	14	23	25	34	44	46	45	47
35	46.22	5	6	7	12	13	14	33	34	35				
17	46.07	2	3	5	9	10	12	21	23	27				
30	46.04	3	5	7	10	12	14	27	29	34				
374	45.85	2	5	7	9	12	14	23	25	34	45	47		
28	45.68	3	4	7	10	11	14	26	29	32				
200	45.25	2	6	7	9	13	14	24	25	35	44	46		
25	44.99	2	6	7	9	13	14	24	25	35				
198	41.97	2	5	6	9	12	13	23	24	33	44	46		
373	41.21	2	5	6	9	12	13	23	24	33	45	47		
14	40.30	1	5	7	8	12	14	18	20	34				
178	39.85	1	2	5	8	9	12	15	18	23	44	46		
353	36.18	1	2	5	8	9	12	15	18	23	45	47		
199	34.49	2	5	7	9	12	14	23	25	34	44	46		
24	34.23	2	5	7	9	12	14	23	25	34				
23	32.65	2	5	6	9	12	13	23	24	33				
3	30.13	1	2	5	8	9	12	15	18	23				

Equations for Predicting February to March Salvage

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Contents

1. Introduction

This report concerns the development of equations for predicting the daily salvage numbers in February and March at the Banks and Jones Pumping Plants. It follows similar work described by Manly (2007) which considered only the prediction of Banks salvage numbers, and reports referenced in that earlier report..

The Variables

The variables considered for the prediction of daily salvage numbers in February and March described in Table 1 below. For use with model fitting each of these variables other than LnNov1 were standardized to have a mean of zero and a standard deviation of one for all available daily data values for the period from January 1, 1991 to April 30, 2007. The standardization therefore involved replacing each observed value x by $x' = (x - \bar{x})/s$, where $\bar{x}$ is the mean and s is the standard deviation of x for this period. Table 2 gives a summary of the distributions of the variables for the full period.

For all analyses described here the salvage numbers on a day are estimated using the values of the explanatory variables up to and including the day before the salvage day, with up to 14 day moving averages for the explanatory variables. For example, to estimate the salvage numbers on day i the explanatory variables measured on day i - 1 are used when there is no averaging, while if there is 14 day averaging then the explanatory variables are averaged for 14 days up to and including day i - 1 are used.

The daily salvage numbers at both the Banks and Jones Pumping Plants appear to be related to all of the variables, with the highest values for salvage occurring with high values of lnNov1, with low values of COMRF, RIO, SJR, CCET, CCETM, WEST, SSDSac and SSDSJ, and with high and low values of XGEO (Figure 1).

Some of the variables are highly correlated, as shown in Table 3. The correlations increase with the amount of averaging done with the variables, with the number of correlations of 0.80 or more increasing from 4 out of 36 with no averaging up to 9 out of 36 with 14 day averaging. A high correlation between CCET and CCETM is of course particularly expected as a result of averaging as the values of CCETM are the same as the values of CCET three days later.

Table 1. Variables considered as predictors of the daily salvage in December and January at the Banks Pumping Plant.

LnNov1	The natural logarithm of the November 1 abundance of preadult and adult delta smelt, as supplied by Rick Sitts on October 12, 2007.
COMRF	The combined old and middle river flow (cfs).
RIO	The flow of the Sacramento River at Rio Vista (cfs) from the DAYFLOW database.
SJR	The flow of the San Joaquin River at Vernalis (cfs) from the DAYFLOW database.
XGEO	The Delta Cross Channel and Georgiana Slough flow estimate (cfs) from the DAYFLOW database.
CCET	The Clifton Court Forebay entrance turbidity (NTU) as supplied by Rick Sitts on November 9, 2007.
CCETM	The Clifton Court forebay entrance turbidity (NTU) as supplied by Rick Sitts on November 9, 2007, but measured three days before CCET.
WEST	The San Joaquin flow estimate (cfs) at Jersey Point from the DAYFLOW database.
SSDSac	The suspended sediment load (tons/day) for the Sacramento River, as supplied by Rick Sitts on October 24, 2007.
SSDSJ	The suspended sediment load (tons/day) for the San Joaquin River, as supplied by Rick Sitts on October 24, 2007.

Table 2. Summary of the distributions of the river flow and related variables being considered for the period from January 1, 1991 to April 30, 2007 (O & M = Old and Middle, Sac = Sacramento, SJ = San Joaquin).

	Combined O & M River Flows COMRF	Sac River at Rio Vista Flow RIO	SJ River flow at Vernalis SJR	From DAYFLOW XGEO	Clifton Court Turbidity CCET	Turbidity 3 Days Earlier CCETM	From DAYFLOW WEST	Suspended Sediment Load Sac River SSDSac	Suspended Sediment Load SJ River SSDSJ
n	5660	5752	5752	5752	4880	4877	5752	5752	5752
Mean	-4086.8	23982.7	4643.2	6106.7	17.7	17.7	4456.5	5494.4	995.0
SD	5321.9	36408.4	6185.6	2428.2	27.6	27.6	11560.0	10347.9	1647.3
Min	-27079	674	390	1406	1	1	-35068	35	16
Max	30146	495492	54300	15858	690	690	97377	122000	45600

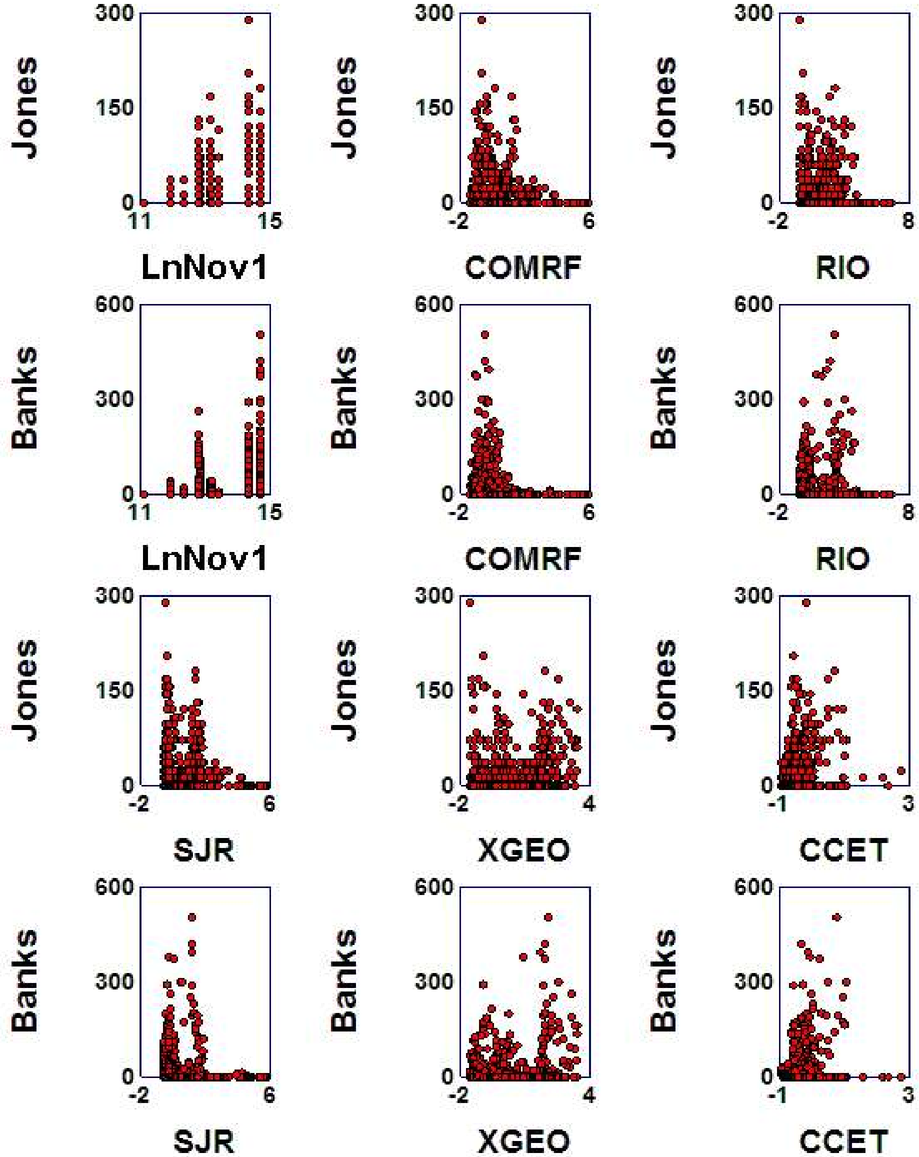


Figure 1 Banks and Jones daily salvage numbers in February and March plotted against LnNov1 and standardized values of the other variables defined in Table 1.

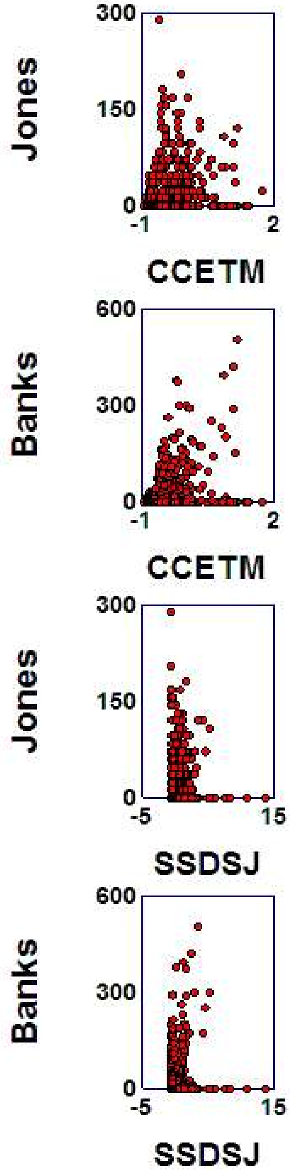


Figure 1, continued

Table 3. Correlations between variables with moving averages (MA) between 1 (no averaging) and 14 (averaging for 14 days). The number of high (0.80 or more) correlations is also shown, with the high values in bold.

MA	High		COMRF	RIO	SJR	XGEO	CCET	CCETM	WEST	SSDSac	SSDSJ
1	4	COMRF	1.00								
		RIO	0.56	1.00							
		SJR	**0.96**	0.65	1.00						
		XGEO	0.47	**0.86**	0.56	1.00					
		CCET	0.38	0.30	0.42	0.29	1.00				
		CCETM	0.44	0.24	0.48	0.25	0.69	1.00			
		WEST	**0.91**	0.78	**0.94**	0.72	0.41	0.41	1.00		
		SSDSac	0.36	0.61	0.39	0.72	0.22	0.10	0.54	1.00	
		SSDSJ	0.59	0.76	0.66	0.61	0.37	0.27	0.76	0.51	1.00
2	4	COMRF	1.00								
		RIO	0.57	1.00							
		SJR	**0.96**	0.65	1.00						
		XGEO	0.47	**0.86**	0.57	1.00					
		CCET	0.40	0.32	0.43	0.30	1.00				
		CCETM	0.46	0.25	0.50	0.25	0.72	1.00			
		WEST	**0.91**	0.79	**0.94**	0.72	0.43	0.42	1.00		
		SSDSac	0.37	0.62	0.40	0.72	0.23	0.11	0.55	1.00	
		SSDSJ	0.59	0.77	0.66	0.61	0.37	0.28	0.77	0.53	1.00
3	4	COMRF	1.00								
		RIO	0.58	1.00							
		SJR	**0.96**	0.66	1.00						
		XGEO	0.48	**0.86**	0.58	1.00					
		CCET	0.42	0.33	0.45	0.31	1.00				
		CCETM	0.47	0.26	0.51	0.26	0.76	1.00			
		WEST	**0.92**	0.79	**0.95**	0.72	0.45	0.44	1.00		
		SSDSac	0.38	0.63	0.41	0.73	0.24	0.12	0.56	1.00	
		SSDSJ	0.61	0.78	0.67	0.62	0.38	0.29	0.78	0.54	1.00
4	6	COMRF	1.00								
		RIO	0.58	1.00							
		SJR	**0.96**	0.67	1.00						
		XGEO	0.48	**0.86**	0.58	1.00					
		CCET	0.44	0.34	0.47	0.31	1.00				
		CCETM	0.48	0.28	0.52	0.27	**0.81**	1.00			
		WEST	**0.92**	**0.80**	**0.95**	0.73	0.46	0.45	1.00		
		SSDSac	0.39	0.64	0.42	0.73	0.25	0.13	0.57	1.00	
		SSDSJ	0.62	0.79	0.69	0.63	0.39	0.30	0.79	0.55	1.00
5	8	COMRF	1.00								
		RIO	0.59	1.00							
		SJR	**0.96**	0.68	1.00						
		XGEO	0.49	**0.87**	0.59	1.00					
		CCET	0.46	0.35	0.49	0.32	1.00				
		CCETM	0.49	0.29	0.53	0.28	**0.85**	1.00			
		WEST	**0.92**	**0.80**	**0.95**	0.73	0.48	0.46	1.00		
		SSDSac	0.40	0.65	0.43	0.74	0.25	0.14	0.58	1.00	
		SSDSJ	0.63	**0.80**	0.70	0.64	0.39	0.31	**0.80**	0.57	1.00

Table3, Continued.

MA	High	COMRF	RIO	SJR	XGEO	CCET	CCETM	WEST	SSDSac	SSDSJ
6	8 COMRF	1.00								
	RIO	0.60	1.00							
	SJR	**0.96**	0.68	1.00						
	XGEO	0.50	**0.87**	0.59	1.00					
	CCET	0.48	0.35	0.51	0.32	1.00				
	CCETM	0.49	0.30	0.54	0.28	**0.88**	1.00			
	WEST	**0.92**	**0.81**	**0.95**	0.73	0.50	0.47	1.00		
	SSDSac	0.41	0.66	0.44	0.75	0.26	0.15	0.58	1.00	
	SSDSJ	0.64	**0.81**	0.71	0.65	0.40	0.32	**0.81**	0.58	1.00
7	8 COMRF	1.00								
	RIO	0.61	1.00							
	SJR	**0.96**	0.69	1.00						
	XGEO	0.50	**0.87**	0.60	1.00					
	CCET	0.49	0.36	0.52	0.32	1.00				
	CCETM	0.50	0.31	0.54	0.29	**0.90**	1.00			
	WEST	**0.93**	**0.81**	**0.95**	0.73	0.50	0.47	1.00		
	SSDSac	0.42	0.68	0.45	0.75	0.25	0.16	0.59	1.00	
	SSDSJ	0.65	**0.82**	0.72	0.65	0.40	0.33	**0.82**	0.58	1.00
8	8 COMRF	1.00								
	RIO	0.62	1.00							
	SJR	**0.97**	0.70	1.00						
	XGEO	0.51	**0.87**	0.60	1.00					
	CCET	0.50	0.37	0.53	0.32	1.00				
	CCETM	0.50	0.31	0.54	0.29	**0.91**	1.00			
	WEST	**0.93**	**0.82**	**0.96**	0.73	0.51	0.48	1.00		
	SSDSac	0.43	0.69	0.46	0.76	0.25	0.16	0.60	1.00	
	SSDSJ	0.66	**0.82**	0.72	0.66	0.40	0.33	**0.82**	0.59	1.00
9	8 COMRF	1.00								
	RIO	0.63	1.00							
	SJR	**0.97**	0.71	1.00						
	XGEO	0.52	**0.87**	0.61	1.00					
	CCET	0.50	0.37	0.53	0.32	1.00				
	CCETM	0.50	0.32	0.54	0.30	**0.93**	1.00			
	WEST	**0.93**	**0.82**	**0.96**	0.74	0.51	0.48	1.00		
	SSDSac	0.44	0.70	0.47	0.77	0.25	0.17	0.61	1.00	
	SSDSJ	0.67	**0.83**	0.73	0.66	0.41	0.34	**0.83**	0.60	1.00
10	8 COMRF	1.00								
	RIO	0.63	1.00							
	SJR	**0.97**	0.71	1.00						
	XGEO	0.52	**0.88**	0.61	1.00					
	CCET	0.51	0.37	0.54	0.32	1.00				
	CCETM	0.50	0.33	0.54	0.30	**0.94**	1.00			
	WEST	**0.93**	**0.83**	**0.96**	0.74	0.52	0.48	1.00		
	SSDSac	0.45	0.71	0.48	0.78	0.25	0.17	0.62	1.00	
	SSDSJ	0.68	**0.84**	0.74	0.67	0.41	0.35	**0.84**	0.61	1.00

Table 3, Continued.

MA	High		COMRF	RIO	SJR	XGEO	CCET	CCETM	WEST	SSDSac	SSDSJ
11	8	COMRF	1.00								
		RIO	0.64	1.00							
		SJR	**0.97**	0.72	1.00						
		XGEO	0.53	**0.88**	0.62	1.00					
		CCET	0.51	0.38	0.54	0.32	1.00				
		CCETM	0.50	0.33	0.54	0.30	**0.94**	1.00			
		WEST	**0.94**	**0.83**	**0.96**	0.74	0.52	0.49	1.00		
		SSDSac	0.46	0.72	0.49	0.78	0.25	0.18	0.62	1.00	
		SSDSJ	0.69	**0.84**	0.75	0.68	0.41	0.36	**0.84**	0.62	1.00
12	8	COMRF	1.00								
		RIO	0.65	1.00							
		SJR	**0.97**	0.73	1.00						
		XGEO	0.53	**0.88**	0.62	1.00					
		CCET	0.51	0.38	0.54	0.32	1.00				
		CCETM	0.50	0.34	0.54	0.30	**0.95**	1.00			
		WEST	**0.94**	**0.83**	**0.96**	0.74	0.52	0.49	1.00		
		SSDSac	0.47	0.73	0.50	0.79	0.25	0.18	0.63	1.00	
		SSDSJ	0.70	**0.85**	0.76	0.68	0.41	0.36	**0.85**	0.63	1.00
13	9	COMRF	1.00								
		RIO	0.66	1.00							
		SJR	**0.97**	0.73	1.00						
		XGEO	0.54	**0.88**	0.62	1.00					
		CCET	0.52	0.38	0.55	0.32	1.00				
		CCETM	0.50	0.34	0.55	0.30	**0.96**	1.00			
		WEST	**0.94**	**0.84**	**0.96**	0.74	0.52	0.49	1.00		
		SSDSac	0.48	0.74	0.50	**0.80**	0.25	0.19	0.64	1.00	
		SSDSJ	0.71	**0.85**	0.77	0.68	0.41	0.37	**0.85**	0.64	1.00
14	9	COMRF	1.00								
		RIO	0.66	1.00							
		SJR	**0.97**	0.74	1.00						
		XGEO	0.54	**0.89**	0.62	1.00					
		CCET	0.52	0.39	0.55	0.32	1.00				
		CCETM	0.51	0.35	0.55	0.30	**0.96**	1.00			
		WEST	**0.94**	**0.84**	**0.96**	0.74	0.52	0.49	1.00		
		SSDSac	0.48	0.74	0.51	**0.80**	0.25	0.19	0.64	1.00	
		SSDSJ	0.72	**0.86**	0.78	0.69	0.42	0.38	**0.86**	0.64	1.00

Equations for the Prediction of Banks Salvage

A total of 784 equations were examined for the prediction of the Banks daily salvage numbers in February and March. All equations included the combined Old and Middle River flow variable COMRF. The other eight variables RIO, SJR, XGEO, CCET, CCETM, WEST, SSDSac and SSDSJ were then considered two at a time for inclusion in the prediction equation, with and without the abundance variable LnNov1. This gave 56 equations for each moving period as this is the number of combinations of eight variables taken two at a time.

All of the fitted equations had the daily Banks salvage numbers as the dependent variable, with the expected value of this variable assumed to take the form

$$E(\text{Salvage}) = \text{Exp}(\beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_1^2 + \beta_5X_2^2 + \beta_6X_3^2 + \beta_7X_1X_2 + \beta_8X_1X_3 + \beta_9X_2X_3)$$

when LnNov1 is not included in the equation. Here X_1 denotes a moving average of standardized values of COMRF, X_2 denotes a moving average of one of the eight other variables, and X_3 denotes a moving average of another of the eight other variables. The argument of the exponential function is then a constant term and a general quadratic function of X_1, X_2 and X_3. If LnNov1 is included in the equation then an additional term of the form β_{10}LnNov1 comes at the end of the exponential argument.

Only salvage days in February and March with values for all of the explanatory variables were considered for model fitting. This resulted in 573 daily observations of salvage to be accounted for by each of the models considered. This involved a loss of 79 days of data because of missing values for one or both of CCET and CCETM. The models were estimated by the standard quasi-maximum likelihood method (McCullagh and Nelder, 1989) using a specially written computer program.

The best of the equations in terms of having the smallest mean residual deviance (a measure of the goodness of fit analogous to the residual mean square in ordinary multiple linear regression) and accounting for the largest amount of the total variation in the data involved the variables COMFR, XGEO, CCET and LnNov1. This equation accounts for 76.68% of the variation in the observed salvage numbers.

Table 4 shows the coefficients for the terms in the equation, and also for a reduced version of the equation with terms that are not significant at the 5% level removed. The reduced equation still accounts for 76.63% of the variation in the data and in practice is the equation that would be used to predict salvage in the future.

Finally for this model Figure 2 shows how the observed and expected salvage numbers compare, while Figure 3 shows the observed and expected numbers separately for each year.

Table 4. Estimates of regression coefficients (Est) with standard errors (SE) and significance levels (Sig) for the best fitting model for Banks daily salvage from 784 models examined and this model with non-significant terms at the 5% level removed. The explanatory variables are moving averages for nine days. The percentage of variation accounted for by the equations is also shown (% Exp).

	Full Model			%	Reduced Model			%
	Est	SE	Sig	Exp	Est	SE	Sig	Exp
Constant	-15.134	1.029		76.68	-15.187	0.993		76.63
COMRF	-0.815	0.125	0.000		-0.815	0.125	0.000	
XGEO	-0.005	0.059	0.928		-0.006	0.056	0.920	
CCET	3.384	0.331	0.000		3.194	0.273	0.000	
$COMRF^2$	0.003	0.061	0.960					
$XGEO^2$	0.135	0.026	0.000		0.137	0.025	0.000	
$CCET^2$	-0.461	0.443	0.298					
COMRF.XGEO	-0.421	0.082	0.000		-0.431	0.081	0.000	
COMRF.CCET	0.657	0.207	0.002		0.644	0.190	0.001	
XGEO.CCET	-1.033	0.159	0.000		-1.113	0.135	0.000	
LnNov1	1.332	0.074	0.000		1.336	0.072	0.000	

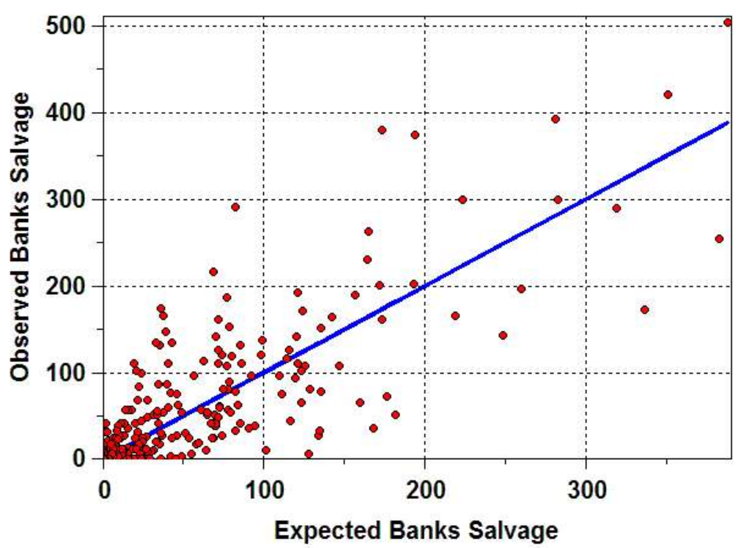


Figure 2. Comparison of observed (!) and expected (—) Banks salvage using the reduced equation with coefficients shown in Table 4. Points are above the line when the observed daily salvage is higher than predicted and are below the line when the observed salvage is lower than predicted.

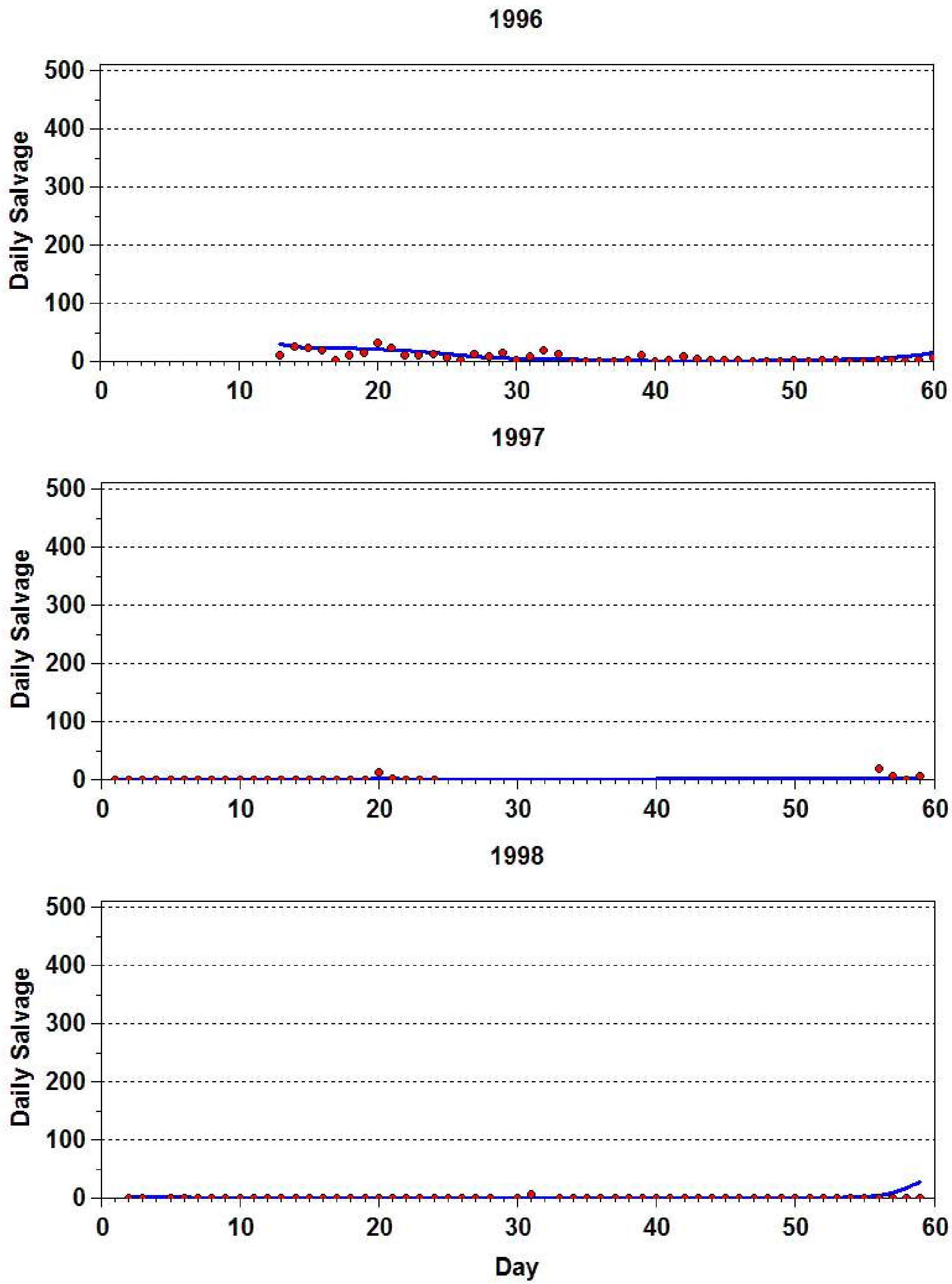


Figure 3. Comparison of the observed (!) and expected (—) daily Banks salvage numbers for February and March periods.

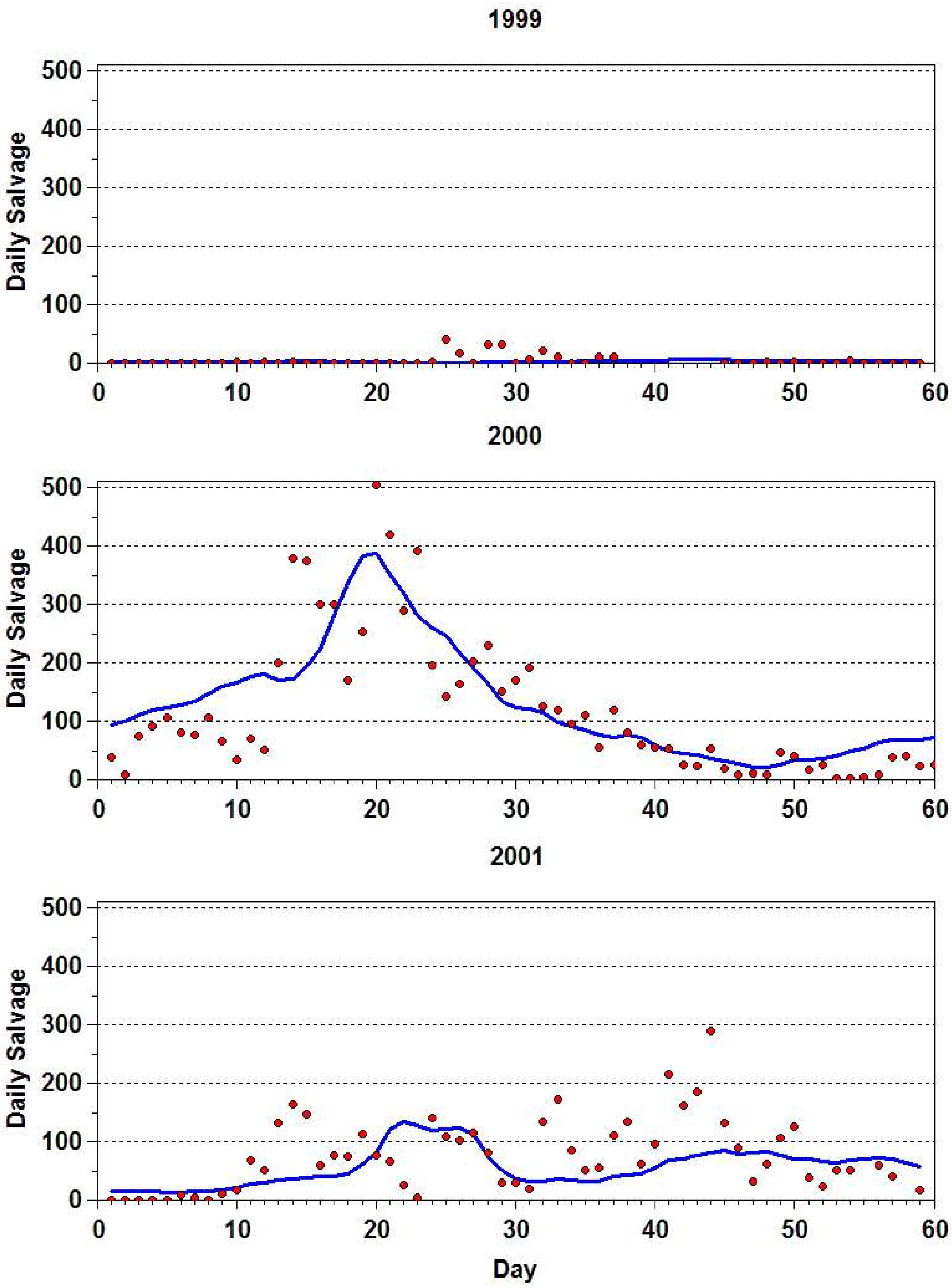
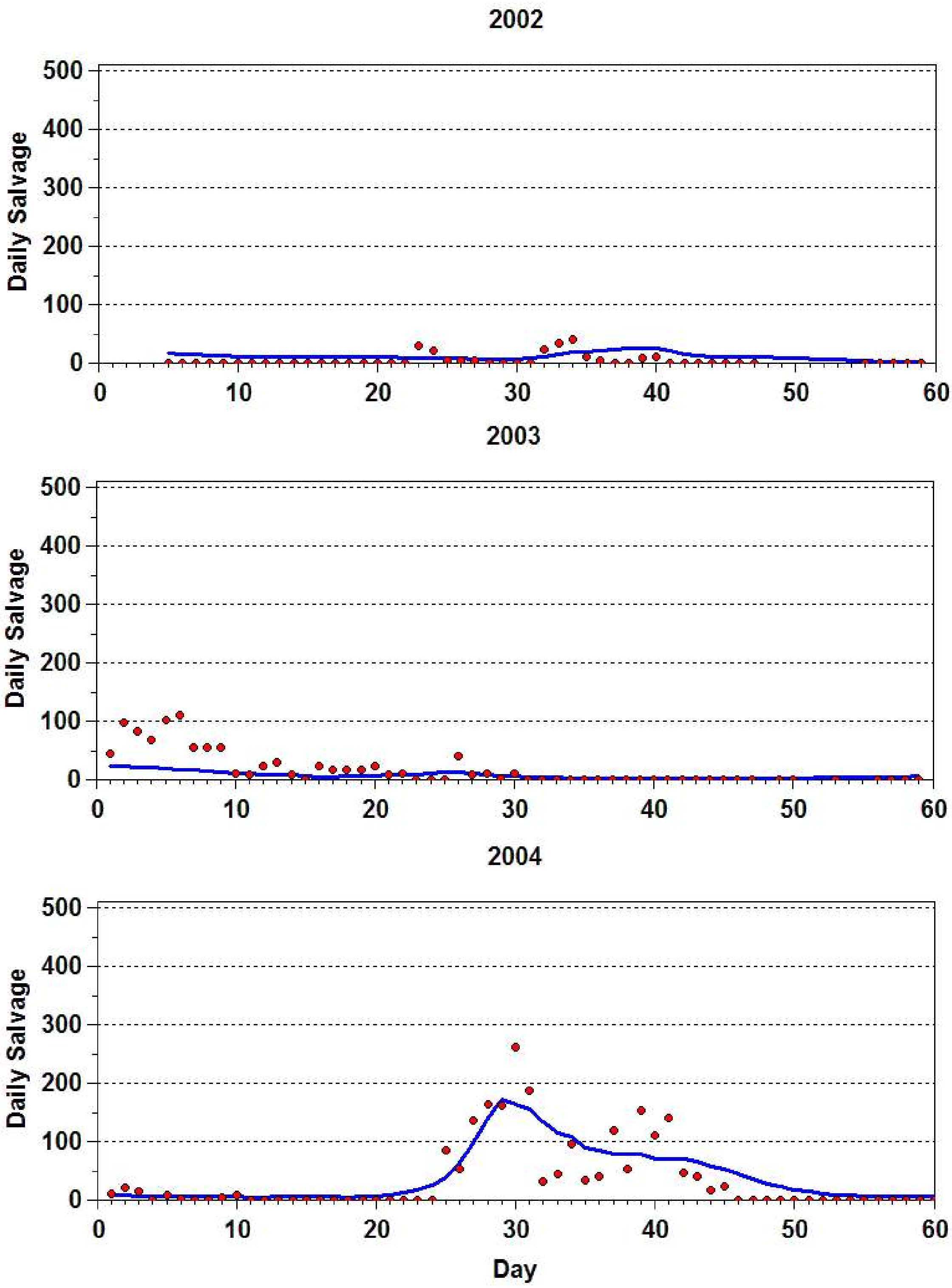


Figure 3, Continued.



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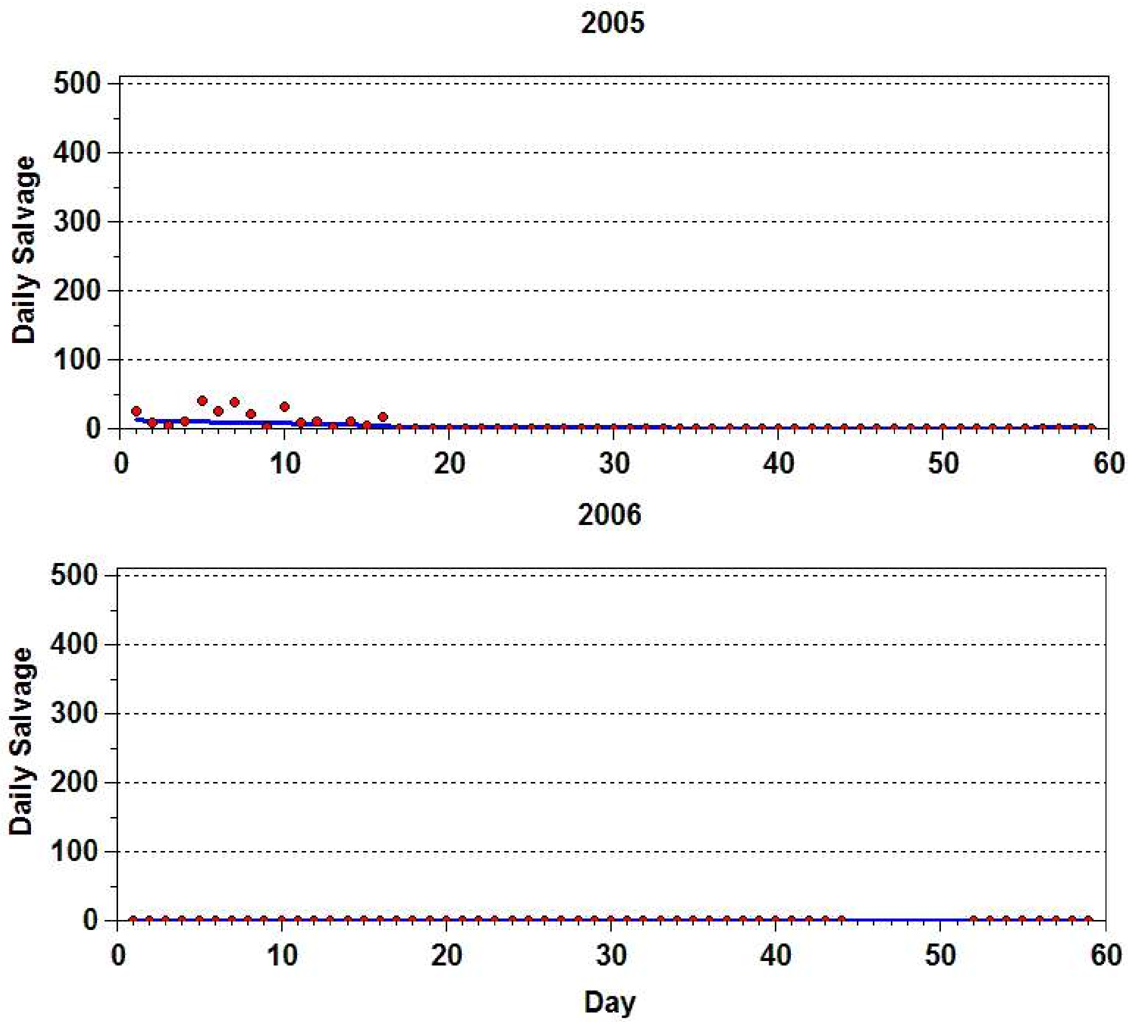

Figure 3, Continued.

Equations for the Prediction of Jones Salvage

The analysis carried out with Banks daily salvage numbers as the dependent variable was repeated using the Jones daily salvage numbers instead. The best fitting of the 784 equations in this case in terms of having the smallest residual mean deviance and the largest percentage of variation accounted for involved COMFR, XGEO, SSDSac with four day moving averages, and the abundance measure LnNov1. This is similar to the best equation for Banks salvage except that SSDSac is included instead of CCET. Also, for Jones salvage only 48.23% of the variation in daily salvage numbers is accounted for, which is much lower that the 76.68% that was obtained for Banks salvage.

Table 5 shows the estimated regression coefficients and standard errors for the best fitting model, and also the coefficients and standard errors after one term that is not significant at the 5% level is removed. In addition, Figure 4 shows a comparison between the observed and expected daily salvage numbers, while Figure 5 shows the observed and expected numbers plotted against time, separately for each year. The fit of the equation is rather poor.

Table 5. Estimates of regression coefficients (Est) with standard errors (SE) and significance levels (Sig) for the best fitting model for Jones daily salvage from 784 models examined and this model with non-significant terms at the 5% level removed. The explanatory variables are moving averages for four days. The percentage of variation accounted for by the equations is also shown (% Exp).

	Full Model			%	Reduced Model			%
	Est	SE	Sig	Exp	Est	SE	Sig	Exp
Constant	-8.637	0.894		48.23	-8.640	0.832		48.23
COMRF	0.005	0.139	0.972		0.005	0.133	0.972	
XGEO	-0.400	0.110	0.000		-0.400	0.104	0.000	
SSDSac	0.737	0.207	0.000		0.737	0.194	0.000	
$COMRF^2$	-0.000	0.039	0.995					
$XGEO^2$	0.422	0.069	0.000		0.422	0.068	0.000	
$SSDSac^2$	-0.186	0.094	0.048		-0.186	0.088	0.035	
COMRF.XGEO	0.419	0.093	0.000		0.418	0.085	0.000	
COMRF.SSDSac	-0.910	0.121	0.000		-0.910	0.120	0.000	
XGEO.SSDSac	-0.277	0.128	0.031		-0.278	0.120	0.021	
LnNov1	0.838	0.066	0.000		0.838	0.061	0.000	

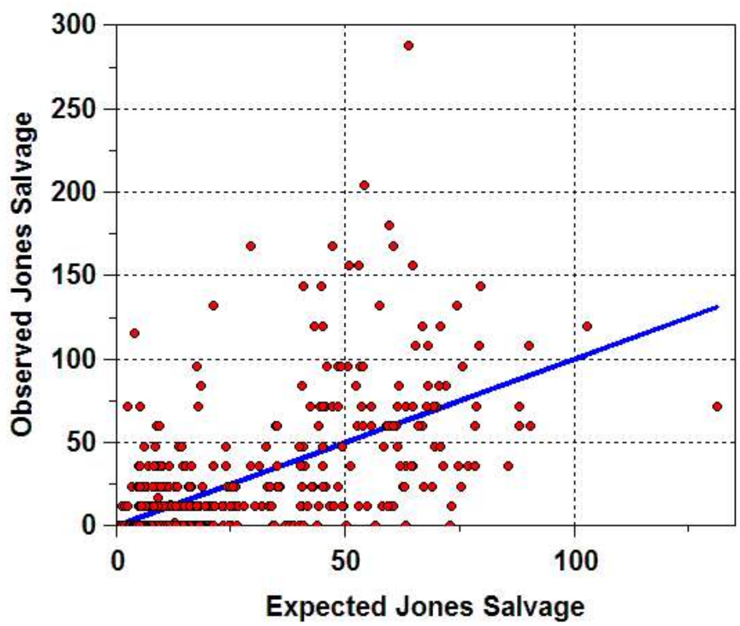

Figure 4. Comparison of observed (!) and expected (—) Jones salvage using the reduced equation with coefficients shown in Table 5. Points are above the line when the observed daily salvage is higher than predicted and are below the line when the observed salvage is lower than predicted.

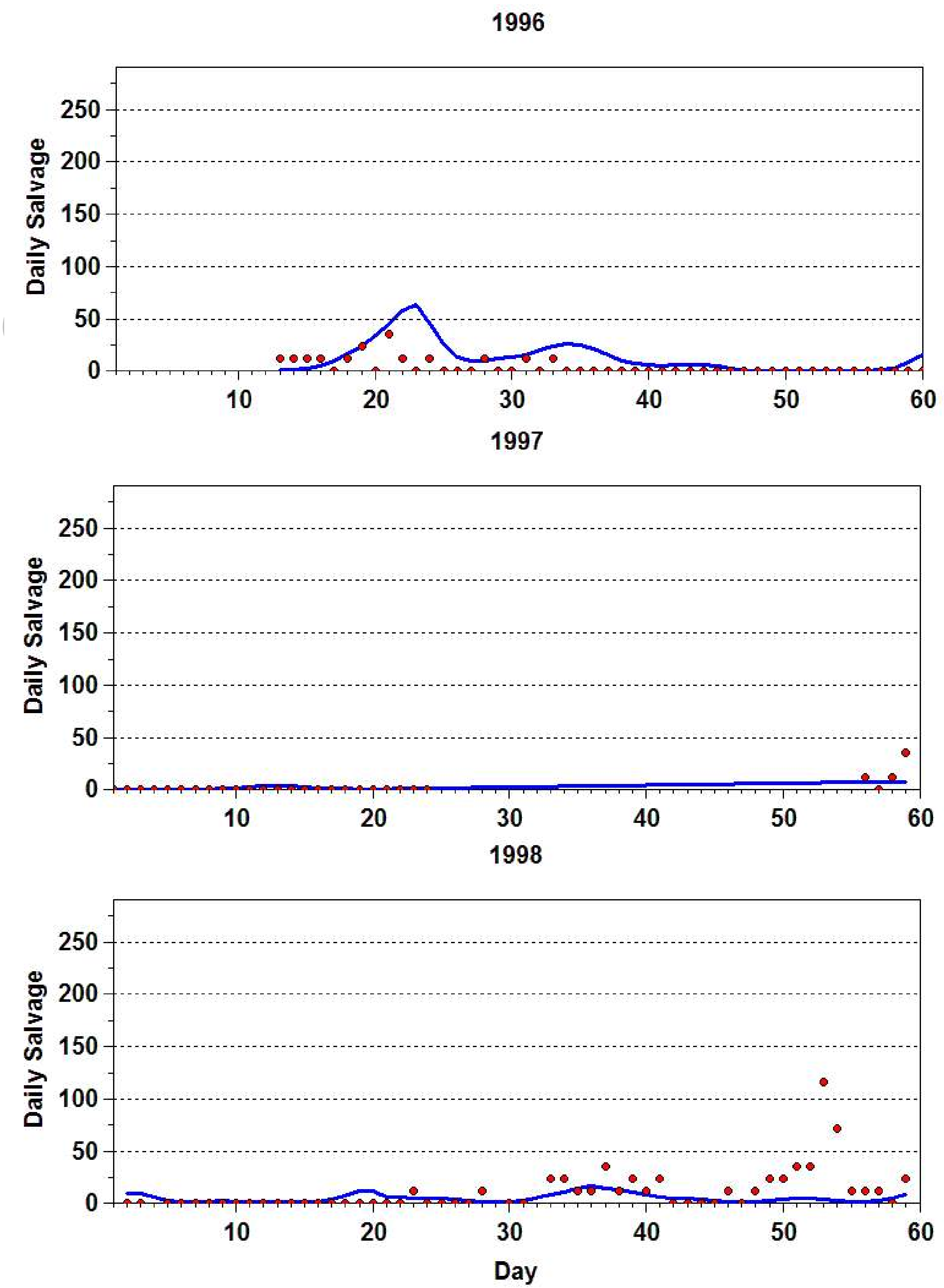

Figure 5. Comparison of the observed (!) and expected (—) daily Jones salvage numbers for February and March periods.

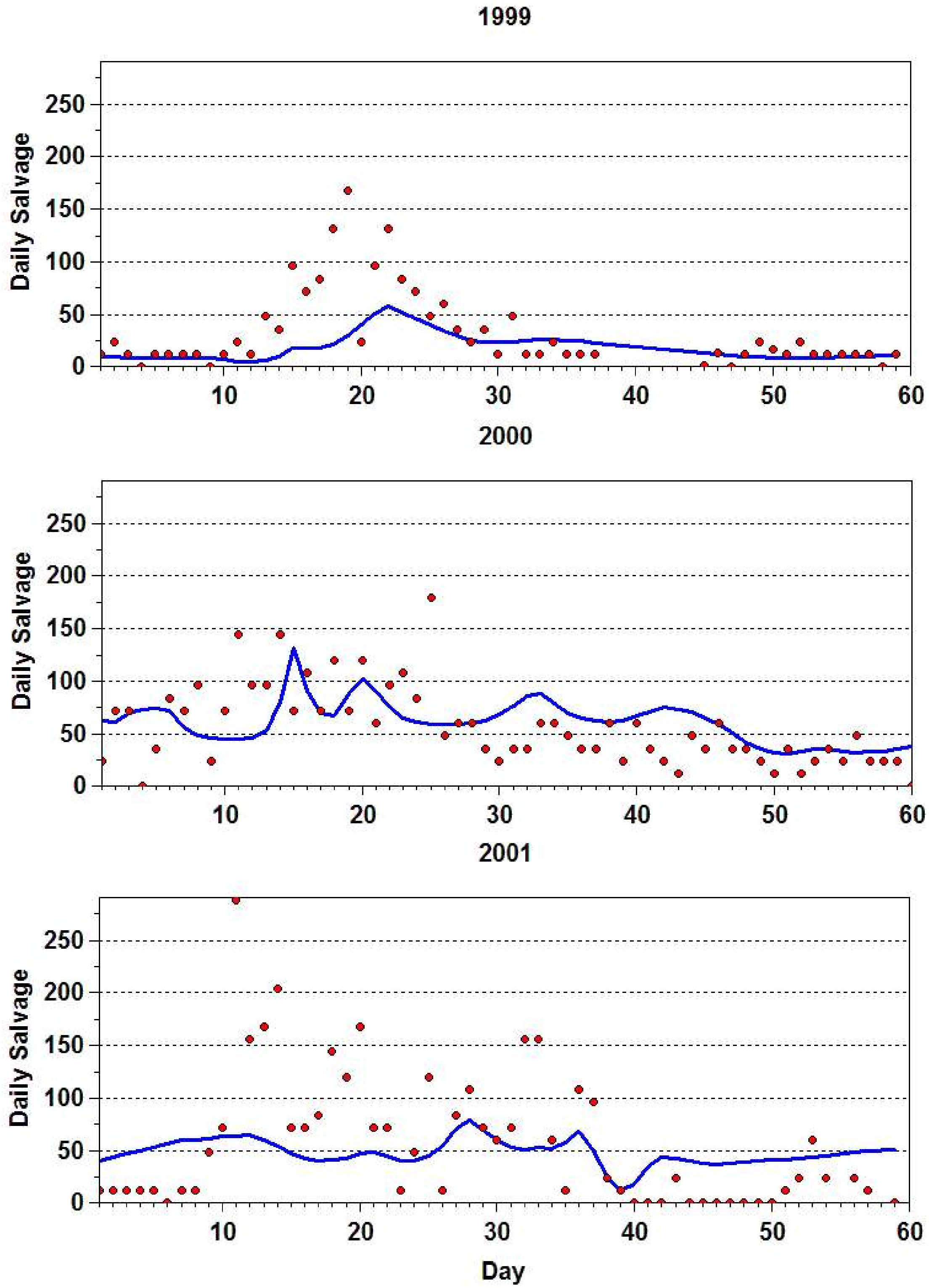

Figure 5, Continued.

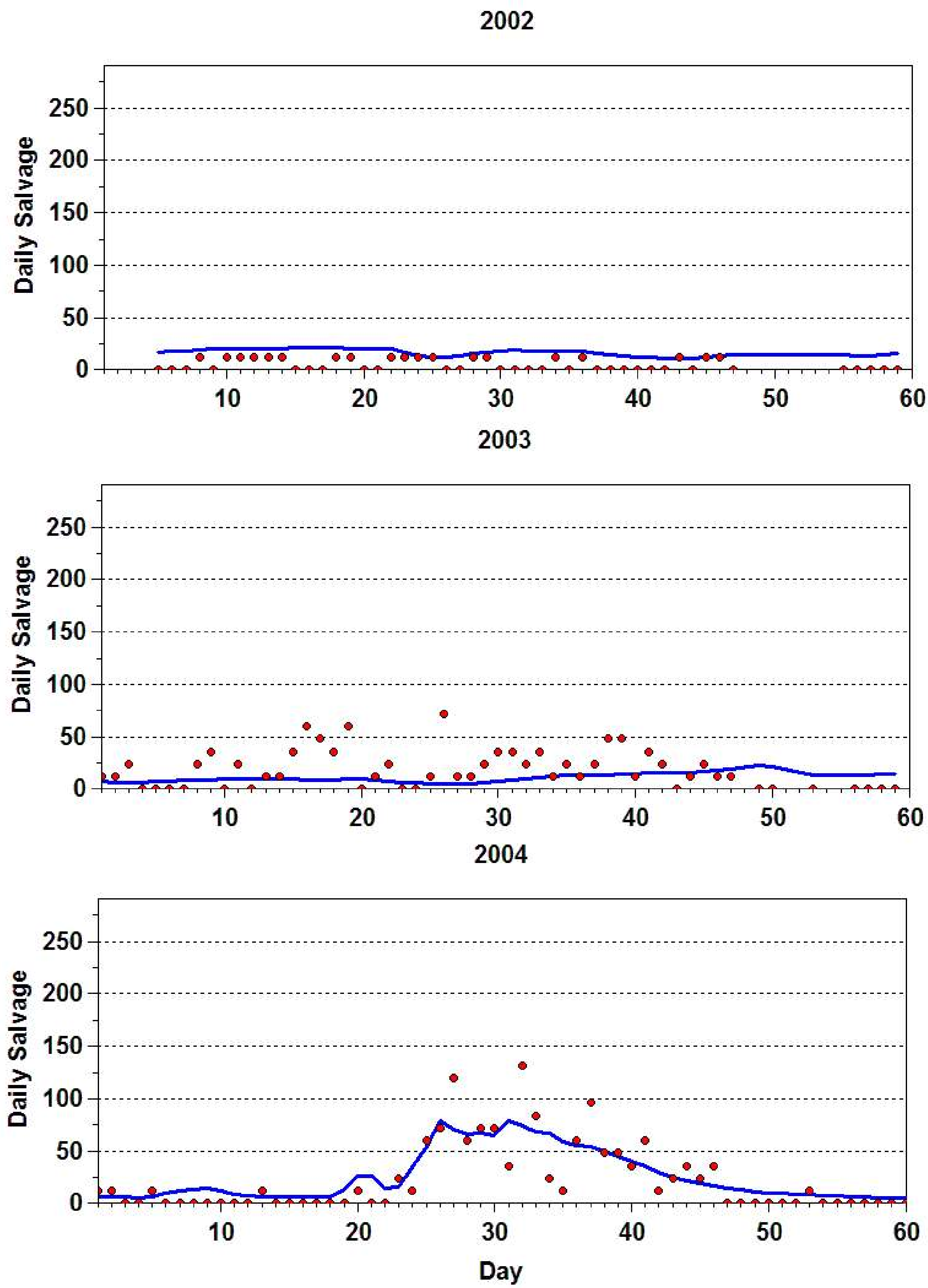

Figure 5, Continued.

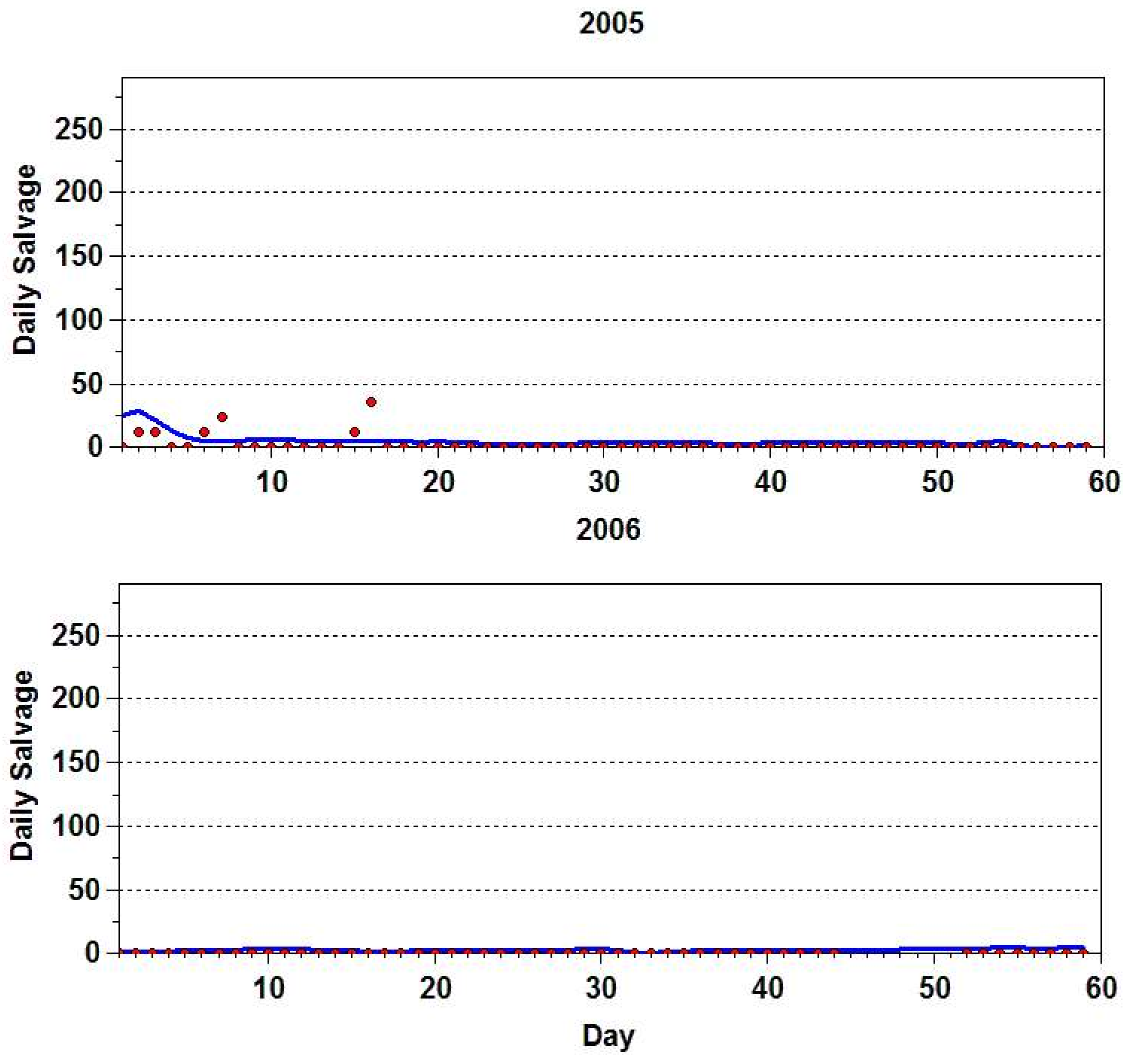

Figure 5, Continued.

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Manly, B.F.J. (2007). *Banks Daily Salvage of Delta Smelt in December and January Related to River Flows and Other Variables (Corrected 11/29/07)*. Western EcoSystems Technology Report dated November 29, 2007.

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UNITED STATES DISTRICT COURT

EASTERN DISTRICT

NATURAL RESOURCES DEFENSE COUNCIL, CALIFORNIA TROUT, BAYKEEPER AND ITS DELTAKEEPER CHAPTER, FRIENDS OF THE RIVER, and THE BAY INSTITUTE, all non-profit organizations, Plaintiffs, v. DIRK KEMPTHORNE in his official capacity as Secretary of the Interior; and STEVEN A. WILLIAMS, in his official capacity as Director, U.S. Fish and Wildlife Service, Defendants. STATE WATER CONTRACTORS, Defendant in Intervention.	Case No. 1:05-CV-01207 OWW LJO **DECLARATION OF DAVID FULLERTON IN SUPPORT OF THE STATE WATER CONTRACTORS' REPLY MEMORANDUM** Date: August 21, 2007 Time: 9:00 a.m. Courtroom: 3 Judge: Honorable Oliver W. Wanger

I, David K. Fullerton, declare and state as follows:

1. I am a Principal Resource Specialist with the Metropolitan Water District of Southern California (Metropolitan), and have held that position since I started to work for Metropolitan in 2002. My job responsibilities as a Principal Resource Specialist include analyzing, and developing strategies for various natural resource, water quality, water supply, and endangered species conflicts and issues that arise in connection with operation of the State Water Project (SWP) and Central Valley Project (CVP) and management of the San Francisco-San Joaquin Bay-Delta.

2. A significant amount of my work at Metropolitan has been spent in analyzing, evaluating, and devising strategies to manage the effects of SWP/CVP operations on the delta smelt. I also have attended and participated in various CALFED and interagency science programs that have developed data and information about the impacts of the projects on the smelt. I have attended the CALFED's annual science conferences as well as its annual expert panel reviews of the Environmental Water Account. I frequently participate in the weekly conference calls of the Delta Assessment Team (DAT). In connection with my work responsibilities at Metropolitan, I also review the scientific literature on delta smelt issues, and regularly consult and interact with others in federal and state agencies, and non-governmental organizations (NGOs) on Delta smelt and Bay-Delta issues. On June 12, 2007, I presented my scientific findings on the linkage between Sacramento-origin turbidity and the onset of adult smelt salvage at the export pumps to the Estuarine Ecology Project Work Team (EET), a forum where Delta scientists share information. I am one of the senior staff at Metropolitan participating at both a policy and technical level in the development of the Bay-Delta Conservation Plan (BDCP) which is a long-term plan for the restoration of the Bay-Delta that is intended to serve as the foundation for obtaining incidental take permits under the federal Endangered Species Act (ESA) and California Endangered Species Act (CESA).

3. Since the end of 2006, I have spent considerable time researching the relationship between Sacramento River flow pulses during the winter, associated turbidity conditions, and the

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salvage of adult delta smelt. My work provides much of the foundation for the State Water Contractors' recommendation in its July 23, 2007 submittal in this case to keep San Joaquin River flows positive during the winter to minimize the risk of entrainment of delta smelt into the project pumps. See the State Water Contractors' Memorandum of Points and Authorities in Response to the Interim Remedy Proposals of the California Department of Water Resources and the Federal Defendants, p. 27 (Doc. #412). The Supplemental Declaration of Jerry Johns (Doc. #432) responded to this proposal by indicating that while the proposal is too experimental for inclusion in the USFWS Action Matrix at this time, the proposal should be considered in the ongoing section 7 consultation over Delta smelt impacts for possible implementation in the future. *Id.* ¶ 10.

4. I am familiar with Central Valley hydrology, Bay-Delta hydrodynamics, CVP and SWP project operations and Delta smelt biology as it relates to project operations. I have been extensively involved in analyzing and developing CVP/SWP operational criteria to minimize adverse impacts to Delta smelt from such operations.

5. Before joining Metropolitan, I was a senior staff scientist in Delta and Central Valley issues for the Natural Heritage Institute (NHI), a non-profit environmental law and consulting organization. I worked at NHI from 1991-2002. During this time, I negotiated, on behalf of the environmental community, the Memorandum of Understanding Regarding Urban Water Conservation between environmental groups and many urban water agencies (1991). This agreement created the urban conservation Best Management Practices (BMPs) that are the basis for modern conservation in the urban sector in California. The agreement also created the California Urban Water Conservation Council (CUWCC), a non profit organization consisting of water agencies and NGOs. I was the chairman of the CUWCC for the first two years of its existence. While I was at NHI, I also testified as a technical expert before the California State Water Resources Control Board (SWRCB) during the Mono Lake hearings in 1993. On behalf of the environmental plaintiffs, I created a computer model to estimate the operational impacts on the Los Angeles Department of Water and Power of leaving additional water in Mono Lake rather than diverting it to Los Angeles. I also participated in the negotiations over the Bay-Delta Accord

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in December 1994 which led up to, and laid the foundation for, the CALFED process, a comprehensive program for the management and environmental restoration of the Bay-Delta. On behalf of NHI, I was one of the three environmental NGO signatories to the Bay-Delta Accord. From 2000 to 2001 I was a Member of the Hydrological/Operations Oversight Study Team during the NRDC/Friant settlement negotiations on behalf of the environmental plaintiffs. This technical study was part of an effort to reach a settlement on restoration of flows into the San Joaquin River.

6. After the CALFED process got underway, I continued to be employed by NHI but worked as one of the staff in the CALFED program under contract. In the CALFED program, I was the prime architect of the Environmental Water Account (EWA), and ran the gaming analysis that determined the initial assets and operational rules for the EWA. I also coordinated EWA Operations in 2000-2001.

7. From 1994 to 1999 I taught a class (with Dr. B. J. Miller) on science and water policy in the Bay-Delta for UC Berkeley Extension.

8. Before joining NHI in 1991 I worked at the Committee for Water Policy Consensus, a non-profit organization involved in water policy issues from 1988 to 1991. During the same years I was the chairman of the Sierra Club's California Water Committee. The Sierra Club is an advocacy organization devoted to environmental protection and enhancement.

9. I have been involved in seeking solutions to the environmental, water supply and institutional problems facing the Bay-Delta and the Central Valley watershed for approximately 20 years.

10. I have a Bachelor of Science degree in Physics, a Bachelor of Arts degree in Classical Studies, and a Master of Science degree in Electrical Engineering from Stanford University. I also have a Master of Arts degree in Ancient History from the University of California at Berkeley.

11. I make this declaration based on my personal knowledge, and if called as a witness I could and would testify to the contents herein.

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12. This declaration is an analysis of the scientific basis for Action #10 in the plaintiffs' interim remedy proposal, discussed in the Declaration of Dr. Christina Swanson (Doc. #421). According to Appendix 2 of the Swanson Declaration, Action #10 calls for "manag[ing] water project operations to maintain Delta outflows at a minimum of 7500 cfs or maintain[ing] X2 (as 14-day running average) at downstream of 80 km, whichever requires less freshwater outflow." Appendix 2 cites three articles or pieces of research as the scientific support for Action #10. The first two pieces of research are (1) Feyrer (2007) and (2) Guerin (2006). Both Feyrer and Guerin developed correlations between Delta fall salinity and juvenile delta smelt populations the following summer. The third citation was to a presentation by Dr. Jan Thompson at the 2007 CALFED Science Program workshop on Variable Salinity in the Delta. Thompson discussed the life histories of the clams *Corbula* and *Corbicula* and how their distribution may change as Delta salinity shifts. I have reviewed Dr. Swanson's Declaration and the three items of research cited in support of Action #10, and it is my conclusion that the cited research and materials do not provide an adequate and reliable scientific justification and basis for Action #10.

13. The Guerin and Feyrer studies describe a correlation whereby reduced Delta salinity in the fall is linked to increased smelt juvenile populations the next summer. A graph showing the data points and the correlation for the years 1988 – 2005 from Guerin is included in the Swanson Declaration as Figure 4 on page 9. I have reproduced the Guerin graph and correlation as Figure 1. In what follows I will focus on the Guerin correlation. However, the same remarks should also apply to the Feyrer correlation as it used essentially the same data (analyzing 1987 to 2004 instead of 1988 to 2005).

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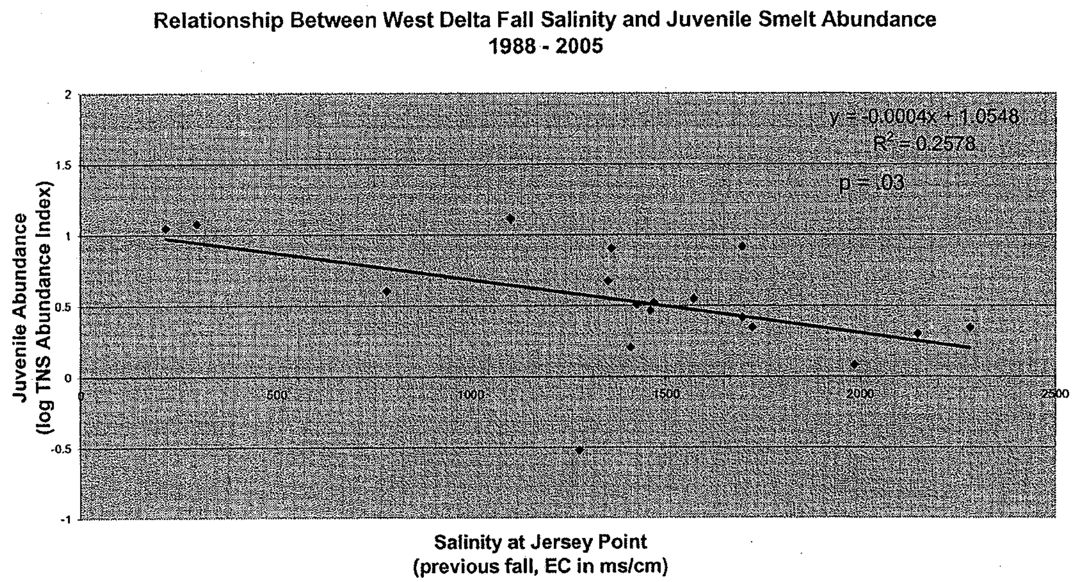

Figure 1

14. The existence of a correlation from 1988 to 2005 is very weak evidence for the conclusion that increasing fall outflow will improve juvenile smelt populations. First, the correlation breaks down if data for the years 2006 and 2007 are included. Indeed, a correlation for the years 2000 – 2008 would tend to imply, if anything, that higher salinity means more smelt, not less. Second, even valid correlations do not imply a causal relationship between the factors. The existence of a correlation is frequently only a hint of some deeper physical process that causes two otherwise unrelated factors to move in unison (salinity and juvenile populations in this case). In the case of the fall salinity/ summer population correlation there is no evidence of any causal connection between fall salinity and summer population. More likely, the appearance of a fall salinity/ summer population linkage is an artifact of powerful, but unmanageable natural hydrological conditions that occurred during this period: (1) the long drought of the late 1980s and early 1990s and (2) a string of extremely wet years in the late 1990s. These points are discussed further below.

15. When I added salinity and Summer Tow Net (a proxy for smelt population in the summer) values for the years 2006 and 2007 to the time-series used by Guerin, it produced the

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new graph shown below (Figure 2). You can see that the R^2 value drops from 0.25 down to 0.07, meaning that only 7% of the variation in log (STN) is now related to salinity. More important, the "p value" has now risen to 0.26. The "p-value" is a measure of the likelihood that a relationship really exists. A common statistical rule of thumb is that "p-values" above 0.05 are not significant. So a statistically significant relationship between log (STN) and salinity the previous fall no longer exists as of 2007. Similarly, if I add in data points for 1986 and 1987 the original correlation disappears. The addition of data for 2006 and 2007 causes the correlation to disappear because the most recent points show that even with relatively favorable salinity conditions over the past few years, juvenile smelt populations are nowhere near the values required by the correlation. Thus, though a correlation may have existed in 2005, it no longer exists today.

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Relationship Between West Delta Fall Salinity and Juvenile Smelt Abundance 1988 - 2007

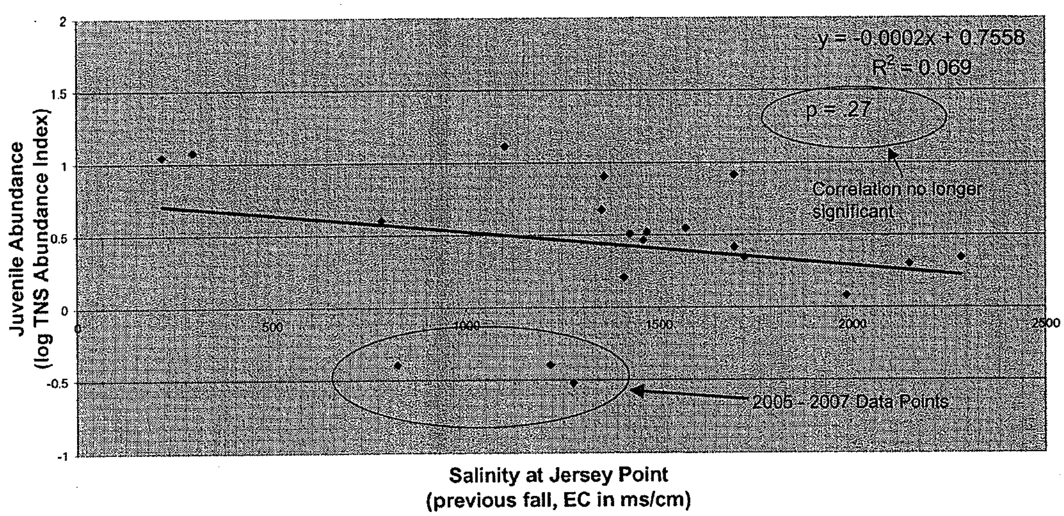
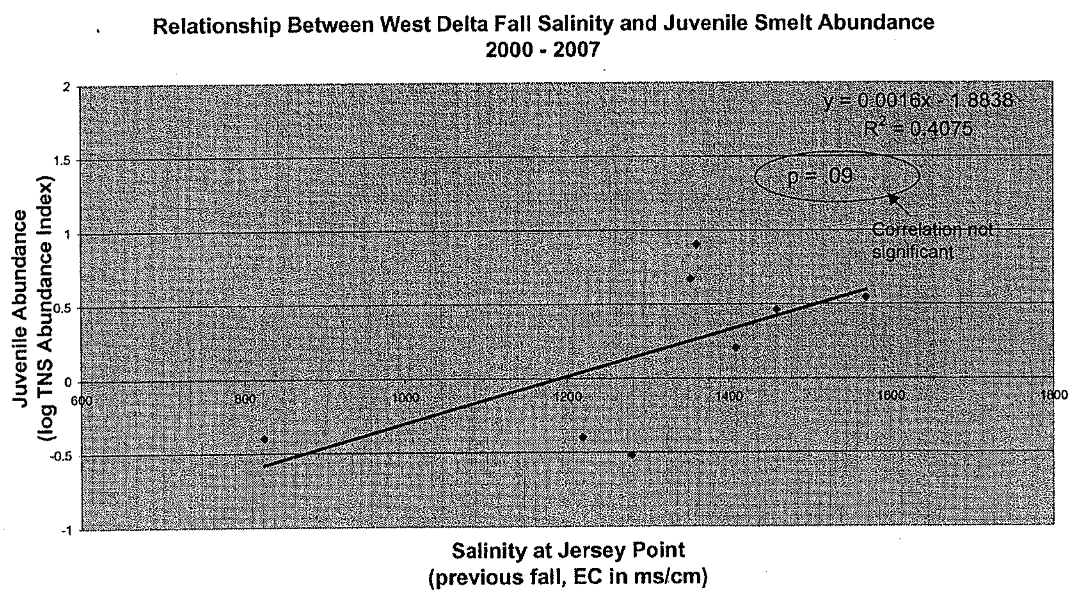


Figure 2

16. The failure of the fall salinity/summer population correlation to accommodate the years 2006 and 2007 (and 1986/1987) exemplifies a generic problem with correlations, particularly when there are few data points. If one is working with a limited numbers of data points, one can usually find a correlation if one looks hard enough. It is possible to vary the period of analysis, kick out data that does not fit the pattern, transform the data in various ways,

and simply keep lining up different data sets. Eventually a pattern will emerge, by coincidence if nothing else. As an example of how correlations can mislead, I ran the same correlation as Guerin but only for the years 2000 – 2007 (Figure 3). I obtained an R^2 of 0.41 and a "p-value" of 0.09. The correlation is not significant but it is far better than the correlation for 1988 – 2007. What is particularly striking is that the 2000 – 2007 correlation implies that the *saltier* the Delta is in the fall, the more smelt will appear the next summer – the exact opposite of Guerin and Feyrer's results. I make no claims that saltier water is better, only that correlations are meaningless unless backed up by a plausible hypothesis linking cause with effect, followed by modeling and experimentation to confirm the effect.

Figure 3



17. The 2006 EWA Technical Review Panel addressed the use and misuse of correlations in its 2006 report, *Review of the 2006 Environmental Water Account (EWA).* The EWA Technical Review Panel is sponsored each year by the CALFED Science Program and is a group of distinguished scientists from around the country who meet each year to review the operations of the EWA and the science linking EWA operations to biological benefits. A representative quote from the Report on "data mining" makes the point (pp 25 – 26):

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> *... the Panel also recognizes the need to improve statistical rigor and discipline during data analysis. Further attempts at data mining that is not hypothesis driven is discouraged. The group should avoid development and interpretation of numerous regression analyses based upon the same data, especially ratios of data, without considerations of statistical assumptions and possible multicolinearity of independent variables.*

The EWA Report is attached hereto as Exhibit A.

18. A second major difficulty with using the Guerin and Feyrer correlations as the basis for operational changes is the difficulty in finding a convincing physical explanation of how reduced salinity during September–December will lead to more smelt 8 to 10 months later. Swanson suggests that the reason high fall salinity causes a reduction in smelt populations the following summer is that the clam *Corbula* becomes better established upstream during years with high fall salinity. Supposedly *Corbula* reduce zooplankton population through their feeding and cause smelt to go short of food. Swanson references a talk by Jan Thompson at a 2007 CALFED Science Program workshop on Variable Salinity in the Delta. I also observed the talk by Thompson (via webcast) and again reviewed the webcast prior to writing this Declaration. Thompson emphasized the enormous uncertainties involved in understanding the *Corbula* lifecycle and its interaction with a variable estuary. She also discussed another clam – *Corbicula* -- which has a range overlapping with and upstream of *Corbula*. The implication of her presentation was that, except for short periods of time following very extreme events (e.g., big storms), either *Corbula* or *Corbicula* may occupy those parts of the Delta suitable for clams. But there is no need to rely upon recollections of the presentation. The final report of the Workshop, entitled, *Report on the CALFED Science Program Workshop "Defining a Variable Delta to Promote Estuarine Fish Habitat"* was released by the CALFED Science Program on July 27, 2007. The report (which was reviewed by all the presenters, including Thompson) was very explicit that the linkage between modifications of Delta salinity the food supply for Delta smelt is too uncertain to form the basis for action:

> This suggests that the overbite clam [i.e., *Corbula amurensis*] easily survives salinities seasonally ranging from 0-12‰. Although survival over longer periods of high and low salinity as suggested

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> by Moyle cannot be determined, it is known that overbite clams survive long periods of time in tidal reaches where salinities on the ebbing tides are at or near zero in the water column. It is also unknown if extending the freshwater period to kill overbite clams would allow Asiatic freshwater clams [i.e., *Corbicula fluminea*] to establish higher populations in Suisun Bay. Thus, the dynamics of clam-phytoplankton interactions under different salinity regimes are not currently predictable. Therefore, the food web responses of fishes feeding on clams or competing with them for food are likewise not currently predictable.

Id., p. 10 (emphasis added).

Thus, there is no support for the Swanson's hypothesis that fall salinity is linked to summer smelt population via *Corbula* clam population and distribution. Without a workable physical hypothesis, the correlation means little.

19. I would explain the 1988 – 2005 fall salinity/ summer smelt population correlation, not as a causal relationship, but as an artifact of the particular hydrology during those years. Please refer to Figure 4 below. In the graph, I have reversed the X-axis so that high salinity is now on the left and low salinity is on the right. I have also added a graph showing Sacramento River inflow for a portion of this period. Finally, I have drawn lines linking data points to the flows during the corresponding years. It is readily apparent that the values in the upper right of the graph – the high population numbers – were all generated during the extraordinarily wet period of the late 1990s. By contrast, all the values in the lower left of the graph – the low population numbers – were generated during the drought of the late 1980s and early 1990s. Without the extreme values created during these dry and wet sequences, there would just be a ball of points in the middle of the graph. So, an alternative explanation is that long wet sequences are good for summer smelt populations and long dry sequences are bad. Boosting outflow during the fall of dry years is very unlikely to replicate the myriad and complex benefits to smelt generated by long strings of very wet years.

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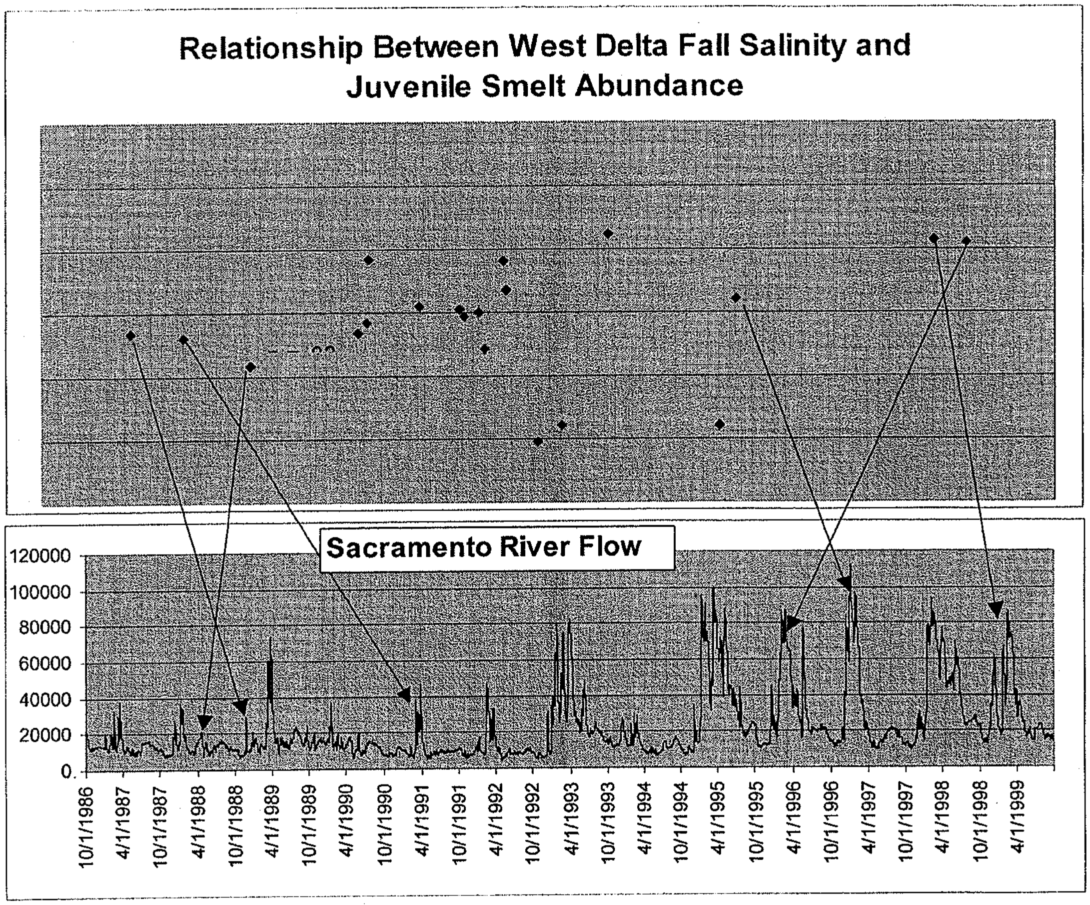

Figure 4

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that this declaration was executed in Sacramento, California on August 9, 2007.

DAVID K. FULLERTON

REFERENCES

EWA Technical Review Panel. 2007. *Review of the 2006 Environmental Water Account* (EWA). http://science.calwater.ca.gov/workshop/ewa.shtml

Feyrer, F. B, M. L. Nobriga, and T. R. Sommer. 2007. *Multidecadal Trends for Three Declining Fish Species: Habitat Patterns and Mechanisms in the San Francisco Estuary, California, USA*, 64 Can. J. Fish. Aquat. Sci. 64:723-734

Guerin, M., G. Gartrell, and R. Denton. 2006. *Linkages Between Fall Salinity, Delta Outflow, and Delta Smelt Population Decline*. Proceedings of the CALFED Science Conference, October 23 – 25, 2006, Sacramento, CA

Nobriga, M. 2007. *Report on the CALFED Science Program Workshop "Defining a Variable Delta to Promote Estuarine Fish Habitat*". July 27, 2007 http://science.calwater.ca.gov/workshop/workshop_variable.shtml

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EXHIBIT 8

In their review of environmental quality impacts on fisheries, Feyrer et al identified a trend towards increasing specific conductance during their study period, which they hypothesized is a function of decreasing river flow entering the estuary during the fall. While the State Water Contractors disagree with many of the conclusions of the Feyrer report, which are discussed elsewhere, there are also concerns with their identification of the cause of salinity changes. To investigate the cause of increased salinities in the fall, historical inflows to the Delta watershed and the Delta were reviewed for the period September through November, which are summarized in the table below:

September-November Flows

											Upstream Flow Contribution				
		Delta	Delta Inflow						In-Delta					Fair	Sac Valley
Year	SRI *	Outflow	Yolo	Freeport	Vernalis	Mokelumne	Eastside	Total	Cons Use	Exports	Keswick	Oroville	Marysville	Oaks	Accretions
1966	13	2,097	15	2,319	190	11	22	2,558	142	316	1,485	365	56	236	191
1967	24	2,977	5	2,967	495	148	17	3,631	327	336	1,708	435	64	524	241
1968	14	1,354	3	2,305	236	12	14	2,571	203	1,018	1,447	159	47	226	429
1969	27	3,587	4	3,285	743	118	14	4,164	242	340	1,486	742	24	654	382
1970	24	3,247	16	3,380	267	68	29	3,759	68	464	1,522	610	409	480	373
1971	23	2,846	3	3,383	302	103	11	3,802	313	648	1,598	841	320	520	105
1972	13	2,901	36	3,370	347	13	16	3,783	-130	1,021	1,403	507	463	486	546
1973	20	5,096	647	4,927	380	120	21	6,095	36	999	2,376	1,164	478	705	850
1974	32	3,815	4	4,038	616	98	40	4,796	287	699	1,755	1,235	121	567	362
1975	19	2,904	8	3,716	670	129	27	4,548	235	1,405	1,689	707	479	490	357
1976	8	652	1	1,708	209	6	3	1,927	257	1,037	861	364	84	199	201
1977	5	526	0	1,081	51	2	8	1,142	289	321	753	179	37	69	43
1978	24	1,938	0	2,575	575	120	15	3,286	251	1,099	1,140	464	268	358	346
1979	12	1,500	0	2,545	419	94	17	3,074	195	1,381	909	356	323	454	503
1980	22	1,430	0	2,290	672	75	12	3,048	363	1,262	1,036	312	325	348	268
1981	11	2,742	221	3,330	249	13	31	3,843	94	1,050	1,007	714	227	476	1,127
1982	33	5,278	24	4,537	1,283	188	120	6,152	-80	1,005	1,658	851	433	754	865
1983	38	8,267	341	5,670	2,127	261	163	8,562	-58	512	2,101	1,147	556	1,115	1,092
1984	22	3,084	87	3,430	576	110	27	4,229	38	1,152	1,498	468	342	416	792
1985	11	806	0	1,942	357	21	14	2,334	110	1,432	905	362	81	314	281
1986	26	1,751	0	2,784	646	112	23	3,564	320	1,502	1,240	622	191	408	323
1987	9	590	0	1,760	271	10	12	2,053	242	1,233	916	270	89	332	154
1988	9	721	0	1,935	231	6	6	2,178	258	1,208	1,174	350	120	169	122
1989	15	1,010	0	2,740	250	12	12	3,015	98	1,915	1,168	491	193	479	409
1990	9	623	0	1,525	180	22	14	1,740	305	818	989	198	135	218	-15
1991	8	697	0	1,584	147	19	13	1,763	299	780	880	251	234	299	-80
1992	9	713	0	1,372	147	19	25	1,563	304	540	820	301	67	127	57
1993	22	1,070	0	2,511	457	45	36	3,048	234	1,752	1,263	398	215	412	222
1994	8	844	0	1,930	213	19	43	2,204	200	1,154	1,035	348	85	177	285
1995	34	2,366	0	3,005	776	112	61	3,955	374	1,239	1,286	747	164	550	258
1996	22	1,323	0	2,750	456	42	57	3,305	177	1,832	1,237	421	192	502	399
1997	25	1,134	2	2,452	407	36	26	2,923	138	1,714	1,045	457	142	386	424
1998	31	3,177	9	3,720	917	35	42	4,722	201	1,400	1,720	684	239	541	545
1999	21	951	0	2,527	405	33	26	2,991	258	1,827	1,244	521	165	411	185
2000	19	909	0	2,352	463	39	25	2,879	211	1,800	1,167	523	143	329	190
2001	10	995	0	1,982	330	20	23	2,355	215	1,184	1,156	237	84	227	279
2002	15	938	0	2,114	277	24	22	2,436	245	1,295	1,262	479	85	276	12
2003	19	863	0	2,331	299	30	23	2,683	247	1,613	1,232	532	104	346	117
2004	16	1,201	0	2,373	272	23	17	2,685	5	1,517	1,245	461	100	256	312
2005	19	1,016	0	2,763	426	66	45	3,299	360	1,953	1,335	600	296	418	114
Summary by 20-Year Periods--Pre and Post 1985															
1966-1985	20	2,852	71	3,140	538	85	31	3,865	159	875	1,417	599	257	470	468
1986-2005	17	1,145	1	2,325	378	36	28	2,768	235	1,414	1,171	445	152	343	215
Difference		1,708	-70	-815	-160	-49	-3	-1,097	75	539	-246	-155	-105	-127	-252
Percentage					10.7%	3.3%	0.2%		5.0%	36.0%	16.4%	10.3%	7.0%	8.4%	16.8%

* Sacramento River Index, Million Acre-feet

This table reports Delta outflows and inflows from 1966 through 2005, and is summarized for two twenty-year periods – 1966 though 1985, and 1986 through 2005. The twenty-year period was selected based on apparent changes in hydrology between the two time periods. The later time period (1986 through 2005) also corresponds generally with the time period used for correlation by Feyrer, et al.

The summary shows that Delta outflows were reduced by more than half, or 1.71 million acre-feet (MAF), for the period 1986-2005 as compared to the period 1966-1985. Of this change, about 1.10 MAF was the result of changes in Delta inflow. The remaining reduction in Delta outflows was primarily the result of increases in Delta exports, with a smaller reduction resulting from higher Delta Consumptive Use. In total, reductions in Delta inflows accounted for about 59% of the reduction in outflow, while increased Delta exports resulted in about 36% of the reduced Delta outflow.

Impacts to Delta inflows were widespread in the watershed, with major reductions occurring on the Sacramento River, the Feather River, Sacramento Valley Accretions, and the San Joaquin River. Sacramento Valley Accretions, which represents the net effect on inflows between the major regulated tributaries and downstream inflows to the Delta, was the largest single reduction to Delta inflow. Sacramento Valley Accretions was reduced by more than 50% from the period 1966-1985 to 1986-2005, accounting for about 17% of the total reduction in Delta inflow. Initial review of the causes for reduced Sacramento Valley Accretions has identified multiple causes, with the primary cause being increased precipitation for the period 1966-1985 than for the later period. Lesser causes could be related to increases in irrigation use since 1985 and changes in water management practices for crop irrigation, particularly since the late 1990s.

Other factors which appear to be responsible for reducing Delta inflows include:

- Sacramento River flows at Shasta were reduced partly as a result of reduced Trinity River diversions, which previously supported a significant portion of fall releases.
- Feather River flows below the Oroville/Thermalito reservoir complex appear to have been reduced in part as a result of the 1983 DFG Fish Agreement. The Agreement restricts variations in outflow after October 15 to minimize impacts to spawning salmon.

The identification of hydrological changes from the above table appears to contradict the reference by Feyrer to a report by Dettinger and Cayan that indicated there is no significant long-term trend in runoff entering the watershed of the estuary during September-December. In part, this difference in cause of water supply is a result of a different time period, as the Dettinger and Cayan paper analyzed trends through the period 1948 through 1991. That period does not correspond to the period of the Feyrer paper correlation, and overlaps only four years with the post-1987 period used in their analysis. The Dettinger and Cayan paper also analyzed only unimpaired flows for eight major basin inflows, which would have included higher elevation watersheds that would be more likely to have snowfall than rainfall in the fall. The lower elevation watersheds reflected by the Sacramento Valley Accretions accounted for a significant portion of the reduced inflows. Unimpaired flows for lower-elevation watersheds that contribute to the Sacramento Valley Accretions did show significantly lower runoff for the period 1966-1985 than for the later 1986-2005 period.