SOLANO COUNTY WATER AGENCY

BOARD OF DIRECTORS MEETING

DATE: **Thursday, December 14, 2017**

TIME: **6:30 P.M.**

PLACE: **Berryessa Room**
Solano County Water Agency Office
810 Vaca Valley Parkway, Suite 203
Vacaville

1. **CALL TO ORDER**

2. **PLEDGE OF ALLEGIANCE**

3. **APPROVAL OF AGENDA**

4. **PUBLIC COMMENT**

   Limited to 5 minutes for any one item not scheduled on the Agenda.

5. **CONSENT ITEMS** *(estimated time: 5 minutes)*

   (A) Minutes: Approval of the Minutes of the Board of Directors meeting of November 9, 2017 is recommended.

   (B) Expenditure Approvals: Approval of the November 2017 checking account register is recommended.

   (C) Contract Amendment with UC Davis for Geomorphological Consulting Services in Support of Lower Putah Creek Restoration Projects: Authorize General Manager to execute $25,000 contract amendment with UC Davis for geomorphological consulting services through FY 2018-2019, in support of Lower Putah Creek restoration projects.

   (D) Contract with Kennedy Jenks Consultants for update of Westside Integrated Regional Water Management Plan: Authorize General Manager to execute $63,428 contract with Kennedy Jenks Consultants for revisions to Westside Integrated Regional Water Management Plan.

810 Vaca Valley Parkway, Suite 203
Vacaville, California 95688
Phone (707) 451-6090 • FAX (707) 451-6099
www.scwa2.com

6. **BOARD MEMBER REPORTS** *(estimated time: 5 minutes)*

RECOMMENDATION: For information only

7. **GENERAL MANAGER'S REPORT** *(estimated time: 5 minutes)*

RECOMMENDATION: For information only.

8. **SOLANO WATER ADVISORY COMMISSION REPORT** *(estimated time: 5 minutes)*

RECOMMENDATION: For information only.

9. **LAKE BERRYESSA BOATER OUTREACH PROGRAM** *(estimated time: 45 minutes)*

RECOMMENDATION

1. Hear presentation on 2017 Lake Berryessa Boater Outreach Program

2. Authorize hiring of permanent part-time Water Resources Technician to assist with implementation of Lake Berryessa Boater Outreach Program, in lieu of outsourcing work tasks to contractor

3. Authorize purchase of Watercraft Seals, total cost not to exceed $13,000

4. Authorize staff to investigate feasibility of purchasing property in or near the Lake Berryessa watershed for operation of permanent boat decontamination station

10. **LEGISLATIVE UPDATES** *(estimated time: 5 minutes)*

RECOMMENDATION:

1. Hear report from Committee Chair on activities of the SCWA Legislative Committee.

11. **WATER POLICY UPDATES** *(estimated time: 10 minutes)*

RECOMMENDATION:

1. Hear report from staff on current and emerging Delta and Water Policy issues and provide direction.

2. Hear status report from Committee Chair on activities of the SCWA Water Policy Committee.

3. Hear report from Supervisor Thomson on activities of the Delta Counties Coalition, Delta Protection Commission, and Delta Stewardship Council.

4. Hear report from Mayor Patterson on activities of the Delta Conservancy.

12. TIME AND PLACE OF NEXT MEETING

Thursday, January 11, 2018 at 6:30 p.m. at the SCWA offices.

The Full Board of Directors packet with background materials for each agenda item can be viewed on the Agency's website at www.scwa2.com.

Any materials related to items on this agenda distributed to the Board of Directors of Solano County Water Agency less than 72 hours before the public meeting are available for public inspection at the Agency's offices located at the following address: 810 Vaca Valley Parkway, Suite 203, Vacaville, CA 95688. Upon request, these materials may be made available in an alternative format to persons with disabilities.

DEC.2017.bod.agd

CONSENT ITEMS

SOLANO COUNTY WATER AGENCY

BOARD OF DIRECTORS MEETING MINUTES

MEETING DATE: November 9, 2017

The Solano County Water Agency Board of Directors met this evening at the Solano County Water Agency. Present were:

Mayor Elizabeth Patterson, City of Benicia
Mayor Thom Bogue, City of Dixon
Mayor Harry Price, City of Fairfield
Mayor Ronald Kott, City of Rio Vista
Mayor Pete Sanchez, Suisun City
Mayor Len Augustine, City of Vacaville
Mayor Bob Sampayan, City of Vallejo
Supervisor Skip Thomson, Solano County District 1
Supervisor Monica Brown, Solano County District 2
Supervisor James Spering, Solano County District 3
Supervisor John Vasquez, Solano County District 4
Supervisor James Spering, Solano County District 5
Director Ryan Mahoney, Maine Prairie Water District
Director Dale Crossley, Reclamation District 2068
Director John Kluge, Solano Irrigation District

CALL TO ORDER

The meeting was called to order at 6:30 P.M. by Chair Sanchez.

APPROVAL OF AGENDA

On a motion by Supervisor Vasquez and second by Mayor Bogue the Board unanimously approved the agenda.

PUBLIC COMMENT

There were no public comments.

CONSENT ITEMS

Director Kluge requested Consent Item 5A be pulled for further discussion.

On a motion by Mayor Patterson and second by Director Kluge the Board unanimously approved the following Consent Items:

(5B) Expenditure Approvals
(5C) Contract with cbec, inc. eco engineering to conduct Lower Cordelia Floodplain Reconnaissance Study.
(5D) Contract amendment with Agrichem Services Incorporated for Nuisance Vegetation Management Services.
(5E) Continuation of Water Ways School Education Program through FY 2017-2018.
(5F) Contract Amendment for Development of Putah Creek Soil Assessment Protocol in Support of LPCCC habitat enhancement projects.

Director Kluge requested that future Board meeting minutes include a more through description of the Board's discussions and deliberations for each agenda item. Chair Sanchez directed staff to provide more through descriptions, per Director Kluge's request, and requested the Executive Committee review draft meeting minutes to confirm Board meeting discussions and deliberations are described in sufficient detail, as a part of their review of draft Board meeting agendas.

On a motion by Mayor Price and second my Supervisor Vasquez the Board unanimously approved Consent Item 5A (minutes of the October 12, 2017 Board meeting).

BOARD MEMBER REPORTS

There were no Board Member reports.

GENERAL MANAGER'S REPORT

There were no additions to the General Manager's written report.

SOLANO WATER ADVISORY COMMISSION

There was no verbal report, the minutes of the September 27, 2017 Solano Water Advisory Commission meeting were included in the Board's November 9, 2017 meeting agenda packet

INCREASE PUTAH CREEK STREAMKEEPER POSTION TO FULL-TIME EMPLOYMENT STATUS

General Manager Roland Sanford stated he had no additions to the written staff report. There were no questions or comments by Board members, on a motion by Supervisor Hannigan and a second by Mayor Bogue the Board unanimously approved increasing the Putah Creek Streamkeeper positon to full-time status.

LEGISLATIVE UPDATES

No report, the Legislative Committee's November 2, 2017 meeting was cancelled

WATER POLICY UPDATES

1. No report by staff on current and emerging Delta and Water Policy issues.

2. General Manager Roland Sanford reported that the Water Policy Committee has now held three meetings, during which it has discussed a variety of flood management topics, and that it is the consensus of the committee members that a meeting facilitator should be retained to help focus future discussions, with the expectation that the Water Policy Committee will identify and recommend a suite of flood management policies, for Board consideration, early next year.

3. No report by Supervisor Thomson on Delta Counties Coalition, Delta Protection Commission, or Delta Stewardship Council meetings or activities.

4. Mayor Patterson commented she had nothing to report, other than the fact that the Delta Conservancy will be meeting later in November.

TIME AND PLACE OF NEXT MEETING

Thursday, November 9, 2017 at 6:30 p.m., at the SCWA offices in Vacaville

ADJOURNMENT

This meeting of the Solano County Water Agency Board of Directors was adjourned at 6:37 p.m.

_____

Roland Sanford
General Manager & Secretary to the
Solano County Water Agency

ACTION OF
SOLANO COUNTY WATER AGENCY

DATE: **December 14, 2017**

SUBJECT: **Expenditures Approval**

RECOMMENDATIONS:

Approve expenditures from the Water Agency checking accounts for the month of November, 2017.

FINANCIAL IMPACT:

All expenditures are within previously approved budget amounts.

BACKGROUND:

The Water Agency auditor has recommended that the Board of Directors approve all expenditures (in arrears). Attached is a summary of expenditures from the Water Agency's checking accounts for the month of November, 2017. Additional backup information is available upon request.

Recommended: _____
Roland Sanford, General Manager

☐ Approved as recommended ☐ Other (see below) ☐ Continued on next page

Modification to Recommendation and/or other actions:

I, Roland Sanford, General Manager and Secretary to the Solano County Water Agency, do hereby certify that the foregoing action was regularly introduced, passed, and adopted by said Board of Directors at a regular meeting thereof held on December 14, 2017 by the following vote.

Ayes:

Noes:

Abstain:

Absent:

_____
Roland Sanford
General Manager & Secretary to the
Solano County Water Agency

SOLANO COUNTY WATER AGENCY
Cash Disbursements Journal
For the Period From Nov 1, 2017 to Dec 31, 2017

Filter Criteria includes: Report order is by Check Number. Report is printed in Detail Format.

Date	Check #	Account ID	Line Description	Debit Amount	Credit Amount
11/8/17	10169	2020WC	Invoice: 17-09-3868	783.75	
		1010WC	MBK ENGINEERS		783.75
11/27/17	10170	2020WC	Invoice: 17-10-3868	4,379.00	
		1010WC	MBK ENGINEERS		4,379.00
11/1/17	30785V	2020SC	Invoice: 2018 DUES		21,905.00
		1020SC	ACWA JOINT POWERS INSURANCE AUTHORIT	21,905.00	
11/13/17	30817V	2020SC	Invoice: 170854		1,526.60
		1020SC	WATERMAN INDUSTRIES, INC.	1,526.60	
11/6/17	30822V	2020SC	Invoice: 9068146573		239.31
		2020SC	Invoice: 9068450691		122.56
		1020SC	AIRGAS USA, LLC	361.87	
11/6/17	30847	2020SC	Invoice: 2018 ANNUAL DUES	21,905.00	
		1020SC	ACWA		21,905.00
11/6/17	30848	2020SC	Invoice: 2560179	578.26	
		1020SC	AMERICAN TOWER CORPORATION		578.26
11/6/17	30849	2020SC	Invoice: 984719	89.96	
		1020SC	CENTRAL AUTO PARTS		89.96
11/6/17	30850	2020SC	Invoice: 51781241	533.72	
		1020SC	CHEVRON AND TEXACO		533.72
11/6/17	30851	2020SC	Invoice: 5009235938	78.13	
		1020SC	CINTAS CORPORATION		78.13
11/6/17	30852	2020N	Invoice: NOV 2017	8,600.00	
		1020SC	CLEAN TECH ADVOCATES		8,600.00
11/6/17	30853	2020SC	Invoice: 2017/18-#3	3,150.00	
		1020SC	DAVID OKITA		3,150.00
11/6/17	30854	2020SC	Invoice: 800021629276	1,170.11	
		2020SC	Invoice: 800021629384	300.08	
		1020SC	EAN SERVICES, LLC		1,470.19
11/6/17	30855	2020SC	Invoice: 20263948	1,096.25	
		1020SC	EVERBANK COMMERCIAL FINANCE		1,096.25
11/6/17	30856	2020SC	Invoice: 89470	981.50	
		2020SC	Invoice: 89472	843.25	
		1020SC	GHD, INC.		1,824.75
11/6/17	30857	2020SC	Invoice: 4228002592	2,019.73	
		1020SC	GUCKENHEIMER HOLDINGS, LLC		2,019.73
11/6/17	30858	2020SC	Invoice: 7020465	59.02	
		2020SC	Invoice: 7020466	74.86	
		2020SC	Invoice: 0021365	67.16	
		2020SC	Invoice: 1011526	444.14	
		1020SC	HOME DEPOT CREDIT SERVICE		645.18
11/6/17	30859	2020SC	Invoice: 5728107	429.41	
		1020SC	HOSE & FITTINGS, ETC		429.41
11/6/17	30860	2020SC	Invoice: NOV 2017 EXEC MTG	100.00	
		1020SC	JOHN D. KLUGE		100.00
11/6/17	30861	2020SC	Invoice: 142352	178.23	
		1020SC	MARTIN'S METAL FABRICATION &		178.23
11/6/17	30862	2020SC	Invoice: 65421	12,741.73	
		1020SC	NORMANDEAU ASSOCIATES, INC.		12,741.73
11/6/17	30863	2020SC	Invoice: 7569	63.67	
		1020SC	REGIONAL GOVERNMENT SERVICES		63.67

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Date	Check #	Account ID	Line Description	Debit Amount	Credit Amount
			SERVICES		
11/6/17	30864	2020SC	Invoice: 1249	1,750.00	
		1020SC	ROCK STEADY JUGGLING		1,750.00
11/6/17	30865	2020SC	Invoice: 005817	174.28	
		2020SC	Invoice: 005857	184.85	
		1020SC	SAM'S CLUB		359.13
11/6/17	30866	2020SC	Invoice: 56630715	978.72	
		2020SC	Invoice: 56631421	77.67	
		1020SC	SBS LEASING A PROGRAM DE LAGE		1,056.39
11/6/17	30867	2020SC	Invoice: 17-11-A	3,481.88	
		1020SC	STATE AND FEDERAL CONTRACTORS WATER AGE		3,481.88
11/6/17	30868	2020U	Invoice: OCT 2017	409.19	
		1020SC	SOLANO COUNTY FLEET MANAGEMENT		409.19
11/6/17	30869	2020SC	Invoice: 0005884	50,256.82	
		1020SC	SOLANO IRRIGATION DISTRICT		50,256.82
11/6/17	30870	2020SC	Invoice: 12804947	9,049.20	
		1020SC	SOLINST CANADA LTD.		9,049.20
11/6/17	30871	2020SC	Invoice: 87096	72.87	
		1020SC	STERLING MAY CO.		72.87
11/13/17	30871V	2020SC	Invoice: 87096		72.87
		1020SC	STERLING MAY CO.	72.87	
11/6/17	30872	2020SC	Invoice: 52405	26.18	
		1020SC	SUISUN VALLEY FRUIT GROWERS AS		26.18
11/6/17	30873	2020SC	Invoice: 201711-13183	131.25	
		1020SC	TERRA REALTY ADVISORS, INC.		131.25
11/6/17	30874	2020SC	Invoice: 20961-28	3,241.40	
		1020SC	THE REGENTS OF THE UNIVERSITY OF CA		3,241.40
11/6/17	30875	2020U	Invoice: OCT 2017	5,980.60	
		1020SC	CRAIG D. THOMSEN		5,980.60
11/6/17	30876	2020U	Invoice: WILLIAM FORNEY	1,000.00	
		1020SC	WILLIAM FORNEY		1,000.00
11/6/17	30877	2020SC	Invoice: LPCCC-FY2017-18_2	2,778.50	
		2020SC	Invoice: LPCCC-FY2017-18_3	5,126.50	
		1020SC	WILDLIFE SURVEY & PHOTO SERVICES		7,905.00
11/6/17	30878	2020SC	Invoice: 9068450691	122.56	
		1020SC	AIRGAS USA, LLC		122.56
11/6/17	30879	2020SC	Invoice: 147202	913.60	
		1020SC	DEPT OF FORESTRY & FIRE PROTECTION		913.60
11/6/17	30880	2020SC	Invoice: 386824	1,463.10	
		1020SC	HAUGHN & SON TIRE		1,463.10
11/6/17	30881	2020SC	Invoice: 509969	112.00	
		1020SC	M&M SANITARY LLC		112.00
11/6/17	30882	2020SC	Invoice: CL72523	496.91	
		1020SC	INTERSTATE OIL COMPANY		496.91
11/6/17	30883	2020SC	Invoice: 12453	3,000.00	
		1020SC	MANN, URRUTIA, NELSON, CPAS		3,000.00
11/6/17	30884	2020SC	Invoice: 770393	8.97	

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Date	Check #	Account ID	Line Description	Debit Amount	Credit Amount
		2020SC	Invoice: 770429	185.92	
		2020SC	Invoice: 770463	25.78	
		2020SC	Invoice: 770427	8.48	
		2020SC	Invoice: 771051	61.40	
		2020SC	Invoice: 771284	98.80	
		2020SC	Invoice: 771832	96.03	
		2020SC	Invoice: 772647	23.58	
		2020SC	Invoice: 772630	90.91	
		2020SC	Invoice: 772747	65.92	
		2020SC	Invoice: 772811	14.15	
		2020SC	Invoice: 773448	128.83	
		2020SC	Invoice: 773639	14.83	
		1020SC	PISANIS AUTO PARTS		823.60
11/7/17	30885	2020SC	Invoice: 237615	225.20	
		2020SC	Invoice: 237945	225.20	
		2020SC	Invoice: 974515	141.00	
		2020SC	Invoice: 238075	29.97	
		2020SC	Invoice: 238296	9.11	
		2020SC	Invoice: 238273	2.31	
		2020SC	Invoice: 238256	21.43	
		2020SC	Invoice: 238745	12.87	
		2020SC	Invoice: 238734	77.36	
		2020SC	Invoice: 976087	3.76	
		2020SC	Invoice: 238873	17.47	
		2020SC	Invoice: 976474	81.22	
		2020SC	Invoice: 239062	49.15	
		2020SC	Invoice: 976808	172.26	
		2020SC	Invoice: 239256	19.29	
		2020SC	Invoice: 239378	41.46	
		2020SC	Invoice: 239821	97.18	
		1020SC	PACIFIC ACE HARDWARE		1,226.24
11/8/17	30886	2020SC	Invoice: 0516887	1,522.56	
		1020SC	ACWA JOINT POWERS INSURANCE AUTHORITY		1,522.56
11/8/17	30887	2020SC	Invoice: 9068146573	239.31	
		1020SC	AIRGAS USA, LLC		239.31
11/13/17	30887V	2020SC	Invoice: 9068146573		239.31
		1020SC	AIRGAS USA, LLC	239.31	
11/8/17	30888	2020SC	Invoice: IN-1171087523	2,095.00	
		1020SC	ALPHA MEDIA II LLC		2,095.00
11/8/17	30889	2020SC	Invoice: 17-792	1,200.00	
		1020SC	BARTEL ASSOCIATES		1,200.00
11/8/17	30890	2020SC	Invoice: 17294	11,161.51	
		1020SC	CENTRAL VALLEY EQUIPMENT REPAIR		11,161.51
11/8/17	30891	2020SC	Invoice: PS010831224	431.67	
		1020SC	HOLT OF CALIFORNIA		431.67
11/13/17	30891V	2020SC	Invoice: PS010831224		431.67
		1020SC	HOLT OF CALIFORNIA	431.67	
11/8/17	30892	2020SC	Invoice: 5730480	152.41	
		1020SC	HOSE & FITTINGS, ETC		152.41
11/8/17	30893	2020N	Invoice: 1107-1	750.00	
		1020SC	JEFFREY J JANIK		750.00
11/8/17	30894	2020SC	Invoice: 33292	15,858.60	
		1020SC	LUHDORFF & SCALMANINI		15,858.60
11/8/17	30895	2020SC	Invoice: 00998476	66.60	
		1020SC	RECOLOGY HAY ROAD		66.60
11/8/17	30896	2020SC	Invoice: 7331	67.41	
		1020SC	REGIONAL GOVERNMENT SERVICES		67.41
11/8/17	30897	2020SC	Invoice: 6935	500.00	

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		1020SC	SALMONID RESTORATION FEDERATION		500.00
11/27/17	30897V	2020SC	Invoice: 6935		500.00
		1020SC	SALMONID RESTORATION FEDERATION	500.00	
11/8/17	30898	2020SC	Invoice: 1031170229	2,351.25	
		1020SC	SHANDAM CONSULTING		2,351.25
11/8/17	30899	2020SC	Invoice: 12046223	154.64	
		1020SC	THE TREMONT GROUP, INC.		154.64
11/8/17	30900	2020SC	Invoice: 9795274823	2,517.81	
		1020SC	VERIZON WIRELESS		2,517.81
11/8/17	30901	2020SC	Invoice: 35778	200.00	
		1020SC	VISION TECHNOLOGY SOLUTIONS, LLC DBC		200.00
11/8/17	30902	2020SC	Invoice: SCWA_FY2017-18_2	14,802.21	
		2020SC	Invoice: SCWA_FY2017-18_3	13,822.20	
		1020SC	WILDLIFE SURVEY & PHOTO SERVICES		28,624.41
11/8/17	30903	2020SC	Invoice: 708174	35,343.72	
		1020SC	YELLOW SPRINGS INSTRUMENT CO.		35,343.72
11/8/17	30904	2020SC	Invoice: SPEAKER FEE	150.00	
		1020SC	MELANIE TRUAN		150.00
11/13/17	30905	2020SC	Invoice: PROP84 RD2 Q10	14,116.05	
		1020SC	ALAMEDA COUNTY WATER DISTRICT		14,116.05
11/13/17	30906	2020SC	Invoice: NOV 2017 BOD MTG	100.00	
		1020SC	THOMAS BOGUE		100.00
11/13/17	30907	2020SC	Invoice: 12013016	780.19	
		1020SC	CALPERS LONG-TERM CARE PROGRAM		780.19
11/13/17	30908	2020SC	Invoice: PROP84 RD2 Q10	94.76	
		1020SC	CITY OF NAPA WATER DIVISION		94.76
11/13/17	30909	2020SC	Invoice: 300005364	599.00	
		2020SC	Invoice: 300005190	352.50	
		2020SC	Invoice: 300005277	227.50	
		2020SC	Invoice: 300005371	227.50	
		2020SC	Invoice: 300006944	125.00	
		2020SC	Invoice: 300008750	125.00	
		1020SC	DAILY REPUBLIC, INC.		1,656.50
11/13/17	30910	2020SC	Invoice: 2018 RAM PURCH	57,646.10	
		1020SC	DODGE CHRYSLER JEEP OF VACAVILLE		57,646.10
11/13/17	30911	2020SC	Invoice: 93370678	2,302.94	
		1020SC	ENVIRONMENTAL SYSTEMS RESEARCH INSTITUT		2,302.94
11/13/17	30912	2020SC	Invoice: 4506	25,707.50	
		1020SC	EYASCO, INC.		25,707.50
11/13/17	30913	2020SC	Invoice: PS010831224	426.98	
		1020SC	HOLT OF CALIFORNIA		426.98
11/13/17	30914	2020SC	Invoice: NOV 2017 BOD MTG	100.00	
		1020SC	JOHN D. KLUGE		100.00
11/13/17	30915	2020SC	Invoice: 63100445178	14.00	
		2020SC	Invoice: 63100446338	175.62	
		2020SC	Invoice: 63100445739	730.28	
		1020SC	LES SCHWAB TIRE CENTER		919.90

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11/13/17	30916	2020SC	Invoice: NOV 2017 BOD MTG	100.00	
		1020SC	RYAN MAHONEY		100.00
11/13/17	30917	2020SC	Invoice: NOV 2017 WAT POL	100.00	
		2020SC	Invoice: NOV 2017 BOD MTG	132.64	
		1020SC	ELIZABETH PATTERSON		232.64
11/13/17	30918	2020SC	Invoice: 152659	379.00	
		1020SC	S&J ADVERTISING, INC.		379.00
11/13/17	30919	2020SC	Invoice: NOV 2017 BOD MTG	126.75	
		1020SC	BOB SAMPAYAN		126.75
11/13/17	30920	2020SC	Invoice: PROP84 RD2 Q10	11,838.10	
		1020SC	SONOMA COUNTY WATER AGENCY		11,838.10
11/13/17	30921	2020SC	Invoice: PROP84 RD2 Q10	18,368.62	
		1020SC	SONOMA RESOURCE CONSERVATION DISTRICT		18,368.62
11/13/17	30922	2020SC	Invoice: NOV 2017 BOD MTG	100.00	
		1020SC	JAMES SPERING		100.00
11/13/17	30923	2020SC	Invoice: PROP84 RD2 Q10	29,795.32	
		1020SC	ALAMEDA COUNTY WASTE MANAGEMENT AUTHORI		29,795.32
11/13/17	30924	2020SC	Invoice: 001755	133.34	
		1020SC	UNAVCO, INC.		133.34
11/13/17	30925	2020SC	Invoice: NOV 2017 WTR POL	100.00	
		2020SC	Invoice: NOV 2017 BOD MTG	100.00	
		1020SC	JOHN VASQUEZ		200.00
11/13/17	30926	2020SC	Invoice: 170854	1,526.60	
		1020SC	WATERMAN INDUSTRIES, INC.		1,526.60
11/13/17	30927	2020SC	Invoice: 348	3,509.77	
		1020SC	WILSON PUBLIC AFFAIRS		3,509.77
11/13/17	30928	2020SC	Invoice: PROP84 RD2 Q10	3,260.34	
		1020SC	ZONE 7 WATER AGENCY		3,260.34
11/14/17	30929	2020SC	Invoice: NOV 2017 BOD MTG	100.00	
		1020SC	RONALD KOTT		100.00
11/14/17	30930	2020SC	Invoice: 9068146573	239.31	
		1020SC	AIRGAS USA, LLC		239.31
11/14/17	30930V	2020SC	Invoice: 9068146573		239.31
		1020SC	AIRGAS USA, LLC	239.31	
11/15/17	30931	2020SC	Invoice: AR3682 PROP84 RD2Q10	949.50	
		1020SC	CONTRA COSTA WATER DISTRICT		949.50
11/15/17	30932	2020SC	Invoice: 0001072279	530.00	
		1020SC	DEPARTMENT OF GENERAL SERV - USE DEPT38		530.00
11/15/17	30932V	2020SC	Invoice: 0001072279		530.00
		1020SC	DEPARTMENT OF GENERAL SERV - USE DEPT38	530.00	
11/15/17	30933	2020SC	Invoice: 0000001072279	4,860.00	
		2020SC	Invoice: 00001072279	4,197.00	
		1020SC	DEPARTMENT OF GENERAL SERVICES		9,057.00
11/15/17	30933V	2020SC	Invoice: 0000001072279		4,860.00
		2020SC	Invoice: 00001072279		4,197.00
		1020SC	DEPARTMENT OF GENERAL SERVICES	9,057.00	
11/15/17	30934	2020N	Invoice: US0131903421	1,424.00	

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Date	Check #	Account ID	Line Description	Debit Amount	Credit Amount
		1020SC	ERNST & YOUNG U.S. LLP		1,424.00
11/15/17	30935	2020SC	Invoice: 86575	1,310.19	
		2020SC	Invoice: 86576	2,129.52	
		1020SC	HERUM \ CRABTREE \ SUNTAG		3,439.71
11/15/17	30936	2020SC	Invoice: CL73858	1,652.32	
		1020SC	INTERSTATE OIL COMPANY		1,652.32
11/15/17	30937	2020SC	Invoice: 116851	16,507.50	
		1020SC	KENNEDY/JENKS CONSULTANTS		16,507.50
11/15/17	30938	2020SC	Invoice: 41916610	239.18	
		1020SC	RECOLOGY VACAVILLE SOLANO		239.18
11/15/17	30939	2020SC	Invoice: 0005774	221,045.82	
		2020SC	Invoice: 0005851	179,114.28	
		1020SC	SOLANO IRRIGATION DISTRICT		400,160.10
11/15/17	30940	2020SC	Invoice: BAWMRP - 006-A	3,861.00	
		1020SC	THINKING GREEN CONSULTANTS		3,861.00
11/15/17	30941	2020SC	Invoice: NOV 2017 BOD MTG	100.00	
		1020SC	DALE CROSSLEY		100.00
11/20/17	30942	2020SC	Invoice: A728553	3,130.00	
		2020SC	Invoice: A722295	120.00	
		2020SC	Invoice: A713561	1,340.00	
		1020SC	BSK ASSOCIATES		4,590.00
11/20/17	30943	2020SC	Invoice: 14520	2,871.16	
		1020SC	CONVENTION TOTES.COM INC		2,871.16
11/20/17	30944	2020SC	Invoice: 0000001072279	4,860.00	
		2020SC	Invoice: 00001072279	4,197.00	
		2020SC	Invoice: 0001072279	530.00	
		1020SC	DEPARTMENT OF GENERAL SERVICES		9,587.00
11/20/17	30945	2020SC	Invoice: IN-131738	15,983.00	
		1020SC	GLOBAL DIVING & SALVAGE, INC.		15,983.00
11/20/17	30946	2020SC	Invoice: REIMBURSE	83.25	
		1020SC	JEFF MIHALICK		83.25
11/20/17	30947	2020SC	Invoice: 10/11/17-11/08/17	1,054.01	
		1020SC	PACIFIC GAS & ELECTRIC CO,		1,054.01
11/20/17	30948	2020SC	Invoice: 152912	830.00	
		1020SC	S&J ADVERTISING, INC.		830.00
11/20/17	30949	2020SC	Invoice: 0005959	48,893.95	
		2020SC	Invoice: 0005960	109,663.91	
		1020SC	SOLANO IRRIGATION DISTRICT		158,557.86
11/20/17	30950	2020SC	Invoice: CALL# 147	162.00	
		2020SC	Invoice: CALL#146	270.00	
		1020SC	CHARLES LOMELI, TAX COLLECTOR		432.00
11/20/17	30951	2020SC	Invoice: 19876	2,953.21	
		1020SC	SUMMERS ENGINEERING, INC.		2,953.21
11/20/17	30952	2020SC	Invoice: OCT 2017	6,600.23	
		1020SC	SUSTAINABLE SOLANO		6,600.23
11/20/17	30953	2020SC	Invoice: 20961-30	5,363.11	
		1020SC	THE REGENTS OF THE UNIVERSITY OF CA		5,363.11
11/20/17	30954	2020SC	Invoice: BAWMRP #008	19,422.00	
		2020SC	Invoice: 007	311.50	
		1020SC	THINKING GREEN CONSULTANTS		19,733.50

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11/20/17	30955	2020SC	Invoice: ROBIN BECKERS	1,500.00	
		1020SC	ROBIN BECKERS		1,500.00
11/20/17	30956	2020SC	Invoice: CARLOS CARRANZA FUEN	1,000.00	
		1020SC	CARLOS CARRANZA FUENTES		1,000.00
11/20/17	30957	2020SC	Invoice: ELIZABETH GANSHORN	296.00	
		1020SC	ELIZABETH GANSHORN		296.00
11/20/17	30958	2020SC	Invoice: CYNTHIA KIEFFER	837.00	
		1020SC	CYNTHIA KIEFFER		837.00
11/20/17	30959	2020SC	Invoice: JOYCE MATTHEWS	1,500.00	
		1020SC	JOYCE MATTHEWS		1,500.00
11/20/17	30960	2020SC	Invoice: COLETTE RENVILLE	1,000.00	
		1020SC	MICHAEL RENVILLE		1,000.00
11/20/17	30961	2020SC	Invoice: ROGER SPETH	769.00	
		1020SC	ROGER A SPETH		769.00
11/20/17	30962	2020SC	Invoice: 11987	250.00	
		2020SC	Invoice: 11986	250.00	
		1020SC	WARREN'S WATER TRUCK SERVICE		500.00
11/20/17	30963	2020SC	Invoice: 171570	1,057.00	
		1020SC	WATERMAN INDUSTRIES, INC.		1,057.00
11/20/17	30964	2020SC	Invoice: 1944	606.00	
		1020SC	YOLO-SOLANO AQMD		606.00
11/20/17	30965	2020SC	Invoice: 12250	4,515.60	
		1020SC	SUMMIT CRANE INC.		4,515.60
11/27/17	30966	2020SC	Invoice: GSA MEMBERSHIP	203.13	
		1020SC	ACWA		203.13
11/27/17	30967	2020SC	Invoice: BA5263	1,733.33	
		2020SC	Invoice: BA5261	1,916.67	
		2020SC	Invoice: BA5262	1,250.00	
		1020SC	BLANKINSHIP & ASSOCIATES, INC.		4,900.00
11/27/17	30968	2020SC	Invoice: 000010505870	164.24	
		2020SC	Invoice: 000010505825	252.93	
		1020SC	CALNET3		417.17
11/27/17	30969	2020SC	Invoice: 2018 MEMBERSHIP	2,851.00	
		1020SC	CSDA MEMBER SERVICES		2,851.00
11/27/17	30970	2020SC	Invoice: 17-026-T DEC 2017	560,903.00	
		2020SC	Invoice: 18-102-V OCT 2017	63,032.00	
		2020SC	Invoice: 17-024-O DEC 2017	631.00	
		1020SC	DEPARTMENT OF WATER RESOURCES		624,566.00
11/27/17	30971	2020SC	Invoice: 53190	137.34	
		1020SC	DIXON HARDWARE & LUMBER		137.34
11/27/17	30972	2020SC	Invoice: ER7746446010	7,909.06	
		1020SC	HOLT OF CALIFORNIA		7,909.06
11/29/17	30972V	2020SC	Invoice: ER7746446010		7,909.06
		1020SC	HOLT OF CALIFORNIA	7,909.06	
11/27/17	30973	2020SC	Invoice: 156404	48,521.25	
		1020SC	LSA ASSOCIATES, INC.		48,521.25
11/27/17	30974	2020SC	Invoice: 7660	1,549.40	
		1020SC	REGIONAL GOVERNMENT SERVICES		1,549.40
11/27/17	30975	2020U	Invoice: 07005	2,700.53	

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		2020U	Invoice: 07003	42,845.68	
		2020U	Invoice: 07004	8,863.24	
		2020U	Invoice: 07002	6,054.85	
		1020SC	SOLANO COUNTY PUBLIC WORKS DIVISION		60,464.30
11/27/17	30976	2020SC	Invoice: 006492990046 NOV2017	1,490.77	
		1020SC	STANDARD INSURANCE COMPANY		1,490.77
11/27/17	30977	2020SC	Invoice: TAYLOR BASILICO	1,500.00	
		1020SC	TAYLOR BASILICO		1,500.00
11/27/17	30978	2020SC	Invoice: BETTYE GRIFFIN	1,000.00	
		1020SC	BETTYE GRIFFIN		1,000.00
12/4/17	30979	2020SC	Invoice: 205372	36.00	
		1020SC	A & L WESTERN AGRICULTURAL LABS		36.00
12/4/17	30980	2020SC	Invoice: INV-17397-C5J0H6	840.00	
		1020SC	ACWA		840.00
12/4/17	30981	2020SC	Invoice: 130218	25,150.00	
		1020SC	BYRO TECHNOLOGIES		25,150.00
12/4/17	30982	2020N	Invoice: DEC 2017	8,600.00	
		1020SC	CLEAN TECH ADVOCATES		8,600.00
12/4/17	30983	2020SC	Invoice: 2017/2018 FLOOD	13,600.00	
		1020SC	JASON COLEMAN		13,600.00
12/4/17	30984	2020U	Invoice: 34752757	9,524.61	
		2020U	Invoice: 34769543	1,189.13	
		1020SC	CROP PRODUCTION SERVICES, INC.		10,713.74
12/4/17	30985	2020SC	Invoice: 147324	342.60	
		1020SC	DEPT OF FORESTRY & FIRE PROTECTION		342.60
12/4/17	30986	2020SC	Invoice: 93378486	3,766.88	
		1020SC	ENVIRONMENTAL SYSTEMS RESEARCH INSTITUT		3,766.88
12/4/17	30987	2020SC	Invoice: 90538	11,324.50	
		1020SC	GHD, INC.		11,324.50
12/4/17	30988	2020SC	Invoice: ER7746446010	7,482.08	
		1020SC	HOLT OF CALIFORNIA		7,482.08
12/4/17	30989	2020SC	Invoice: CL75191	1,009.23	
		1020SC	INTERSTATE OIL COMPANY		1,009.23
12/4/17	30990	2020SC	Invoice: 65810	18,748.12	
		1020SC	NORMANDEAU ASSOCIATES, INC.		18,748.12
12/4/17	30991	2020SC	Invoice: 240080	11.45	
		2020SC	Invoice: 978990	302.75	
		2020SC	Invoice: 979459	90.37	
		2020SC	Invoice: 240679	24.10	
		2020SC	Invoice: 240796	80.97	
		2020SC	Invoice: 980863	35.48	
		2020SC	Invoice: 241514	66.56	
		2020SC	Invoice: 241626	10.67	
		1020SC	PACIFIC ACE HARDWARE		622.35
12/4/17	30991V	2020SC	Invoice: 240080		11.45
		2020SC	Invoice: 978990		302.75
		2020SC	Invoice: 979459		90.37
		2020SC	Invoice: 240679		24.10
		2020SC	Invoice: 240796		80.97
		2020SC	Invoice: 980863		35.48
		2020SC	Invoice: 241514		66.56
		2020SC	Invoice: 241626		10.67

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Date	Check #	Account ID	Line Description	Debit Amount	Credit Amount
		1020SC	PACIFIC ACE HARDWARE	622.35	
12/4/17	30992	2020SC	Invoice: 1841123	46.56	
		1020SC	RAY MORGAN COMPANY		46.56
12/4/17	30993	2020SC	Invoice: 1255	750.00	
		1020SC	ROCK STEADY JUGGLING		750.00
12/4/17	30994	2020SC	Invoice: 001113	355.44	
		2020SC	Invoice: 002778	159.97	
		1020SC	SAM'S CLUB		515.41
12/4/17	30995	2020SC	Invoice: 57105983	978.72	
		2020SC	Invoice: 57106010	77.67	
		1020SC	SBS LEASING A PROGRAM DE LAGE		1,056.39
12/4/17	30996	2020SC	Invoice: 1162	5,050.38	
		1020SC	SOLANO RESOURCE CONSERVATION DISTRICT		5,050.38
12/4/17	30997	2020SC	Invoice: 1925558041	136.71	
		2020SC	Invoice: 1933231421	27.97	
		2020SC	Invoice: 1933867861	63.51	
		2020SC	Invoice: 1933872121	102.02	
		2020SC	Invoice: 1933872401	20.76	
		2020SC	Invoice: 1935183691	11.23	
		2020SC	Invoice: 1935658981	142.48	
		2020SC	Invoice: 1937314231	195.10	
		2020SC	Invoice: 1933876381	43.04	
		2020SC	Invoice: 1939034091	118.12	
		2020SC	Invoice: 1939938201	111.97	
		2020SC	Invoice: 1942203511	39.60	
		2020SC	Invoice: 1942214801	33.98	
		2020SC	Invoice: 1942462601	9.49	
		1020SC	STAPLES		1,055.98
12/4/17	30997V	2020SC	Invoice: 1925558041		136.71
		2020SC	Invoice: 1933231421		27.97
		2020SC	Invoice: 1933867861		63.51
		2020SC	Invoice: 1933872121		102.02
		2020SC	Invoice: 1933872401		20.76
		2020SC	Invoice: 1935183691		11.23
		2020SC	Invoice: 1935658981		142.48
		2020SC	Invoice: 1937314231		195.10
		2020SC	Invoice: 1933876381		43.04
		2020SC	Invoice: 1939034091		118.12
		2020SC	Invoice: 1939938201		111.97
		2020SC	Invoice: 1942203511		39.60
		2020SC	Invoice: 1942214801		33.98
		2020SC	Invoice: 1942462601		9.49
		1020SC	STAPLES	1,055.98	
12/4/17	30998	2020SC	Invoice: 0002 8391 646	65,583.90	
		2020SC	Invoice: 0002 8469 740	4,212.68	
		2020SC	Invoice: 0002 8219 403	1,879.47	
		1020SC	STATE BOARD OF EQUALIZATION		71,676.05
12/4/17	30999	2020SC	Invoice: STACEY ALLESANDRO-AC	595.00	
		1020SC	STACEY ALLESANDRO-ACOSTA		595.00
12/4/17	31000	2020SC	Invoice: ROBERT OSBORNE	1,000.00	
		1020SC	ROBERT OSBORNE		1,000.00
12/4/17	31001	2020SC	Invoice: JEFF SKINNER	858.00	
		1020SC	JEFF SKINNER		858.00
12/4/17	31002	2020SC	Invoice: 15231	1,095.00	
		1020SC	WESTERN WEATHER GROUP		1,095.00
12/4/17	31003	2020SC	Invoice: 33690	557.00	
		1020SC	YOLO-SOLANO AQMD		557.00
12/4/17	31004	2020SC	Invoice: 240080	11.45	

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		2020SC	Invoice: 978990	302.75	
		2020SC	Invoice: 979459	90.37	
		2020SC	Invoice: 240679	24.10	
		2020SC	Invoice: 240796	80.97	
		2020SC	Invoice: 980863	35.48	
		1020SC	PACIFIC ACE HARDWARE		545.12
12/4/17	31005	2020SC	Invoice: 1925558041	136.71	
		2020SC	Invoice: 1933231421	27.97	
		2020SC	Invoice: 1933872121	102.02	
		2020SC	Invoice: 1933867861	63.51	
		2020SC	Invoice: 1933872401	20.76	
		2020SC	Invoice: 1935183691	11.23	
		2020SC	Invoice: 1935658981	142.48	
		2020SC	Invoice: 1937314231	195.10	
		2020SC	Invoice: 1933876381	43.04	
		2020SC	Invoice: 1939034091	118.12	
		2020SC	Invoice: 1939938201	111.97	
		2020SC	Invoice: 1942214801	33.98	
		2020SC	Invoice: 1942203511	39.60	
		2020SC	Invoice: 1942462601	9.49	
		2020SC	Invoice: FIN CHARGE 11/15/17	14.24	
		1020SC	STAPLES		1,070.22
12/5/17	31005V	2020SC	Invoice: 1925558041		136.71
		2020SC	Invoice: 1933231421		27.97
		2020SC	Invoice: 1933872121		102.02
		2020SC	Invoice: 1933867861		63.51
		2020SC	Invoice: 1933872401		20.76
		2020SC	Invoice: 1935183691		11.23
		2020SC	Invoice: 1935658981		142.48
		2020SC	Invoice: 1937314231		195.10
		2020SC	Invoice: 1933876381		43.04
		2020SC	Invoice: 1939034091		118.12
		2020SC	Invoice: 1939938201		111.97
		2020SC	Invoice: 1942214801		33.98
		2020SC	Invoice: 1942203511		39.60
		2020SC	Invoice: 1942462601		9.49
		2020SC	Invoice: FIN CHARGE 11/15/17		14.24
		1020SC	STAPLES	1,070.22	
12/5/17	31006	2020SC	Invoice: 1925558041	136.71	
		2020SC	Invoice: 1933231421	27.97	
		2020SC	Invoice: 1933867861	63.51	
		2020SC	Invoice: 1933872121	102.02	
		2020SC	Invoice: 1933872401	20.76	
		2020SC	Invoice: 1935183691	11.23	
		2020SC	Invoice: 1935658981	142.48	
		2020SC	Invoice: 1937314231	195.10	
		2020SC	Invoice: 1933876381	43.04	
		2020SC	Invoice: 1939034091	118.12	
		2020SC	Invoice: 1939938201	111.97	
		2020SC	Invoice: 1942203511	39.60	
		2020SC	Invoice: 1942214801	33.98	
		2020SC	Invoice: 1942462601	9.49	
		2020SC	Invoice: FIN CHARGE 11/15/17	14.24	
		2020SC	Invoice: 1903891811-A	0.10	
		1020SC	STAPLES		1,070.32
12/11/17	ASHLEY NO	6040AC	REMOTE LINK - SALMON FEST CONF CALL	4.15	
		6040AC	BIG GREEN BOX - BATTERY BOX	70.00	
		6040AC	REMOTELINK - PROP 1 CONF CALL	9.96	
		6040AC	NAPOLI PIZZA - SWAC MEETING	100.03	
		6250SC	RALEYS - HCP	53.02	
		6040AC	CHEVRON - ICE FOR TEAM MTG	5.61	
		6040AC	BOUDIN CATERING - FOOD FOR TEAM MTG	199.57	
		6040AC	REMOTELINK - SALMON FEST CONF CALL	6.89	
		6040AC	REMOTELINK - WATER POLICY CONF CALL	4.05	
		6040AC	REMOTELINK - EXEC COMM CONF CALL	4.79	
		6040AC	REMOTELINK - CONF CALL	87.13	

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		6210AC	NAPOLI PIZZA - BOARD MTG	87.03	
		1020SC	BANK OF THE WEST		632.23
11/11/17	ASHLEY OCT	6040AC	REMOTELINK - CONF CALL	36.92	
		6040AC	NAPOLI PIZZA - GSA	71.40	
		6040AC	REMOTELINK - HCP	31.38	
		6310AC	CHEVRON - FUEL	26.09	
		6040AC	REMOTE LINK - CONF CALL	20.83	
		6040AC	NAPOLI PIZZA - SWAC	84.88	
		6040AC	REMOTE LINK - CONF CALL	10.59	
		6040AC	NAPOLI PIZZA - ALEX RABIDOUX MTG	61.40	
		6040AC	REMOTELINK - HEW REBATE	7.25	
		6040AC	NATIONS - TEAM MTG	23.20	
		6040AC	BUCKHORN - TEAM MTG	196.95	
		6040AC	AMAZON - SCREENS FOR HCP	277.66	
		6040AC	NAPOLI PIZZA	119.73	
		6040AC	REMOTELINK - CONF CALL	17.20	
		6210AC	ABAG - REGISTRATION FOR ELIZABETH PATTERSON	330.00	
		6040AC	REMOTELINK - CONF CALL	15.35	
		6040AC	REMOTELINK - CONF CALL	20.02	
		6040AC	X STAMPER - NAMEPLATES FOR LPCCC	35.07	
		1020SC	BANK OF THE WEST		1,385.92
12/25/17	BARICH NOV	6230SC	LOWES - SUPPLIES	326.89	
		6310AC	CHEVRON - FUEL	40.57	
		6300AC	SPEEDEE OIL CHANGE	91.03	
		6310AC	CHEVRON - FUEL	43.02	
		5500AC	DODGE CHRYSLER JEEP OF VV - SPEARE KEYS	87.50	
		1020SC	BANK OF THE WEST		589.01
11/25/17	BARICH OCT	6310AC	CHEVRON - FUEL	47.93	
		6310AC	CHEVRON - FUEL	45.87	
		1020SC	BANK OF THE WEST		93.80
12/6/17	COLIAS NOV	6166SC	FACEBOOK - SALMON FESTIVAL POSTING	1.27	
		6551AC	BROWNS VALLEY CLEANING	15.75	
		1020SC	BANK OF THE WEST		17.02
11/6/17	COLIAS OCT	6166SC	AMAZON - CANOPY	458.53	
		6310AC	CHEVRON - FUEL	24.99	
		6310AC	CHEVRON - FUEL	44.68	
		6310AC	CHEVRON - FUEL	41.56	
		6310AC	CHEVRON - FUEL	61.43	
		6360AC	ASSOC OF CA - ACWA 2017 REGULATORY SUMMIT REGISTRATION	270.00	
		6310AC	CHEVRON - FUEL	37.32	
		6310AC	CHEVRON - FUEL	24.70	
		6310AC	CHEVRON - FUEL	12.94	
		6310AC	CHEVRON - FUEL	9.72	
		6310AC	CHEVRON - FUEL	47.11	
		5500SC	ROYCE INDUSTRIES - MOBILE WASH STATION ACCESSORIES	666.25	
		6166SC	AMAZON - TEMP GUN	42.92	
		6040AC	STAPLES - SUPPLIES	52.71	
		6166SC	LOWES - SUPPLIES	53.75	
		2025SC	SALES TAX ON AMAZON - CANOPY		32.49
		2025SC	SALES TAX ON AMAZON - TEMP GUN		3.04
		1020SC	BANK OF THE WEST		1,813.08
12/25/17	CUETARA N	6310AC	CHEVRON - FUEL	79.28	
		6300AC	AUTOZONE - SUPPLIES	3.97	
		6144AC	BATTERIES PLUS - SUPPLIES	174.78	
		6144SC	THE HOME DEPOT - SUPPLIES	62.30	
		6144SC	BATTERIES PLUS - SUPPLIES	5.91	
		6300AC	SAFELITE AUTOGLASS - REPAIR CHIP ON WINDSHIELD	148.46	
		1020SC	BANK OF THE WEST		474.70

SOLANO COUNTY WATER AGENCY
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Date	Check #	Account ID	Line Description	Debit Amount	Credit Amount
11/25/17	CUETARA O	6144SC	RUGGED COMPUTING - VEHICLE MOUNTS FOR SID VEHICLE	168.95	
		6310AC	CHEVRON - FUEL	87.50	
		6144AC	LOWES - SUPPLIES	30.59	
		6144AC	BATTERIES PLUS - SUPPLIES	45.19	
		6144AC	THE HOME DEPOT - SUPPLIES	159.88	
		6144AC	LOWES - SUPPLIES	9.54	
		6144AC	PACIFIC ACE HARDWARE - SUPPLIES	404.12	
		6144AC	THE HOME DEPOT - SUPPLIES	14.66	
		6144AC	AMAZON - FISHING BOOTS	176.04	
		1020SC	BANK OF THE WEST		1,096.47
11/1/17	EFT	2020SC	Invoice: HEALTH NOV 2017	15,668.15	
		1020SC	CALPERS		15,668.15
11/10/17	EFT	6040AC	FSA PARTICIPANT FEE NOV 2017	113.50	
		1020SC	PAYCHEX, INC.		113.50
11/10/17	EFT	2020SC	Invoice: SIP PPE 11.04.17	4,442.97	
		1020SC	CALPERS		4,442.97
11/10/17	EFT	2020SC	Invoice: PPE 11.04.17	8,264.91	
		1020SC	CALPERS		8,264.91
11/10/17	EFT	2020SC	Invoice: PEPRA PPE 11.04.17	1,319.04	
		1020SC	CALPERS		1,319.04
11/4/17	EFT	2024AC	EMPLOYEE LIABILITIES PPE 11.04.17	13,930.78	
		6012AC	EMPLOYER LIABILITIES PPE 11.04.17	1,941.71	
		1020SC	PAYROLL TAXES		15,872.49
11/10/17	EFT	2020SC	Invoice: 2017110801	203.95	
		1020SC	PAYCHEX, INC.		203.95
11/21/17	EFT	2020SC	Invoice: PPE 11.18.17	8,264.91	
		1020SC	CALPERS		8,264.91
11/21/17	EFT	2020SC	Invoice: SIP PPE 11.18.17	4,442.97	
		1020SC	CALPERS		4,442.97
11/21/17	EFT	2020SC	Invoice: PEPRA PPE 11.18.17	1,330.70	
		1020SC	CALPERS		1,330.70
11/18/17	EFT	2024AC	EMPLOYEE LIABILITIES PPE 11.18.17	13,340.75	
		6012AC	EMPLOYER LIABILITIES PPE 11.18.17	1,760.34	
		1020SC	PAYROLL TAXES		15,101.09
11/24/17	EFT	2020SC	Invoice: 2017112101	214.75	
		1020SC	PAYCHEX, INC.		214.75
12/4/17	EFT	2020SC	Invoice: HEALTH DEC 2017	15,668.15	
		1020SC	CALPERS		15,668.15
12/1/17	FEHRENKAM	6090AC	CA SOCIETY OF MUNICIPAL FINANCE OFFICERS - MEMBERSHIP DUES	110.00	
		1020SC	BANK OF THE WEST		110.00
11/1/17	FEHRENKAM	6360AC	CA SOCIETY - FINANCE MEETING	30.00	
		6040AC	NAPOLI PIZZA - BOARD MTG	94.40	
		6310AC	CHEVRON - FUEL	65.55	
		6310AC	CHEVRON - FUEL	43.06	
		6330AC	SOUTHWEST AIRLINES	222.96	
		1020SC	BANK OF THE WEST		455.97
11/25/17	FLORENDO O	6330AC	ATLANTIS CASINO RESORT - HOTEL FOR AWWA CONFERENCE		
		6330AC	ESQUIRE GRILLE - LUNCH AWWA CONF	30.01	
		6330AC	TAXI SVC LAS VEGAS - AWWA CONFERENCE	31.50	

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Date	Check #	Account ID	Line Description	Debit Amount	Credit Amount
		6330AC	CORONADO CAFE - LUNCH AWWA CONF	17.29	
		6330AC	DELUXE TAXI - AWWA CONF	36.10	
		6330AC	SO PT HOTEL - AWWA CONF	96.05	
		6330AC	AIRPORT PARKING - PARKING	30.00	
		6551AC	360 WEB SECURITY	50.00	
		6330AC	ATLANTIS CASINO - HOTEL FOR AWWA		
		6330AC	7 FLAGS CARWASH	15.99	
		1020SC	BANK OF THE WEST		306.94
11/25/17	FOWLER OC	6045AC	MARVIN CARTE - FRAUDULENT CHARGE	36.00	
		6230SC	WALMART - SUPPLIES	87.03	
		6040AC	STAPLES - SUPPLIES	55.19	
		6230SC	SAMS CLUB - SUPPLIES	115.64	
		6230SC	AUTOZONE - RATCHET AND SOCKETS	30.85	
		1020SC	BANK OF THE WEST		324.71
11/25/17	JONES OCT 2	6199SC	BERRYESSA SPORTING GOODS - PROPANE	20.93	
		6183SC	YOLO COUNTY LANDFILL - GARBAGE	79.38	
		6310AC	BERRYESSA SPORTING GOODS - FUEL	44.95	
		6197SC	PACIFIC ACE HARDWARE - SUPPLIES	337.96	
		6195SC	PACIFIC ACE HARDWARE - SUPPLIES	45.02	
		6151SC	SPORTSMANS WAREHOUSE - SUPPLIES	238.40	
		6149SC	SPORTSMANS WAREHOUSE - SUPPLIES	370.62	
		6199SC	EL PUEBLO MEAT MARKET	5.52	
		6230SC	EAGLE DRUG - PAPER	14.99	
		6230SC	BERRYESSA SPORTING GOODS - PROPANE	31.09	
		1020SC	BANK OF THE WEST		1,188.86
12/25/17	LEE NOV 201	6040AC	SOLANO BAKING CO - SUPPLIES	27.00	
		6140AC	ADOBE CREATIVE CLOUD	49.99	
		1020SC	BANK OF THE WEST		76.99
11/25/17	LEE OCT 201	6410AC	AMAZON - SUPPLIES	50.00	
		6040AC	NUGGET MARKET - COOKIES	26.06	
		6410AC	AMAZON - 100 FEET COAX CABLE	117.15	
		6330AC	SOUTHWEST AIRLINES	182.96	
		6410AC	ADOBE CREATIVE CLOUD - 1 MONTH RENEW	49.99	
		2025SC	SALES TAX ON AMAZON - SUPPLIES		3.54
		1020SC	BANK OF THE WEST		422.62
12/25/17	MAROVICH	6199SC	DAVIS ACE HARWARE - SUPPLIES	36.79	
		6183SC	OBC NORTHWEST - SUPPLIES	200.33	
		6181SC	USHIP - DOZER TRANSPORTATION	1,302.51	
		6199SC	ADOBE CREATIVE CLOUD	49.99	
		1020SC	BANK OF THE WEST		1,589.62
11/25/17	MAROVICH	6040AC	UPS - SHIPPING ADJUSTMENT	5.80	
		6310AC	CHEVRON - FUEL	40.79	
		6199SC	STAPLES - SUPPLIES	51.28	
		6199SC	ADOBE CREATIVE CLOUD - RENEWAL	49.99	
		1020SC	BANK OF THE WEST		147.86
12/1/17	PASCUAL OC	6161N	W GRAINGER - SUPPLIES	206.00	
		6161N	W GRAINGER - SUPPLIES	169.57	
		6310AC	CHEVRON - FUEL	20.52	
		6330AC	CITY OF SAC PARKING	1.75	
		6161N	SAFEWAY - PASTRIES	15.00	
		6161N	PANERA BREAD - FOOD	63.96	

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Date	Check #	Account ID	Line Description	Debit Amount	Credit Amount
		6144N	BEN MEADOWS - SUPPLIES	173.27	
		6310AC	CHEVRON - FUEL	15.39	
		2025SC	SALES TAX ON BEN MEADOWS		12.28
		1020SC	BANK OF THE WEST		653.18
11/1/17	PASCUAL SE	6310AC	CHEVRON - FUEL	54.91	
		6144N	OFFICE DEPOT - SUPPLIES	59.40	
		6144N	LOWES - SUPPLIES	30.02	
		6144N	PACIFIC ACE HARDWARE - SUPPLIES	91.10	
		6144N	BEN MEADOWS- SUPPLIES	156.54	
		6161N	BEN MEADOWS- SUPPLIES	91.47	
		6144N	LOWES - SUPPLIES	73.06	
		6144N	PACIFIC ACE HARDWARE - SUPPLIES	28.34	
		2025SC	SALES TAX - BEN MEADOWS		11.55
		2025SC	SALES TAX - BEN MEADOWS		6.48
		1010WC	BANK OF THE WEST		566.81
11/25/17	PATE OCT 20	6330AC	LYFT RIDE - PERSONAL - REFUNDED WITH CHECK #154	7.00	
		6330AC	LYFT RIDE - PERSONAL - REFUNDED WITH CHECK #154	9.71	
		6330AC	LYFT RIDE - PERSONAL - REFUNDED WITH CHECK #154	9.24	
		6330AC	L&L HAWAIIAN BBQ - PERSONAL REFUNDED WITH CHECK #154	4.32	
		6330AC	LYFT RIDE	8.83	
		6330AC	BEST WESTERN - SWC MEETING	109.45	
		6041AC	FRYS ELECTRONICS - SUPPLIES	75.73	
		1020SC	BANK OF THE WEST		224.28
12/25/17	RABIDOUX N	6600SC	COLEPARMERINSTUMENT - DYE STUDY FOR PSC	481.89	
		6330AC	PRIORITY PARKING - PARKING FOR DWR MTG	10.00	
		6230SC	CISCO EAGLE DALLAS - FORKLIFT EXTENSIONS	490.37	
		1020SC	BANK OF THE WEST		982.26
11/25/17	RABIDOUX O	6330AC	CITY OF SAC PARKING - PARKING FOR ANNUAL MWQI CONFERENCE	5.00	
		6330AC	CITY OF SAC PARKING - PARKING FOR ANNUAL MWQI CONFERENCE	20.00	
		1020SC	BANK OF THE WEST		25.00
12/25/17	SANFORD N	6330AC	CITY OF SAC PARKING	20.00	
		6330AC	CITY OF SAC PARKING	10.50	
		1020SC	BANK OF THE WEST		30.50
11/25/17	SANFORD O	6330AC	CITY OF SAC PARKING - PARKING	20.00	
		6330AC	CITY OF SAC PARKING - PARKING	10.50	
		1020SC	BANK OF THE WEST		30.50
11/25/17	SNYDER OCT	6042AC	TARGET - SUPPLIES	56.76	
		6670U	LOWES - SUPPLIES	38.69	
		6300AC	AGLIS LINXUP - VEHICLE GPS	183.92	
		6040AC	HOME DEPOT - SUPPLIES	26.54	
		6310AC	BERRYESSA SPORTING GOODS - FUEL FOR CHIPPER	58.51	
		6310AC	CHEVRON - FUEL	83.16	
		6670U	LOWES - SUPPLIES	4.53	
		6042AC	STATION 1 FIRE PROTECTION - FIRE EXTINGUISHER SERVICE	18.00	
		6300AC	WALMART - SUPPLIES	254.64	
		6041AC	LOWES - SUPPLIES	181.85	
		1020SC	BANK OF THE WEST		906.60
11/25/17	WILLINGMY	6210AC	NAPOLI PIZZA - BOD MTG	99.30	
		6210AC	SAMS CLUB - BOD FOOD	31.57	
		6210AC	BEACH HUT - BOD MTG	49.22	
		1020SC	BANK OF THE WEST		180.09

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Date	Check #	Account ID	Line Description	Debit Amount	Credit Amount
	Total			2,206,341.30	2,206,341.30

ACTION OF
SOLANO COUNTY WATER AGENCY

DATE: **December 14, 2017**

SUBJECT: **Contract amendment with UC Davis for geomorphological consulting services through FY 2018-2019, in support of Lower Putah Creek habitat restoration projects**

RECOMMENDATIONS:

Authorize General Manager to execute Contract Amendment # 5 to UC Davis contract number 03-00206VR for geomorphology consulting services through FY 2018-2019, in support of Lower Putah Creek habitat restoration projects

FINANCIAL IMPACT:

Increase total contract amount by $25,000, from $435,708 to $460,708. Funding for this contract amendment has been programed into the Water Agency's adopted FY 2017-2018 budget.

BACKGROUND:

The Water Agency supports many habitat restoration projects on Lower Putah Creek that involve earth moving (channel realignment) to restore the "form and function" of the channel – the ability of the channel to be self-maintaining under the post-Monticello Dam stream flow regime. The combination of extensive instream gravel mining, primarily upstream of Interstate 505, channel regrading between Winters and Davis to maximize flood conveyance capacity, construction of the South Fork Putah Creek channel, which diverted water away from the North Fork of Putah Creek, coupled with the construction of Monticello Dam, which reduced the frequency and magnitude of high stream flow events have significantly altered the Lower Putah Creek stream channel and created a situation where the existing channel form is not in sync with the current stream flow regime.

Recommended: _____
Roland Sanford, General Manager

☐	Approved as recommended	☐	Other (see below)	X	Continued on next page

Modification to Recommendation and/or other actions:

I, Roland Sanford, General Manager and Secretary to the Solano County Water Agency, do hereby certify that the foregoing action was regularly introduced, passed, and adopted by said Board of Directors at a regular meeting thereof held on December 14, 2017 by the following vote.

Ayes:

Noes:

Abstain:

Absent:

_____
Roland Sanford
General Manager & Secretary to the
Solano County Water Agency

The concept of channel form and function is arguably somewhat abstract and at times difficult to demonstrate due to the extended timeline – often decades – it can take for physical disturbances such as instream gravel mining to fully manifest as changes in channel form. Consequently, the importance of channel form and function is often overlooked by the public and even some regulatory agencies. The aforementioned contract amendment will provide the services of a UC Davis geomorphologist to help inform the public and regulatory agencies of the benefits of reconciling channel form to current flows. As a member of the LPCCC, UC Davis waives overhead for work under this contract.

RELEVANCE TO 2016-2025 SCWA STRATEGIC PLAN:

The retention of geomorphological consulting services is consistent with Goal 5 (*Education and Outreach*), Objective B (*Evaluate, and where appropriate, coordinate public awareness of water-related programs throughout the County*) and Goal 7 (*Natural Resource Stewardship*), Objective B (*Support and promote Lower Putah Creek Coordinating Committee programs and projects*) of the 2016-2025 Strategic Plan.

SOLANO COUNTY WATER AGENCY

AMENDMENT TO AGREEMENT FOR PROFESSIONAL SERVICES

AMENDMENT NUMBER: 5

CONTRACTOR: UC Davis Contract #03-00206VR

EFFECTIVE DATE: December 15, 2017

PROJECT: LPCCC Fish Monitoring - Geomorphology

DESCRIPTION OF AMENDMENT:

1. Increase contract amount by $25,000 from $435,708 to $460,708
2. Amend scope per Exhibit A to include:
   - 40% Communicate applications of geomorphic principles to regulatory agencies
   - 30% Geomorphic analyses for permits, habitat enhancement
   - 15% Develop indices to measure geomorphic function
   - 15% Preparing presentations and publications including YouTube videos

SIGNATURES:

Solano County Water Agency,
a Public Agency

By:_____
Roland Sanford
General Manager

The Regents of the University
of California

By:_____
Brian D. Russ
Business Contract Officer

AG-U-UCD Amd 5.#03-00206VR.Larsen.Geomorphology

Lower Putah Creek Geomorphic Consultation for Topics related to Stream Processes

Partners: Lower Putah Creek Coordinating Committee

UC Davis

Dates: October 1, 2017 – September 30, 2019

Amount: $25,000

Background

The Lower Putah Creek Coordinating Committee is involved in various projects that involve fish habitat studies in Putah Creek. An understanding of the geomorphic processes of streams complements the fish biology studies. Consultation and advice for geomorphic aspects of the fish habitat studies are key to all aspects (grant proposals, planning, implementation, monitoring, evaluation, and presenting information to the public) of the integrated studies. For these reasons, the Lower Putah Creek Coordinating Committee requires geomorphic expertise. Dr. Eric Larsen has the required skills, which he has developed and used in many areas of river geomorphology and stream restoration. Dr. Larsen will apply these skills in portions of Putah Creek as specified by the Agency.

The advisor's primary task is to provide expert advice and consultation for the fish studies, grant proposals, planning, design, restoration, informing the public, and other topics related to Putah Creek as needed by the Lower Putah Creek Coordinating Committee.

Tasks and Deliverables

Dr. Larsen will work under the direction of Rich Marovich, Putah Creek Streamkeeper, to advise on the topics outlined in the Background above. He may be asked to provide various written reports, technical support and project descriptions in support of permits, public presentations, as well as receive and respond to questions from consultants and Lower Putah Creek Coordinating Committee members (e.g., research answers to technical and policy questions). He will also assist project design (suggest design approaches, review and comment on plans and specifications, and other consultant products). He may be asked to assist development of monitoring projects to measure project success. He may be asked to prepare reports and assist in field surveys, mapping and other assessment activities.

	Cumulative Total	2017-2018 Year 1	2018-2019 Year 2
A. Senior Personnel			
Principal Investigator	$17,568.02	$7,883	$9,685.02
Total Salary	$17,568.02	$7,883	$9,685.02
B. Fringe Benefits	$6,986.98	$3,066.49	$3,880.50
Total Personnel Costs	**$24,515.00**	**$10,949.49**	**$13,565.52**
C. Travel	$85.00	$35.00	$50.00
D. Other Direct Costs			
Materials and Supplies	$400.00	$200.00	$200.00
Total Direct Costs	**$25,000**	**$11,184.49**	**$13,815.52**
Indirect Costs	$0.00	$0.00	$0.00
Total	**$25,000**	**$11,184.49**	**$13,815.52**

ACTION OF
SOLANO COUNTY WATER AGENCY

DATE: **December 14, 2017**

SUBJECT: **Contract with Kennedy Jenks Consultants for Update of Westside Integrated Regional Water Management Plan**

RECOMMENDATION:

Authorize General Manager, on behalf of the Regional Water Management Group, to execute contract with Kennedy Jenks Consultants to prepare update of Westside Integrated Regional Water Management Plan.

FINANCIAL IMPACT:

Total contract amount not to exceed $63,428. Project costs to be divided equally among the Regional Water Management Group members (Lake County Watershed Protection District, Napa County Flood Control and Water Conservation District, Solano County Water Agency, and the Water Resources Association of Yolo County). Accordingly, the Solano County Water Agency's cost share, pursuant to the proposed contract, will not exceed $15,857. Sufficient funding for the Solano County Water Agency's share of the proposed contract has been programed into the Solano County Water Agency's adopted FY 2017-2018

BACKGROUND:

It has been five years since the adoption of the Westside Integrated Regional Water Management Plan (Westside IRWMP). The Regional Water Management Group (Lake County Watershed Protection District, Napa County Flood Control and Water Conservation District, Solano County Water Agency, and the Water Resources Association of Yolo County) is revisiting the IRWMP to ensure that the document continues to meet the needs of its stakeholders and is compliant with changes to the Water Code in general, and eligibility criteria for future grant opportunities in particular.

The Regional Water Management Group elected to hire Kennedy Jenks Consultants after an RFP process to update the Westside IRWMP. The contract with Kennedy Jenks Consultants will be a time and materials contract. The costs for this update are split evenly between the Regional Water Management Group agencies.

Recommended: _____
Roland Sanford, General Manager

☐	Approved as recommended	☐	Other (see below)	☒	Continued on next page

Modification to Recommendation and/or other actions:

I, Roland Sanford, General Manager and Secretary to the Solano County Water Agency, do hereby certify that the foregoing action was regularly introduced, passed, and adopted by said Board of Directors at a regular meeting thereof held on December 14, 2017 by the following vote.

Ayes:

Noes:

Abstain:

Absent:

Roland Sanford
General Manager & Secretary to the
Solano County Water Agency

RELEVANCE TO 2016-2025 SCWA STRATEGIC PLAN:

Preparation of the Westside IRWMP update is consistent with Goal 5 (*Education and Outreach*), Objective B (*Evaluate, and where appropriate, coordinate public awareness of water-related programs throughout the County*) and Goal 7 (*Natural Resource Stewardship*), Objective D (*Identify other habitat and watershed stewardship opportunities and implement activities where feasible*) of the 2016-2025 Strategic Plan.

Name of Project: **Westside IRWMP Update**

SOLANO COUNTY WATER AGENCY

AGREEMENT FOR PROFESSIONAL SERVICES

THIS AGREEMENT, **effective December 14, 2017**, is between SOLANO COUNTY WATER AGENCY, a public agency existing under and by virtue of Chapter 573 of the 1989 statutes of the State of California, hereinafter referred to as "Agency," and **Kennedy/Jenks Consultants Inc.**, California Corporation, hereinafter referred to as "Consultant."

The Agency requires services for **Westside IRWMP Update**; and the Consultant is willing to perform these services pursuant to the terms and conditions set out in this Agreement.

IT IS MUTUALLY AGREED, as follows:

1. SCOPE OF SERVICES

The Agency hereby engages the Consultant, and the Consultant agrees to perform the professional services for the **Westside IRWMP Update**, as described in Exhibit A, in accordance with the terms of this Agreement and the Standard of Care for similar professionals in the application of any applicable laws, codes, ordinances, rules or regulations. In case of conflict between any part of this Agreement, this Agreement shall control over any Exhibit.

2. COMPENSATION

Compensation for services shall be as follows: Hourly rate of personnel plus any allowed reimbursable expenses based on unit costs as indicated on any allowed reimbursable expense in Exhibit B **not to exceed $63,428** for all work contemplated by the Scope of Services in Exhibit A of this Agreement.

3. METHOD OF PAYMENT

Upon submission of an invoice by the Consultant, and upon approval of the Agency's representative, the Agency shall pay the Consultant monthly in arrears for fees and allowed expenses incurred the prior month, however in no event shall the cumulative total paid pursuant to this Agreement exceed the maximum amount provided for in paragraph 2 of this Agreement. Every invoice shall specify hours worked for each task identified in Exhibit A undertaken.

Each invoice shall be accompanied by a spreadsheet showing, by month, costs incurred to date for the project broken down by the Tasks identified in Exhibit A. The spreadsheet shall show, for each task, budget amounts, total expended and remaining amounts. The spreadsheet shall show a subtotal for each fiscal year covered by the contract. Any amendments to the

contract shall be listed and incorporated into spreadsheet. An example of a typical spreadsheet shall be provided by the Agency.

4. TIME OF PERFORMANCE

This Agreement shall become effective as of the date it is executed and said services will take place between this date and **June 30, 2018** as directed by the Agency.

5. MODIFICATION AND TERMINATION

This Agreement may be modified or amended only by written instrument signed by the parties hereto, and the Consultant's compensation and time of performance of this Agreement shall be adjusted if they are materially affected by such modification or amendment.

Any change in the scope of the professional services to be done, method of performance, nature of materials or price thereof, or to any other matter materially affecting the performance or nature of the professional services will not be paid for or accepted unless such change, addition or deletion be approved in advance, in writing, by the Agency's General Manager.

This Agreement may be terminated by the Agency at any time, without cause, upon written notification to the Consultant. The Consultant may terminate this Agreement upon 30 days written notice to Agency.

Following termination by the Agency or the Consultant, the Consultant shall be reimbursed for all expenditures made in good faith in accordance with the terms of this Agreement that are unpaid at the time of termination.

6. (Deleted).

7. **INDEMNIFY AND HOLD HARMLESS**

When the law establishes a professional standard of care for the Consultant's services, to the fullest extent permitted by law, Consultant will defend, indemnify and hold harmless the Agency, its directors, officers, employees, and authorized volunteers from all claims and demands of all persons that arise out of, pertain to, or relate to the Consultant's negligence, recklessness, or willful misconduct in the performance (or actual or alleged non-performance) of the work under this agreement. The Consultant shall defend itself against any and all liabilities, claims, losses, damages, and costs arising out of or alleged to arise out of Consultant's performance or non-performance of the work hereunder, and shall not tender such claims to Agency nor to its directors, officers, employees, or authorized volunteers, for defense or indemnity.

Other than in the performance of professional services, to the fullest extent permitted by law, Consultant will defend, indemnify and hold harmless the Agency, its directors, officers, employees and authorized volunteers from all claims and demands of all

persons arising out of the performance of the work or furnishing of materials; including but not limited to, claims by the Consultant or Consultant 's employees for damages to persons or property except for the sole negligence or willful misconduct or active negligence of the Agency, its directors, officers, employees, or authorized volunteers.

8. INSURANCE

By his/her signature hereunder, Consultant certifies that he/she is aware of the provisions of Section 3700 of the California Labor Code which requires every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and that Consultant will comply with such provisions before commencing the performance of the professional services under this Agreement. Consultant and sub-consultant will keep workers' compensation insurance for their employees in effect during all work covered by this Agreement.

Consultant will file with the Agency, before beginning professional services, certificates of insurance satisfactory to the Agency evidencing general liability coverage of not less than $1,000,000 per occurrence ($2,000,000 general and products-completed operations aggregate (if used)) for bodily injury, personal injury and property damage; auto liability of at least $1,000,000 for bodily injury and property damage each accident limit; workers' compensation (statutory limits) and employer's liability ($1,000,000) (if applicable); requiring 30 days (10 days for non-payment of premium) notice of cancellation to the Agency. Any insurance, self-insurance or other coverage maintained by the Agency, its directors, officers, employees, or authorized volunteers shall not contribute to it. Coverage is to be placed with a carrier with an A.M. Best rating of no less than A- :VII, or equivalent, or as otherwise approved by the Agency. In the event that the Consultant employs other consultants (sub-consultants) as part of the work covered by this Agreement, it shall be the Consultant's responsibility to endeavor to require and confirm that each sub-consultant meets the minimum insurance requirements specified above, unless the Agency agrees to lesser coverage appropriate to the sub-consultant's role.

If any of the required coverages expire during the term of this agreement, the Consultant shall deliver the renewal certificate(s) including the general liability additional insured endorsement to the Agency at least ten (10) days prior to the expiration date.

9. COMPLIANCE WITH LAW

The Consultant shall be subject to and comply with all federal, state and local laws and regulations applicable with respect to its performance under this Agreement, including but not limited to, licensing, employment and purchasing practices; and wages, hours and conditions of employment.

10. RECORD RETENTION

Except for materials and records delivered to the Agency, the Consultant shall retain all materials and records prepared or obtained in the performance of this Agreement, including financial records, for a period of at least three years after the Consultant's receipt of the final

payment under this Agreement. Upon request by the Agency, the Consultant shall make such materials and records available to the Agency at no additional charge and without restriction or limitation to State and federal governments at no additional charge.

11. OWNERSHIP OF DOCUMENTS

All materials and records of a finished nature, such as final plans, specifications, reports and maps, prepared or obtained in the performance of this Agreement, shall be delivered to and become the property of the Agency. All materials of a preliminary nature, such as survey notes, sketches, preliminary plans, computations and other data, prepared or obtained in the performance of this Agreement, shall be made available, upon request, to the Agency at no additional charge and without restriction or limitation on their use.

12. SUBCONTRACT AND ASSIGNMENT

This Agreement binds the heirs, successors, assigns and representatives of the Consultant. The Consultant shall not enter into subcontracts for any work contemplated under this Agreement and shall not assign this Agreement or monies due or to become due, without the prior written consent of the General Manager of the Agency or his designee, subject to any required state or federal approval. The following sub-consultants are approved for subcontract under this Agreement:

- Montgomery and Associates and Hydrometrics

13. NONRENEWAL

The Consultant understands and agrees that there is no representation, implication, or understanding that the services provided by the Consultant under this Agreement will be purchased by the Agency under a new agreement following expiration or termination of this Agreement, and waives all rights or claims to notice or hearing respecting any failure to continue purchase of all or any such services from the Consultant.

14. NOTICE

Any notice provided for herein are necessary to the performance of this Agreement and shall be given in writing by personal delivery or by prepaid first-class mail addressed as follows:

AGENCY	CONSULTANT
Roland Sanford, General Manager Solano County Water Agency 810 Vaca Valley Parkway, Suite 203 Vacaville, CA 95688	Sachi Itagaki, Principal Kennedy/Jenks Consultants 2350 Mission College Blvd., Suite 525 Santa Clara, CA 95054

The parties have executed this Agreement the day and year first above written. If the Consultant is a corporation, documentation must be provided that the person signing below for the Consultant has the authority to do so.

Solano County Water Agency a Public Agency	Kennedy/Jenks Consultants, Inc a California Corporation
By:_____	By:_____
Roland Sanford, General Manager	Sachi Itagaki Principal

EXHIBIT A

SCOPE OF SERVICES

Kennedy/Jenks Consultants
Engineers & Scientists
10850 Gold Center Drive, Suite 350
Rancho Cordova, California 95670
916-858-2700

13 October 2017

Ms. Jeanette Wrysinski
Senior Program Manager
Yolo County Resource Conservation District
221 West Court Street, Suite 1
Woodland, CA 95695

Subject: Proposal for Professional Services to Support the Westside Sacramento Integrated Regional Water Management Plan Update

Dear Ms. Wrysinski:

The Westside Sacramento Regional Water Management Group (RWMG) began working together in September 2010 to develop an Integrated Regional Water Management Plan (IRWM Plan) for the Cache Creek and Putah Creek watersheds with the assistance of Kennedy/Jenks Consultants (Kennedy/Jenks) led by Project Manager Sachi Itagaki. Since then the RWMG, represented by the Coordinating Committee and the IRWM Plan's stakeholders, continues to work collaboratively to implement and track IRWM Plan projects, as well as progress towards achieving Plan Objectives and Goals.

It has been almost five years since the adoption of the Westside Sacramento IRWM Plan, and the RWMG is revisiting the plan to ensure that the document continues to meet the needs of its stakeholders. The Kennedy/Jenks Westside IRWM Plan Update Project Team (K/J Project Team) is prepared to assist the Coordinating Committee with updating the Westside Sacramento IRWM Plan to meet the California Department of Water Resources (DWR) 2016 IRWM Plan Program Standards, which include added topics related to:

- The Westside Sacramento Region's vulnerability to climate change;
- Characterization, impacts, and efforts to address contamination from nitrate, arsenic, perchlorate, or hexavalent chromium (AB1249); and
- Additional water management planning activities such as storm water and groundwater sustainability planning.

An accepted updated IRWM Plan is necessary to be eligible for funding through the upcoming Proposition 1 IRWM Implementation Grant Program.

Our Qualifications and Experience

Founded in 1919 in San Francisco, Kennedy/Jenks is an award-winning, full-service, multidiscipline engineering and environmental sciences consulting firm that has earned a reputation for excellence and innovation in water planning, groundwater management and infrastructure design. We continue to provide excellent service to public agencies with combined resources of over 180 staff in our Sacramento, San Francisco, Santa Rosa and Santa Clara offices, and over 430 staff company-wide.

The K/J Project Team has extensive experience in water resources planning in the Westside Region through our work on the 2013 Westside Sacramento IRWM Plan, 2014 Drought Grant, 2015 IRWM Grant Application, Solano County Water Agency 2016-2025 Strategic Plan, and Yolo Storm Water Resource Plan. Through this work, we have acquired a solid understanding of the water resources issues in the Westside IRWM region, and we have become familiar with the outreach and coordination process used by the RWMG and the Coordinating Committee.

Under Sachi Itagaki, Project Manager, the K/J Project Team completed the 2013 Westside IRWM Plan on schedule and under budget. The remaining project budget was used to develop an application for the 2014 Drought Grant, which was awarded $7,000,000 for canal modernization, recycled water, and pipeline replacement projects.

In addition to our work in the Westside Region, the K/J Project Team offers the RWMG unparalleled recent and relevant project experience with IRWM Plan preparation throughout California as summarized in the table below. These projects demonstrate our firm's solid record of accomplishment in helping clients obtain acceptance of their IRWM Region Acceptance Process (RAP), developing Water Management Strategies and IRWM Plans, assisting with preparation and submission of various planning and implementation grant applications, and administration of IRWM implementation grants once received.

IRWM Plan Name	IRWM Plan Preparation	IRWM Planning/ Implementation Grant Applications	IRWM On-line Grant Administration
Yosemite-Mariposa IRWM Plan (including meeting 2016 IRWM Plan Standards)	X	X	
Tuolumne-Stanislaus IRWM Plan	X	X	
Westside Sacramento IRWM Plan	X	X	
Bay Area IRWM Plan	X		
Tahoe-Sierra IRWM Plan	X	X	
Mojave IRWM Plan	X	X	X
Calleguas Creek Watershed IRWM Plan	X	X	
Western Municipal Water District IRWM Plan	X	X	X
Antelope Valley IRWM Plan*	X	X	
Upper Santa Clara River Watershed IRWM Plan*	X	X	X
Kern IRWM Plan*	X	X	

* Including Regional Acceptance Process Assistance.

Our K/J Project Team also includes individuals who have prepared IRWM Plans while with other employers for the Los Angeles Gateway Region, San Luis Obispo Region, Eastern San Joaquin Region, and the Imperial Region.

In addition, the K/J Project Team has extensive experience and success in developing and implementing storm water resource plans, groundwater management plans, and other large-scale planning efforts requiring multi-stakeholder cooperation and coordination throughout California. The K/J Project Team planning experience also includes:

Storm Water Resource Plans (SWRPs) for:

- Yolo County Water Resources Association/Yolo County Flood Control & Water Conservation District, Proposition 1 Storm Water Planning Grant Application and Storm Water Resource Plan preparation for Yolo County
- Monterey Regional Water Pollution Control Agency/City of Salinas Proposition 1 Storm Water Implementation Grant Application and Storm Water Resource Plan preparation for the Greater Salinas Area
- Mojave Water Agency Storm Water Resource Plan preparation for the Mojave IRWM Region
- San Bernardino County Flood Control and Water Conservation District Storm Water Resource Plan preparation for Upper Santa Ana River

Similar to the IRWM Plan process, SWRP development requires stakeholder outreach and collaboration to develop goals and objectives to address storm water issues. Projects submitted to the SWRP must be reviewed and prioritized using a quantitative evaluation. The K/J Project Team is using its familiarity with the Westside IRWM Plan, the Region and its stakeholders and outreach process to streamline the development of the Yolo SWRP and ensure that it is consistent with the IRWM Plan and meets the needs of the Region.

Groundwater Management Planning for:

- Sustainable Groundwater Management Agency (SGMA) technical support for the Indian Wells Valley Cooperative Groundwater Management Group
- South Y Proposition 1 Groundwater Sustainability Grant Application preparation for the South Tahoe Public Utility District
- Water Resources Association of San Benito County alternatives analysis for the Groundwater Management Plan Update and Programmatic Environmental Impact Report Technical Support
- Twenty Nine Palms Water District AB3030 Groundwater Management Plan
- Local Groundwater Assistance Program (AB303) Grant Application for Elsinore Valley Municipal Water District
- Local Groundwater Assistance Program (AB303) Grant Application for Murietta County Water District
- Groundwater Conjunctive Use – Stormwater Management and Treatment for San Francisco Public Utilities Commission
- Local Groundwater Assistance Program (AB303) Grant Application for Scotts Valley Water District

Other large-scale planning for:

- Solano County Water Agency 2016-2025 Strategic Plan
- Marin Municipal Water District Watershed Sanitary Survey Updates for 2005, 2010, and 2015
- Santa Cruz Watershed Sanitary Survey Updates for 2007, 2013, and 2018

A summary of team qualifications follows and resumes are attached.

Role Staff Member Office Location	Qualifications / Responsibilities
Project Manager Sachi Itagaki, PE Santa Clara, CA	**Qualifications:** Sachi has over 23 years of water resources and civil engineering experience, specifically in conducting integrated water resource planning and management programs including IRWM Plans, surface water and groundwater quantity and quality investigations; utility infrastructure management, master planning, modeling, and design studies; and grant funding application preparation. She has worked extensively in the IRWM Program since its inception with Proposition 50 in preparing both IRWM Plans and IRWM Planning and Implementation grant funding applications that have resulted in approximately $90 million of financial support for water resource planning and construction projects. Her work for the Westside RWMG includes the 2013 IRWM Plan, two Prop 84 Grant applications, as well as the Solano County Water Agency Strategic Plan, the Yolo County SWRP, and the Solano Sub-basin Proposition 1 Groundwater Sustainability grant workplan. **Responsibilities:** Project's primary contact and will be responsible for managing the Kennedy/Jenks Team. She will coordinate between the Coordinating Committee Project Manager and our K/J Project Team.
Assistant Project Manager/Plan Update Task Leader Jennifer Lau Larsen, PE Rancho Cordova, CA	**Qualifications:** Jennifer brings eight years of large-scale water resources planning experience, including but not limited to IRWM Plans, Storm Water Resource Planning, Salt and Nutrient Management Planning, and Statewide Flood Management Planning. Other planning efforts include federal, state, and local grant applications, Urban Water Management Plans, Water Supply Assessments, recycled water market assessments, CEQA support, water-energy assessments, and master planning. **Responsibilities:** Daily delegation of assigning tasks/responsibilities to the K/J Project Team members, a secondary point of contact to Sachi as needed.
Water Resources Planning/ Funding Jacques DeBra Rancho Cordova, CA	**Qualifications:** Jacques has over 30 years of experience in water resource planning and funding procurement for a wide variety of projects and funding sources. Jacques is part of the Kennedy/Jenks funding team which has helped our clients secure more than $450M in grants and low interest loans from DWR, the State Water Resources Control Board, the Bureau of Reclamation, and United States Department of Agriculture for our clients in California. **Responsibilities:** Water resources planning, coordination and funding support.

Role Staff Member Office Location	Qualifications / Responsibilities
Technical Advisor - Groundwater Eddy Teasdale, PG, CHG Rancho Cordova, CA	**Qualifications:** Eddy has over 18 years of experience working on geological and hydrogeological investigations, and has been involved with design, installation, rehabilitation or abandonment of over 300 water wells in California. He has conducted numerous well evaluation/reconstruction projects for municipalities, private water companies, mines and industry to improve the pumped water quality through structural or operational modification of the well. He is well versed in SGMA and is actively working to serve clients on Groundwater Sustainability Plan (GSP) development, modeling, database management, and groundwater monitoring programs and projects. **Responsibilities:** Technical support related to hydrogeology and AB1249 water quality evaluation, groundwater monitoring, modeling and database management, as well as well design and construction.
Plan Update Support Chantelle Garvin, EIT Rancho Cordova, CA	**Qualifications:** Since joining Kennedy/Jenks in 2016, Chantelle has assisted with a number of water/wastewater resources planning projects including the Yolo Storm Water Resource Plan, Santa Rosa Subregional Water Resources Recovery Facilities Master Plan, and the La Contenta and Copper Cove Wastewater Master Plan Update. She has also drafted technical memorandums and reports in support of hydraulic analysis and design of municipal water systems, as well as technical reports in support of the Clean Water State Revolving Fund Financial Assistance Application. **Responsibilities:** Plan update support, including drafting plan section updates.
Quality Control Reviewer Meredith Clement Oxnard, CA	**Qualifications:** Meredith is a water resource planning and environmental expert with 20 years of relevant planning experience dealing with water and grant funding issues in California. She has special expertise with IRWM Plan projects, grant funding applications and administration, and environmental compliance documentation. **Responsibilities:** Technical resource for Plan update and internal review of project deliverables for quality control.

Scope of Services – Westside IRWM Plan Update to 2016 Standards

Kennedy/Jenks has preliminarily reviewed the existing 2013 IRWM Plan in conjunction with the current 2016 Proposition 1 Guidelines to determine what updates are necessary, particularly with regard to the 2016 IRWM Plan Standards and all eligibility criteria. Kennedy/Jenks used DWR's Plan Review Tool, and the 2016 IRWM Guidelines (including Appendix H of Volume II) as resources for determining compliance.

Based on this preliminary review, Kennedy/Jenks has determined that the Westside IRWM Plan sufficiently meet these 2016 IRWM Plan Standards: Integration, Impact and Benefit, Data Management, Finance, Technical Analysis, and Coordination. While these Standards in the IRWM Plan could be updated with existing conditions or changed circumstances, to expedite completion of the update, only changes necessary to have DWR deem the IRWM Plan

compliant with the Proposition 1 Guidelines are proposed at this time. Future IRWM Plan updates will allow the opportunity to do a more thorough update.

As part of this scope of services, Kennedy/Jenks will perform a more detailed review of the 2013 IRWM Plan, DWR's Plan Review Tool, and the 2016 IRWM Plan Guidelines to ensure all necessary updates have been identified.

Task 1 – DWR Plan Standards Review Tool

DWR provides an excel spreadsheet, the DWR Plan Standards Review Tool, as a means to demonstrate how an existing IRWM Plan meets the current (2016) IRWM Plan Guidelines. Kennedy/Jenks shall prepare a draft and final DWR Plan Review Tool. The DWR Plan Standards Review Tool will be used to direct the drafting of the IRWM Plan update.

Task 1 Deliverables: Draft and Final Draft DWR Plan Standards Review Tool (electronic)

Task 2 – IRWM Plan Sections Update

Based on the review of the 2013 IRWM Plan, which included preparation of a climate change vulnerability checklist, and the draft DWR Plan Standards Review Tool, Kennedy/Jenks has determined the existing IRWM Plan requires updates to meet the IRWM Plan Standards listed in the table below. Very brief suggestions for updates are provided. Specific development and attention will be given to:

- Reviewing and updating the climate change vulnerability checklist and language in the IRWM Plan which will result in updates throughout the Plan;
- The groundwater/water quality relative to gathering data and updating water quality narrative to reflect the AB1249 groundwater contaminants; and
- Updating the project list and evaluating the projects.

DWR Plan Standard	Update Suggestion	Westside IRWM Plan Sections Affected
Governance	Documentation of previous IRWM Plan adoptions, discussion of American Indian Tribe consultation.	1 – Introduction 11 – Implementation Framework
Region Description	Describe water/groundwater quality conditions (particularly, perchlorate, arsenic, nitrate)*, ensure climate change impacts on region are discussed, and add social and cultural makeup of the region.	2 – Region Description 3 – Existing and Future Conditions
Objectives	Ensure climate change clarified in objectives, may need to augment objectives language.	6 – Goal and Objectives

DWR Plan Standard	Update Suggestion	Westside IRWM Plan Sections Affected
Resource Management Strategies	Add new CA Water Plan strategies, ensure thorough discussion of how climate change effects the IRWM region.	8 – Resource Management Strategies
Project Review Process	Update call for project forms, specifically mention vulnerability to climate change, discuss project contributions to GHG emissions and reducing dependence on Delta supply, and add Native American Tribal communities. Update project list to include new projects from IRWM and SWRP and reevaluate projects, as needed.	8 – Project Review and Prioritization
Plan Performance and Monitoring	Revisit rules for monitoring plan performance and update project status.	10 – Coordination 11 – Implementation Framework
Local Water Planning	Provide update on SGMA developments.	1 – Introduction 4 – Water and Land Use Planning
Local Land Use Planning	Enhance discussion on information sharing and collaboration with land use agencies and in relation to adapting to climate change.	4 – Water and Land Use Planning
Stakeholder Involvement	Outreach to Native American Tribes and IRWM Plan facilitate participation.	1 – Introduction
Climate Change	Ensure plan is equipped with background knowledge in order to evaluate GHG emissions on projects, highlight prioritized vulnerabilities, and update next steps on climate change research for next largescale update.	3 – Existing and Future Conditions 5 – Challenges and Opportunities Summary 6 – Goals and Objectives 8 – Project Review and Prioritization

*We assume this data is available through State databases/programs (e.g., Geotracker, California Environmental Data Exchange Network, Groundwater Ambient Monitoring Assessment) and local/regional planning documents/programs (e.g., discharge permits, other water quality monitoring and control plans/programs).

Task 2 Deliverables: Draft Sections (electronic), Final Draft Plan (1 hard copy + electronic), Final Plan (1 hard copy + electronic)

Task 3 – Attend IRWM Plan Update Stakeholder Meetings

Kennedy/Jenks will work with the Westside IRWM Plan Coordinating Committee to develop meeting materials to present drafts of the IRWM Plan sections at regular Coordinating Committee meetings and elicit feedback on the updated content. Agenda items are proposed for three meetings.

	Proposed Topics
Meeting 1	• Overview of IRWM Plan Update and Identified Changes • Updated IRWM Plan Sections 1
Meeting 2	• Updated IRWM Plan Sections 2
Meeting 3	• Final Draft Presentation

Additional meetings may be added to the scope with the approval of the RWMG/Coordinating Committee. It is estimated that each additional in-person meeting with one K/J staff in attendance will add $1,200 to the budget. The K/J Project Team is prepared to conduct additional meetings relating to:

- Final IRWM Plan presentation
- New project selection/prioritization for funding opportunities
- EDA/DAC and/or Tribal outreach meetings
- Other outreach meetings

Task 3 Deliverables: Meeting Materials (electronic) including draft Plan Sections, Slides, Handouts as needed provided prior to each meeting.

Task 4 – Project Management and QA/QC

Sachi Itagaki, our Project Manager supported by Jennifer Lau Larsen, will responsible for coordinating and communicating with the Coordinating Committee and the K/J Project Team. Project administrative and management tasks will include: preparation of monthly invoices, managing staff; coordinating with the Coordinating Committee, and planning and monitoring project activities.

Quality assurance and quality control (QA/QC) is integrated into our project management system from project inception to the execution of final documents and submission. Quality Control (QC) review of all the IRWM Plan work products and project deliverables (i.e. individual section updates, Final Draft Plan, and Final Plan) will be completed before they are submitted to the Coordinating Committee. Meredith Clement will be our experienced senior staff member that will assure we uphold our QA/QC process. She will be familiar with, but not directly involved in, the project work to provide a fresh look at the documents before submitting them to the Westside IRWM Plan Coordinating Committee and Stakeholders.

Task 4 Deliverables: Invoices (electronic)

Optional Tasks

Tasks 1-4 are presented as the minimum needed to bring the existing Westside IRWM Plan up to the 2016 Standards. We suggest a $10,000 optional task that can be authorized by Coordinating Committee Project Manager on an as-needed basis. Potential optional services

are listed below and can be provided upon request, at which time specific scope and budget will be provided to the Coordinating Committee:

- New Call for Projects and project development assistance
- Update IRWM Plan sections with new EDA/DAC data
- Develop Storm Water Resource Plan for one or more agencies
- Prioritization of additional projects
- Additional outreach
- Other identified items

The K/J Project Team is tracking to complete the Yolo SWRP in Spring of 2018, which will be the fourth SWRP completed by this team. Kennedy/Jenks will use a similar process as the Yolo SWRP to develop any additional requested SWRPs for the Westside IRWM Region. Kennedy/Jenks developed additional SWRPs for the City of Salinas, Upper Santa Ana River, and the Mojave IRWM Region.

Schedule

The IRWM Plan Update is required to be submitted and accepted by DWR prior to execution of the next round of Implementation Grant contracts. It is anticipated that the Proposal Solicitation Period for the Implementation Round of the Proposition 1 Grant Program will commence in late summer 2018 with grant contract execution in early 2019. The K/J Project Team proposes a project schedule with Coordinating Committee/Stakeholder meetings every two (2) months to allow for comment and discussion on draft IRWM Plan Update sections. Based on the proposed schedule below, the Final Westside IRWM Plan Update is anticipated to be submitted to DWR in June-July 2018. The estimated timelines for DWR to issue IRWM implementation grant Proposal Solicitation Packages (PSPs) are found in italic text within the table below.

Description	Schedule
Submit Westside IRWM Plan Update Proposal	Oct. 13, 2017
Notice to Proceed and Kickoff Conference Call	Nov. 2017
DWR: Conceptual Proposition 1 Implementation Grant PSP	*Dec. 2017/ Jan. 2018*
Submit Draft IRWM Plan Update Sections: DWR Plan Standards Review, 1 – Introduction, 2 – Region Description, 3 – Existing and Future Conditions, 4 – Water and Land Use Planning	Jan. 2018
Meeting 1	Jan. 10, 2018
Submit Draft IRWM Plan Update Sections: 5 – Challenges and Opportunities Summary, 6 – Goal and Objectives, 8 – Project Review and Prioritization, 10 – Coordination, 11 – Implementation Framework	March 2018
Meeting 2	March 14, 2018
DWR: Draft Proposition 1 Implementation Grant PSP	*Spring 2018*
Submit Final Draft IRWM Plan Update, Final DWR Plan Standards Review	May 2018
Meeting 3	May 8, 2018
Submit Final IRWM Plan Update to Coordinating Committee	June 2018
Submit IRWM Plan Update Package to DWR	July 2018
DWR Plan Review Process	July – Sept. 2018
DWR: Final Proposition 1 Implementation Grant PSP and Proposal Solicitation Period	*June/July 2018 – Sept./ Oct. 2018*
DWR: Implementation Grant Contract Execution	*Early 2019*

Budget

Kennedy/Jenks proposes to provide the scope of services described above on a time and materials basis for an estimated fee of $63,428 for the base scope of services and $10,000 for optional services. Please see the attached fee estimate breakdown for details, along with our January 1, 2017 schedule of charges.

Please contact me at (650) 852-2817 or Sachiltagaki@kennedyjenks.com or Jennifer Lau Larsen at (916) 858-2714 or JenniferLau@kennedyjenks.com if you have any questions. We appreciate the opportunity to support the Westside RWMG on this important project and look forward to working with the RWMG, Coordinating Committee, and the Westside-Sacramento Region's stakeholders to develop the IRWM Plan Update.

Very truly yours,

KENNEDY/JENKS CONSULTANTS, INC.

Sachiko Itagaki, P.E.
Project Manager

Enclosure(s): Proposal Fee Estimate
Schedule of Charges
K/J Project Team Resumes

cc: Jennifer Lau Larsen, Kennedy/Jenks

SOLANO COUNTY WATER AGENCY

MEMORANDUM

TO: **Board of Directors**

FROM: **Roland Sanford, General Manager**

DATE: **December 7, 2017**

SUBJECT: **December 2017 General Manager's Report**

NBA water supply – initial 2018 allocation at 20 percent

The Department of Water Resources (DWR) recently announced its initial 2018 water supply allocation for the North Bay Aqueduct – 20 percent of the full "Table A" contractual amount. Each December DWR issues an initial water supply allocation for the coming calendar year. These initial allocations are always very conservative since they are made at the beginning of the rainy season and it is assumed that the coming months will be comparatively dry. This year the situation is compounded by the fact that Lake Oroville has been drawn down to minimize the probability of reservoir spills, in order to minimize if not avoid using the partially repaired spillway this winter. Assuming the balance of the rainy season is at or near "normal" we will likely see the 20 percent allocation increase, at least somewhat. Fortunately, Lake Berryessa is nearly full and even if the balance of the rainy season is extremely dry, will provide full water supply allocations in the coming year.

New water conservation program

Staff is pleased to announce a new component of the ongoing Water Efficient Landscape Rebate Program – a pilot program specifically directed toward Solano County residents with limited incomes and/or disabilities (see attached flyer and press release). The need for the program was identified in the "Single-Family Residential Water Use and Conservation Potential Pilot Study" report commissioned by the Water Agency and prepared by Erler & Kalinowski, Incorporated (EKI) in 2016.

In evaluating the performance of past and current water conservation programs, EKI found that low income neighborhoods and seniors were generally less likely to take advantage of the Water Agency's conservation programs, either because they could not afford the up-front costs in advance of receiving a rebate check or, particularly in the case of the Water Efficient Landscape Rebate Program, they were physically unable to perform the landscaping work themselves. Because low income residents and seniors tend to live in older homes with older, less efficient plumbing fixtures, they are typically strong candidates for the Water Agency's various water conservation programs.

810 Vaca Valley Parkway, Suite 203
Vacaville, California 95688
Phone (707) 451-6090 • FAX (707) 451-6099
www.scwa2.com

SOLANO WATER
BE GREEN. SAVE BLUE.

If successful, it is staff's hope that the pilot program can be integrated with other services provided by the County and/or various community services groups that assist low income, seniors, and/or disabled residents.

Salmon return to Lower Putah Creek

As of this writing approximately 500 adult Chinook salmon have reportedly been observed in Lower Putah Creek, fewer fish than observed last year at this time but still impressive. As a part of the Chinook salmon study funded by the Water Agency, UC Davis personnel are monitoring spawning activity and collecting samples for DNA and related laboratory analyses, and in the first half of 2018 will be monitoring and tagging downstream migrants – all in an effort to answer the question: are we beginning to see a self-sustaining population of Chinook salmon in Lower Putah Creek (fish that are born and return as adults to Lower Putah Creek as opposed to hatchery produced strays that randomly select Lower Putah Creek).

Wragg Fire harzard mitigation grant received

The Water Agency was recently awarded a $450,000 California Office of Emergency Services (Cal OES) Hazard Mitigation Grant to address fire-related and legacy soil erosion problems on approximately 8,000 acres draining into Putah Creek, between Monticello Dam and the Putah Diversion Dam (Interdam Reach). The area burned in July, 2015 (Wragg Fire) and constitutes a potentially significant source of sediment and turbid runoff for Lake Solano and the Putah South Canal.

In 2016 the Water Agency contracted with Integrated Environmental Restoration Services to perform a watershed assessment of the Wragg Fire burn area. That assessment, which cost approximately $40,000, provided the technical basis for the grant proposal – a proposal the Water Agency would not have been eligible to submit without the assistance of Solano County OES and more specifically, the fact that Solano County OES has an adopted Hazard Mitigation Plan. Funding for the project –"Solano County Erosion" – originates from the Federal Emergency Management Agency (FEMA) and is being routed through Cal OES and ultimately Solano County OES. The Water Agency, in partnership with Solano County OES, is hoping to obtain a similar grant for the Cold Fire of 2016, which also burned lands draining to the Interdam reach.

Water-Efficient Landscape Rebate Program

Assistance Available for Residents with Limited Incomes and Disabilities

Solano County Water Agency (SCWA) is pleased to offer a new program that provides extra assistance for residents with limited incomes and/or disabilities who wish to replace lawn with a beautiful, low-water landscape. Qualifying residents can receive:

- Up to 20 low-water native plants for your yard
- Help with eliminating lawn using sheet mulching (a natural method for removing turf)
- Labor for planting your new landscape

This is in addition to SCWA's existing rebate of $1 per square foot of landscape converted (up to $1,000 total in rebates).

To qualify, participants must be enrolled in PG&E's CARE Program and/or should show a disabled driving placard, ADA assistance dog registry or a doctor's note. This program is open on a first-come, first-served basis until June 2018 or until funds are depleted.

For more information and to apply visit http://solanosaveswater.org/rebates/ or call (707) 455-4450.

810 Vaca Valley Parkway, Suite 203
Vacaville, CA 95688

www.solanosaveswater.org

NEWS RELEASE

November 29, 2017

Contact: Sabrina Colias
Assistant Water Resources Specialist
Solano County Water Agency
(707) 455-4450
scolias@scwa2.com

New Pilot Helps Residents with Limited Incomes and Disabilities Transform Turf to Low-Water Use Landscapes

VACAVILLE, Calif. – Solano County Water Agency (SCWA) is offering special assistance to low-income households and residents with disabilities for replacing turf with sustainable, water-efficient landscaping through a new pilot program.

Qualifying low-income residents can now receive low-water use native plants, and qualifying residents with disabilities can also receive labor to help with removing turf and planting their new landscape. This is in addition to SCWA's existing rebate of $1 per square foot of turf removed (up to $1,000 total in rebates).

"Our goal is to make the transition to low-water landscapes more attainable for all Solano County residents," said Water Resources Assistant Sabrina Colias. "We're hoping this pilot program will give residents the extra boost needed to allow those transitions to happen."

Participants must be enrolled in PG&E's CARE Program to qualify, and may receive two plants for every 100 square feet of turf removed (up to 20 plants total).

--MORE--

In addition, those wishing to quality for the Americans with Disabilities Act (ADA) labor assistance program should show a disabled driving placard, ADA assistance dog registry or a doctor's note. Participants will receive help with sheet mulching (a natural method for removing lawn) and with planting.

"This program has several added bonuses," Colias said. "Not only does it help reduce water use, it allows more of our community to participate in our rebate programs, promotes environmental sustainability by using low-water native plants that are grown locally and provides training opportunities for our interns who are learning about water conservation, landscaping and community outreach."

Participants may reside in single family homes, multifamily residences or in mobile homes. The pilot program is open on a first-come, first-served basis until June 2018 or until funds are depleted. Full eligibility terms, guidelines and an application are available at SolanoSavesWater.org.

About Solano County Water Agency (SCWA):

SCWA is a wholesale water supplier providing untreated water to cities and agricultural districts in Solano County. The Agency is responsible for operations and maintenance of flood management systems, restoration and habitat conservation activities, and implements the water conservation programs for Solano County. Solano County Water Agency is an independent special district and the Agency's mission is to ensure sustainable, reliable high-quality water resources and flood management for the benefit of the residents, businesses, industries and agricultural communities of Solano County.

###

Time Period Covered: NOVEMBER 2017

REPORT OF CONSTRUCTION CHANGE ORDERS AND CONTRACTS APPROVED BY GENERAL MANAGER UNDER DELEGATED AUTHORITY

Construction Contract Change Orders (15% of original project costs or $50,000, whichever is less) - none

Construction Contracts ($30,000 and less) - none

Professional Service Agreements ($30,000 and less)

Non-Professional Service Agreements ($30,000 and less) –
Streamwise – McCune-Sweeney Cross Vane - $5,000
Sustainable Solano – Rainwater Harvesting Workshops - $2,000
JM Consultants – Water Policy Committee Meeting Services - $15,000

Construction contracts resulting from informal bids authorized by SCWA Ordinance- none

Note: Cumulative change orders or amendments resulting in exceeding the dollar limit need Board approval.

MISC. NEWSPAPER ARTICLES

LAKE BERRYESSA NEWS

Without *THE LAKE BERRYESSA NEWS* there would be no Lake Berryessa news!

LAKE BERRYESSA BOATER OUTREACH PROGRAM REPORT: SUMMER 2017

The Lake Berryessa Boater Outreach (LBBO) program focuses on educational outreach and invasive species prevention at Lake Berryessa. Lake Berryessa provides drinking water for more than 500,000 people in Solano County and is used by the Jelly Belly Factory and Anheuser-Busch for their products. The 2017 LBBO program was active from April to September. Throughout the season, LBBO interns conducted watercraft screenings for invasive mussels and educated boaters and recreational users. Sixteen student interns staffed six boat launches.

Download Full Report PDF Here...

The high water levels brought many visitors from different counties to check out the Glory Hole and the rest of Lake Berryessa. In order to track and analyze the effectiveness of outreach efforts, LBBO interns gathered data and provided weekly summaries to partner agencies and stakeholders. LBBO interns also participated in community volunteer cleanup events throughout the summer, including World Environment Day and California Coastal Cleanup Day.

Back from left to right: Alessandro Schiavone, Lydia Kenison, Jo Black, Edward Blong- Her, and Qiming Yang.

Middle from left to right: Christopher Zaleski, Sierra Lissick, Mary Capcap, Angie Flores, Kyrie Aragon.

Front from left toright: Kevin Young-Lai (Supervisor), Gustavo Cruz (Supervisor), Kasey Chohan, and Olivia Hart.

Insets: Scott Navarro (Supervisor) and Sarah Day.

Invasive Mussel Inspection Program

The primary goal of the LBBO program is to prevent the introduction of invasive mussels into Lake Berryessa. Invasive species are transported from one body of water to another through boats and other watercraft. LBBO interns screened watercraft both visually and through boater surveys. Interns staffed all boat launch sites at Lake Berryessa seven days a week from June-September - the peak boating season.

In addition to screening boats and other watercraft, interns educated boaters on preventing the spread of invasive species, as well as the ecological, economic, and recreational impacts that the introduction of invasive mussels would cause Lake Berryessa, the surrounding community, and beyond. The vast majority of boaters were not only amenable to the screening process, but also supportive of the program.

Program Achievements

Screenings increased by 54% from 2016 and by 82% from 2015: 16,799 watercraft screened in 2017; 10,860 watercraft screened in 2016; 9,197 watercraft screened in 2015.

Eight potentially infested watercraft were prevented from launching this year. Such watercraft launched in infested bodies of water in the past thirty days without sufficient dry time to eliminate risk of transmitting invasive mussels to Lake Berryessa.

As part of the invasive screening process, interns collected the following data: time of the screening, the boater's home zip code, and the last body of water the boat had launched. This data helps the LBBO program understand the efficacy of the invasive screenings as well as to strategize better protection of Lake Berryessa in the future.

Home County Data Analysis

Protecting Lake Berryessa from invasive mussels also requires knowledge of the geographic region from which boaters are coming and how many are coming from each region. As part of the invasive screening process, each boater's zip code is collected and corresponds to their county of residence.

The population that most frequently uses Lake Berryessa for recreational boating is also dependent on it for drinking water, and would be the most personally affected by an infestation of invasive mussels. Of the Solano County boaters that visited Lake Berryessa, more than 41% came from Vacaville and more than 26% came from Fairfield.

Contra Costa and Napa are also major counties of origin for Lake Berryessa boaters with 21% and 13%, respectively. Although residents of Contra Costa, Napa and other counties are not reliant on Lake Berryessa for drinking water, it is still critical to engage them in education and outreach for the sake of Solano County's principle water source and their own local reservoirs that could be affected by an invasive mussel infestation.

Hydrologic Region Data Analysis

The most critical data collected during the invasive screening process is information on where a boat last launched. By recognizing launch patterns of boaters and determining which hydrologic regions are most popular, we can better assess and prepare for the risk Lake Berryessa would face if a nearby region became infested with invasive mussels.

76% of boaters screened reported to have last launched at Lake Berryessa. Other commonly reported places of most recent launch are within the Sacramento River hydrologic region or the San Joaquin hydrologic region, neither of which currently contain any infested bodies of water with invasive mussels.

After Lake Berryessa, the most common recent launch locations were the California Delta (95), Lake Shasta (68), Lake Tahoe (67), Clear Lake (52,) Lake Sonoma (41), Sacramento River (36), Camanche Reservoir (36) and Folsom Lake (35).

Conclusion

The main goal of the Lake Berryessa Boater Outreach Program is to protect the drinking water source for nearly 500,000 residents of Solano County through invasive screenings, cleanup events, and educational efforts.

The 2017 LBBO Program was successful in screening a record number of boats for invasive species and educating over 3,400 visitors about the importance of keeping Lake Berryessa clean.

Interns hope that visitors were inspired to help keep Lake Berryessa cleaner than when they arrived so that the lake continues to be one of the cleanest reservoirs in the state of California. The chart below shows the results of the program for the last five years.

Outreach Program Achievements

2,377 people were educated with boater surveys

1,115 boater surveys given: Of the 1,115 boats surveyed, 82% were inboard or inboard/outboard (eligible for bilge pad installation) and 41% of those eligible boaters installed a bilge pads

372 bilge pad installations prompted by surveys

41% of eligible boaters installed bilge pads (based on rates of Inboard/Outboard boats)

606 additional bilge pads distributed

Boater Kits and Premiums

All boaters who completed a survey received a tote bag filled with a boater kit.

Highlights of the boater kit included a bilge pad to keep oil and fuel contaminants from leaving bilge compartments, a fuel bib to eliminate spilled gasoline while refueling, and a West Marine coupon for 15% off a purchase. Also included in the kits are booklets about California boating and environmental laws as well as educational materials regarding zebra and quagga mussels. Boater kits were generously provided by the California State Parks Division of Boating and Waterways and the California Coastal Commission.

Conclusion

The main goal of the Lake Berryessa Boater Outreach Program is to protect the drinking water source for nearly 500,000 residents of Solano County through invasive screenings, cleanup events, and educational efforts. The 2017 LBBO Program was successful in screening a record number of boats for invasive species and educating over 3,400 visitors about the importance of keeping Lake Berryessa clean. Interns hope that visitors were inspired to help keep the water and shores of Lake Berryessa cleaner than when they arrived so that the lake continues to be one of the cleanest reservoirs in the state of California.

The Lake Berryessa Boater Outreach Program is managed by the Lake Berryessa Watershed Partnership which includes the Solano County Water Agency, the Bureau of Reclamation, the Solano Resource Conservation District. It also includes representatives from Solano and Napa Counties as well as a range of local agencies in collaboration whose goal is to keep Lake Berryessa's water safe and clean.

Season Totals	2013	2014	2015	2016	2017
Interns	6	6	14	12	16
Screenings	1,547	4,301	9,197	10,860	16,799
Boater Surveys	1,568	1,670	1,195	1,210	1,115
Recreator Surveys	325	300	392	265	224
Bilge Pads Installed	478	690	589	497	372

Acknowledgement of Partners and Funders

PKILKUS@GMAIL.COM

DAILY REPUBLIC
Solano County's News Source

Community News and Views

Press Release: Two Demonstration Food Forest Gardens Coming to Fairfield!

By Sustainable Solano November 16, 2017

Installing the food forest foundation

Sustainable Solano will be installing two demonstration food forest gardens in Fairfield at a private residence and one public location as part of its Sustainable Backyard program. The program aims to teach gardening techniques based on permaculture design principles (layered planting system that supports life) and wise water practices such as groundwater storage, roof water catchment, and laundry-to-landscape greywater re-use. This November, over two dozen community members gathered for the first two public installation workshops at a local Fairfield residential yard to help create the foundation for this demonstration food forest. Attendees created contour swales, built berms, planted a diverse group of food forest plants and helped to install a laundry-to-landscape greywater system that will feed the garden. There will be one last educational, hands-on public workshop event for this demonstration site on Saturday, December 16th where attendees can learn to plant a fruit tree guild and complete the installation. The expansion of these projects is funded by the Solano County Water Agency.

This holiday season, the program will also move forward with the creation of an edible "Christmas" food forest garden at Mission Solano, a transitional housing shelter that provides food, lodging, faith support and job training to over one hundred individuals and families in Solano County. Mission Solano sits on 3.5 acres with much of its land being underdeveloped making it an ideal location for a public demonstration food forest community garden. The demonstration garden will also include

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swales to capture rainwater, a laundry-to-landscape system, permaculture planting methods and will be open most Saturdays of the year for self-guided tours.

Mission Solano relies heavily on food donations and struggles with providing resident guests high-quality, nutritious food and access to fresh fruits and vegetables. A portion of food is purchased by the organization itself. Both partnering agencies saw an opportunity to not only reduce program food costs through this project, but to also serve the greater community by providing educational opportunities for Fairfield residents to learn about growing their own food, secondary water use and building resilient communities. On Saturday, 12/2 the public is welcome to attend a free greywater system installation workshop to learn how secondary water from your laundry and roof can feed an entire garden.

Most of the installation work and ongoing maintenance of this demo food forest garden will be completed by Mission Solano volunteers. The project is in in alignment with the agencies "job therapy" program that helps resident guests develop skills for future employment and sustainable living. Chief Operating Officer of Mission Solano, Shauna Hughes states, "By teaching our guests how to grow their own food, we can equip them to continue doing so once they establish permanent housing. This will help them overcome the barrier to good nutrition that most low-income residents face."

Registration is required for all installation workshops for both public and private projects. Visit www.sustainablesolano.org/events to register.
The Sustainable Backyard program will expand to Suisun City next spring and to Vacaville in the fall of 2018. Sustainable Solano will be looking for both private and public lands to install food forests in these cities. Visit www.sustainablesolano.org and www.facebook.com/sustainablesolano for updates and details about this expansion.

About Sustainable Solano
Sustainable Solano a non-profit organization is a non-profit organization dedicated to Nurturing Initiatives for the Good of the Whole. For more information, email info@sustainablesolano.org or visit www.sustainablesolano.org.

###

Recent Articles

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Community Calendar: Nov. 17, 2017

Fairfield police log: Nov. 15, 2017

Suisun City police log: Nov. 15, 2017

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Commentary: Half-hearted coup extends Zimbabwe's reign of terror

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Solano DA's office to host forum on Brown Act

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The Solano County Water Agency

NEWS RELEASE

810 Vaca Valley Pkwy, Vacaville, California 95688 - (707) 451 - 6090 - www.SCWA2.com

FOR IMMEDIATE RELEASE
December 5, 2017

Contact: Roland Sanford
707-455-1103
rsanford@scwa2.com

Solano County Water Agency Approves Study of Cache Slough Complex

Complex identified as ideal location for restoration by state and federal agencies

The Solano County Water Agency Board of Directors (SCWA) has approved a $1.2 million dollar contract with the University of California, Davis for the 3-year Cache Slough Complex Water Quality, Productivity and Fisheries Study. This study will extend and expand the work that UC Davis has done under a state contract that is ending and will provide much needed information for future water management decisions

"The majority of Solano County's urban and agricultural water supply is connected to the Cache Slough Complex – either as a source or as a conduit," explains Pete Sanchez, Board Chair. "This study is a critical component of our larger, long-term objective to be a well-informed authority on the physical and biological characteristics of the Cache Slough Complex moving forward."

The Cache Slough Complex has been identified by State and Federal agencies as an ideal location for large scale habitat conservation and restoration efforts. The findings from this study will be instrumental in providing greater insights into a largely understudied area that can then be leveraged to benefit habitat conservation and restoration efforts in a way that preserves current operations in the area.

"We're really anxious to see what this study reveals," says General Manager Roland Sanford. "A central component of the Cache Slough Complex Study is to identify ways we can be achieving and amplifying environmental benefits within the region while preserving ongoing agricultural operations."

The UC Davis Center for Watershed Sciences is California's leading academic institute in water management. The Center includes biologists, geologists, engineers, economists, legal scholars and others that help to understand California's complex water dynamics. Dr. John Durand – Principal Investigator for this study – has conducted numerous studies and published papers pertaining to the ecology of the Cache Slough Complex and surrounding areas.

"This decision by The Solano County Water Agency will allow the UC Davis Center for Watershed Sciences to continue meaningful study on the ecology of the Cache Slough Complex, which will be critical for the county's water supply moving forward," said Dr. John Durand.

###

Established in 1951, the Solano County Water Agency (SCWA) is a public agency and regional water wholesaler representing all local agencies involved in water and flood management. It is governed by a Board of Directors comprised of the five members of the Solano County Board of Supervisors, the seven mayors of the cities in Solano County, and a director from each of the three agricultural districts that provide retail agricultural water supply. SCWA's mission is to provide clean, reliable and adequate water supply to more than 400,000 residents in its service area while working to protect and preserve the environment.

ADVISORY COMMISSION UPDATES

Solano Water Advisory Commission
Meeting Minutes
October 25, 2017

Present: Roland Sanford and Alex Rabidoux, Solano County Water Agency; Royce Cunningham, Steve Sawyer and Justen Cole, Vacaville; Kevin King, Solano Irrigation District; Bryan Busch, RD 2068; Randy Murphy, Benicia; Misty Kaltreider, Solano County; Jack Caldwell, California Water Service (Dixon); Jim Christensen, Travis AFB; and Rick Wood.

The meeting was called to order at 12:36 PM.

1. Approval of Minutes
   The minutes of the September 27, 2017 meeting were approved.

2. SCWA General Manager's Report
   Roland informed the Commission that he would like to have the Water-Supply Demand Analysis Working Group meet in mid-November as the group has not yet met. For the Ulatis Channels Working Group, the Agency needs to synthesize the information collected to date and summarize this information to the Working Group. In regards to future Board Items, Roland will be requesting support to make the Putah Creek Streamkeeper full-time. Roland will also be seeking approval for the Cordelia Flood Study, to investigate flood and drainage issues in the lower Cordelia region. On other flood issues, the Water Policy Group has met several times, with little progress made. A facilitator will be brought in for future meetings.

   For the NBA Water Quality Treatment study, a 6-month contract has been approved to support this work. On other NBA issues, Roland passed around a letter from the Mojave Water Agency (MWA) in regards to SWP water transfers. Roland explained that Mojave would like to do a multiyear contract that would also generate funding, two items that historically DWR has not approved. If DWR approves the transfer, it would provide more SWP flexibility, and would be advantageous to NBA agencies like Benicia, with large SWP reserves.

   On Solano Project issues, Roland informed the Commission that the final Scientific Report for Phase 2 of the Bay Delta Plan has been released. Negotiations are currently underway with the Eastside Tributaries. Roland explained that Putah Creek only provides 1% of the Delta Outflow and is not likely a key target of the Phase 2 plan. However, the Agency will still want to negotiate with the State Water Resources Control Board (SWRCB) to prevent a blanket regulation that could significantly impact the Solano Project. The SWRCB is focused on four key items: tributary inflow, improvement to salmonid populations & cold water habitat, Delta outflow, and interior Delta flows. Roland explained that for Putah Creek, the key issues are salmonid populations, cold water habitat, and improved knowledge of the Yolo Bypass and floodplain inundation. Anecdotally, the Agency has information showing improved water temperatures and cold water habitat from the Putah Creek Accord, but additional data is needed. The Scientific Report also very briefly discusses a fish ladder into Lake Solano and the Interdam Reach. The Agency needs to conduct a habitat assessment and genetic study of fish in the Interdam Reach, to illustrate

why the fish ladder would be a poor suggestion. The Agency will still need to address the four key items outlined by the SWRCB during negotiations.

3. Groundwater Planning
   For SGMA, the grant deadline for helping to fund GSPs has been extended to early December. Vacaville and SID will each be contributing $100K/year to help fund the GSP and show regional support for the grant. The key focus for the Solano subbasin GSAs is meeting the grant deadline. Secondarily, the Solano subbasin GSAs are revising the coordinating MOU, but will have a draft MOU in place for the grant submission.

4. Solano County Report
   None

5. PSC/NBA Maintenance
   For the PSC, the annual canal cleanout will be starting next week, as well as the PSC Headworks Screen Replacement project. On the NBA, the one remaining PG&E outage will be rescheduled next year, with the goal of being scheduled during the standard March outage.

6. Solano Water Authority Report
   None

7. Water Conservation
   None

8. Legislative/Initiative/Court Decision Issues Not Discussed Above
   None

9. New Business
   None

10. Public Comments
    None

The next meeting will be December 6, 2017 at 12:30 PM.

The meeting adjourned at 1:24 PM.

SWAC Minutes.10-25-2017.docx

ACTION OF
SOLANO COUNTY WATER AGENCY

DATE: **December 14, 2017**

SUBJECT: **Lake Berryessa Boater Outreach Program**

RECOMMENDATION:

1. Hear presentation on 2017 Lake Berryessa Boater Outreach Program
2. Authorize hiring of permanent part-time (up to 1,000 hours/year) Water Resources Technician to assist with implementation of Lake Berryessa Outreach Program, in lieu of outsourcing work tasks to contractor.
3. Authorize purchase of Watercraft Seals, total cost not to exceed $13,000
4. Authorize staff to investigate feasibility of purchasing property in or near the Lake Berryessa watershed for operation of permanent boat decontamination station

FINANCIAL IMPACT:

Current annual cost of permanent part-time Water Resources Technician – salary and benefits – estimated to be $55,000. Cost of permanent part-time Water Resources Technician will be more than offset by eliminating contractor costs, resulting in overall annual cost savings to the Water Agency of $40,000 to $60,000 per year.

BACKGROUND:

The primary goal of the Lake Berryessa Boater Outreach Program is to prevent the introduction of quagga, zebra, and other invasive species into Lake Berryessa. Neither quagga nor zebra mussels are native to North America. Both mussels are extremely prolific and by sheer numbers, capable of severely fouling water conveyance facilities and causing significant ecological damage. If or when quagga and/or zebra mussel populations become established in Lake Berryessa, they are likely to spread to Lower Putah Creek, the Putah South Canal, and any water body that ultimately receives agricultural return flow water that originates from Lake Berryessa, including the Cache Slough Complex and Barker Slough (source water for North Bay Aqueduct).

Recommended: _____
Roland Sanford, General Manager

☐	Approved as Recommended	☐	Other (see below)	☒	Continued on Next Page

Modification to Recommendation and/or other actions:

I, Roland Sanford, General Manager and Secretary to the Solano County Water Agency, do hereby certify that the foregoing action was regularly introduced, passed, and adopted by said Board of Directors at a regular meeting thereof held on December 14, 2017 by the following vote.

Ayes:

Noes:

Abstain:

Absent:

Roland Sanford
General Manager & Secretary to the
Solano County Water Agency

The economic impacts of quagga and/or zebra mussel infestations are potentially significant, though difficult to quantify (see attached). Although it may be inevitable that Lake Berryessa becomes infected with quagga or zebra mussels, the potential water infrastructure operation and maintenance cost associated with mussel infestations is in itself sufficient justification for implementing programs that at the very least delay mussel infestations at Lake Berryessa.

In response to the increasing threat of zebra and quagga mussel infestations, the Lake Berryessa Boater Outreach Program has expanded in scope over the last three years and in 2017 involved twelve seasonal interns, contracted services to assist with day to day supervision of interns, and operation of a mobile boat wash station – total program cost of approximately $300,000, approximately half of which was grant funded. A summary of the 2017 Lake Berryessa Boater Outreach Program activities and accomplishments is attached.

In looking forward to the 2018 boater season and beyond, staff is seeking to increase the number of boat inspections - ideally to encompass all boats launched at Lake Berryessa, minimize the time required to complete boat inspections, and increase operational efficiency in general. To achieve these objectives staff is requesting Board authorization to:

a) Hire a seasonal Water Resources Technician
b) Purchase Watercraft Seals
c) Investigate feasibility of purchasing property in or near the Lake Berryessa watershed for operation of a permanent decontamination station

a) Hire Seasonal Water Resources Technician

The proposed Water Resources Technician would assist with the supervision of the Water Agency's twelve seasonal interns, in lieu of the supervisory services currently provided by the Solano Resource Conservation District, and would operate the boat decontamination station with interns assisting. In 2015, the Agency contracted with Solano Resource Conservation District to implement what was then a significantly smaller version of the current Lake Berryessa Boater Outreach Program – a program that was almost entirely a public outreach effort. Since 2015 the program has expanded to include operation of a mobile boat decontamination station, and as discussed elsewhere, will hopefully include operation of a permanently located boat decontamination station. Staff has concluded that operationally, it would now be more efficient for the Water Agency to manage and implement the entire Lake Berryessa Boater Outreach Program in house. Utilizing an in house Water Resources Technician in lieu of contractor-provided supervisory services is projected to save the Water Agency up to $60,000 annually. If approved, the Water Resources Technician would report to the Principal Water Resources Specialist.

b) Purchase Watercraft Seals

Many mussel prevention programs are now employing a watercraft seal system to expedite boat inspections. The seals – much like the seals or metal bands used by utility companies to confirm possible tampering of utility meters – would be used to identify boats that have passed inspection at Lake Berryessa, so that upon their return, and assuming they have not been launched elsewhere in the intervening period (with an intact watercraft seal), could bypass the inspection process. The proposed watercraft seals cost approximately $.23 each. Staff is requesting authorization to purchase approximately 50,000 seals at a cost not to exceed $13,000.

c) Investigate feasibility of purchasing property in or near the Lake Berryessa watershed for operation of permanent decontamination station.

The Water Agency recently purchased a mobile boat decontamination station, which in 2017 was located at what turned out to be the only available site near a boat launching facility, in a remote overflow parking lot over five miles off of Highway 128. Ideally, a boat decontamination station would be located at each Lake Berryessa boat launch facility. However, site constraints, either physical or institutional, make that option impractical. While generally supportive, the resort operators are reluctant to dedicate space – assuming space is even available - that they believe could be used for profit generating purposes, and/or because of the additional liability (possible damage to watercraft during decontamination, spillage of contaminated liquids, etc.) associated with operation of a boat decontamination facility. In view of the aforementioned concerns, staff is seeking Board authorization to explore the feasibility of purchasing property for the purposes of providing a permanent, highly accessible boat decontamination station.

RELEVANCE TO 2016-2025 SCWA STRATEGIC PLAN

The proposal to add a seasonal Water Resources Technician position is consistent with Goal #10 (*Funding and Staffing; Objectives C and D).*

The proposal to incorporate all three components of augmentation of the Lake Berryessa Program is consistent with Goal #5 – *(Education and Outreach; Objective B-Evaluate, and where appropriate, coordinate public awareness of water-related programs throughout the County).*

The proposal to incorporate all three components of augmentation of the Lake Berryessa Program is also consistent with Goal #7 (*Natural Resources Stewardship, Objectives C-Protect SCWA water supply sources, and E-Monitor and assess outside planning efforts for influences on SCWA's habitat stewardship activities).*

Lake Berryessa Boater Outreach Program Report

Summer 2017

Prepared by the 2017 Lake Berryessa Boater Outreach Interns

Table of Contents

Introduction

The Lake Berryessa Boater Outreach (LBBO) program focuses on educational outreach and invasive species prevention at Lake Berryessa. Lake Berryessa provides drinking water for over 500,000 people in Solano County and is used by the Jelly Belly Factory and Anheuser-Busch for their products. This report summarizes the 2017 LBBO program, which began mid-April and concluded in September. Throughout the season, LBBO interns administered watercraft screenings for invasive zebra and quagga mussels and conducted surveys and one-on-one education with boaters and recreational users. Thirteen interns and three student supervisors frequented all six boat launches at Lake Berryessa. Due to record rainfall the previous winter, water levels at Lake Berryessa were so high for the first time in ten years that water fell into the Glory Hole Spillway. This resulted in very popular launch sites over the summer with some concessions filling up most weekends.

The high water levels brought many visitors from different counties to check out the Glory Hole and the rest of Lake Berryessa. In order to track and analyze the effectiveness of outreach efforts, LBBO interns collected and managed relevant data and shared that information in weekly summaries to partner agencies and stakeholders. LBBO interns also participated in community volunteer cleanup events throughout the summer, including World Environment Day and California Coastal Cleanup Day. The 2017 LBBO interns are pictured below.

Image 1: *Back from left to right:* Alessandro Schiavone, Lydia Kenison, Jo Black, Edward Blong-Her, and Qiming Yang. *Middle from left to right:* Christopher Zaleski, Sierra Lissick, Mary Capcap, Angie Flores, Kyrie Aragon. *Front from left to right:* Kevin Young-Lai (Supervisor), Gustavo Cruz (Supervisor), Kasey Chohan, and Olivia Hart. *Not Pictured*: Sarah Day and Scott Navarro (Supervisor).

Invasive Mussel Inspection Program

The primary goal of the LBBO program is to prevent the introduction of the quagga mussels (*Dreissena bugensis*) and zebra mussels (*Dreissena polymorpha*) into Lake Berryessa. Both species of dreissenid mussels are considered aquatic invasive species not native to North America. Aquatic invasive species are transported from one body of water to another by human activity through boats and other watercraft. LBBO interns screen watercrafts both visually and through a set of verbal questions to assess for risk of transmitting invasive dreissenid mussels. Interns staffed all boat launch sites at Lake Berryessa seven days a week from June-September, which is peak boating season at the lake. In addition to screening boats and other watercraft, interns used these contacts to educate boaters on preventing the spread of invasive species, as well as the ecological, economic, and recreational impacts that the introduction of invasive mussels would cause Lake Berryessa, the surrounding community, and beyond. The vast majority of boaters were not only compliant with the screening process, but also supportive of the screening program.

Dreissenid Mussel Facts[1]

- Mussel larvae, called veligers, are microscopic and can be transported by standing water in bilge compartments, ballast tanks, and live wells.
- Mussel veligers can survive in standing water for upwards of 30 days.
- Adult mussels are sessile, and can attach to hulls of boats using byssal threads characteristic of their species.
- One mussel can produce 30,000 to 1,000,000 offspring, and as an invasive species can reproduce exponentially.
- Invasive mussels have no natural predators, and filter feed large amounts of phytoplankton and zooplankton, which disrupts the food web from the bottom up.
- Mussel pseudofeces causes algal blooms and thus causes dead zones in the water column.

[1] "Talking Points Regarding Western Quagga Mussels." 100th Meridian. March 25, 2007. 100thmeridian.org.

- Adult mussels clog water delivery infrastructure and necessitate costly maintenance which raise municipal water rates and costs of goods dependent on this water.
- Mussels in all life stages can cause damage to water intake and cooling systems in boats, threaten fish populations, and adult shells can be sharp hazards on beaches, all of which limit human ability to recreate in a body of water.

Program Achievements

- Screenings increased by 54% from 2016 and by 82% from 2015. 16,799 watercraft screened in 2017; 10,860 watercraft screened in 2016; 9,197 watercraft screened in 2015 (Figure 1). As the lake reached full capacity earlier this year, boaters were more attracted to recreation on the lake.
- 8 potentially infested water craft were prevented from launching this year. Such watercraft launched in infested bodies of water in the past thirty days without sufficient dry time to eliminate risk of transmitting invasive mussels to Lake Berryessa.

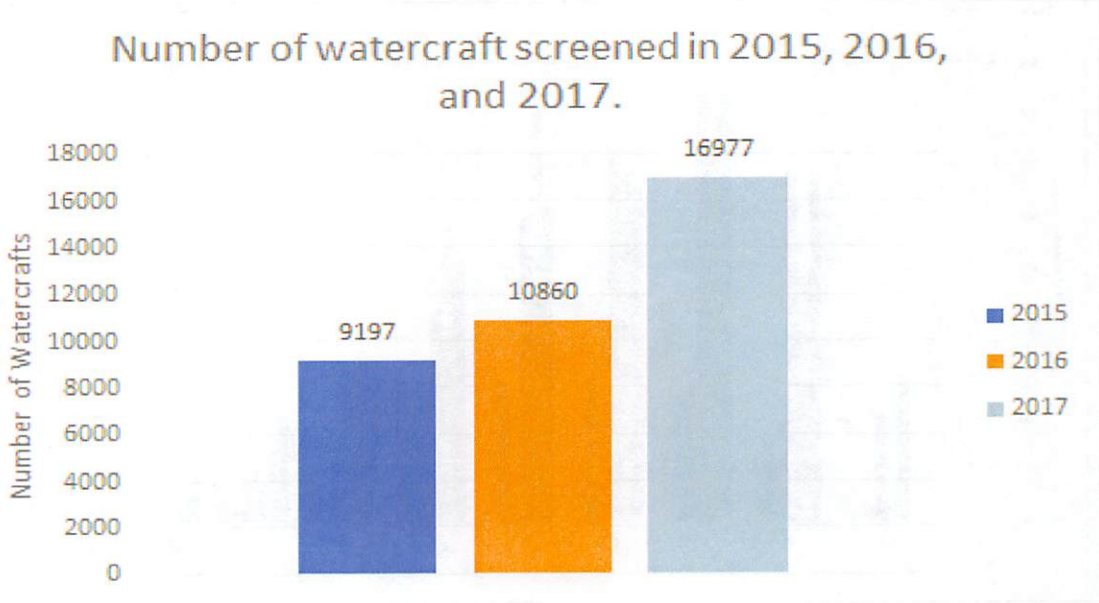


Figure 1: Number of watercrafts screened in the past three years.

Invasive Screening Data

Invasive screenings were conducted using The Bureau of Reclamation's *Invasive Mussel Self-Certification Form*, which helps identify boaters that may have launched in an infested body of water within the past 30 days. Boaters that passed the screening were given the form to display on the dashboard of their vehicle to indicate they were approved to launch; however, boaters that had launched in an infested water body within 30 days of the screening and failed a full inspection were denied entry to the lake and directed to contamination services.

As part of the invasive screening process, interns collected the following data: time of the screening, the boater's home zip code, and the last body of water the boat had launched. This data helps the LBBO program understand the efficacy of the invasive screenings as well as to strategize better protection of Lake Berryessa in the future. Figure 5 displays a distribution of the cumulative number of invasive screenings from the boating season for each hour of the day at all six launch sites. All of the sites experience peak launch activity between 10AM and 1PM. Of the three busiest sites (Markley Cove, Capell Cove, and Steele Canyon), Markley Cove and Capell Cove are busiest between 10AM and 1PM, while Steele Canyon peaks from 11AM to 12PM. The overall distribution shows that the LBBO program is efficiently focusing its outreach efforts to the times when most boaters are arriving at the lake.

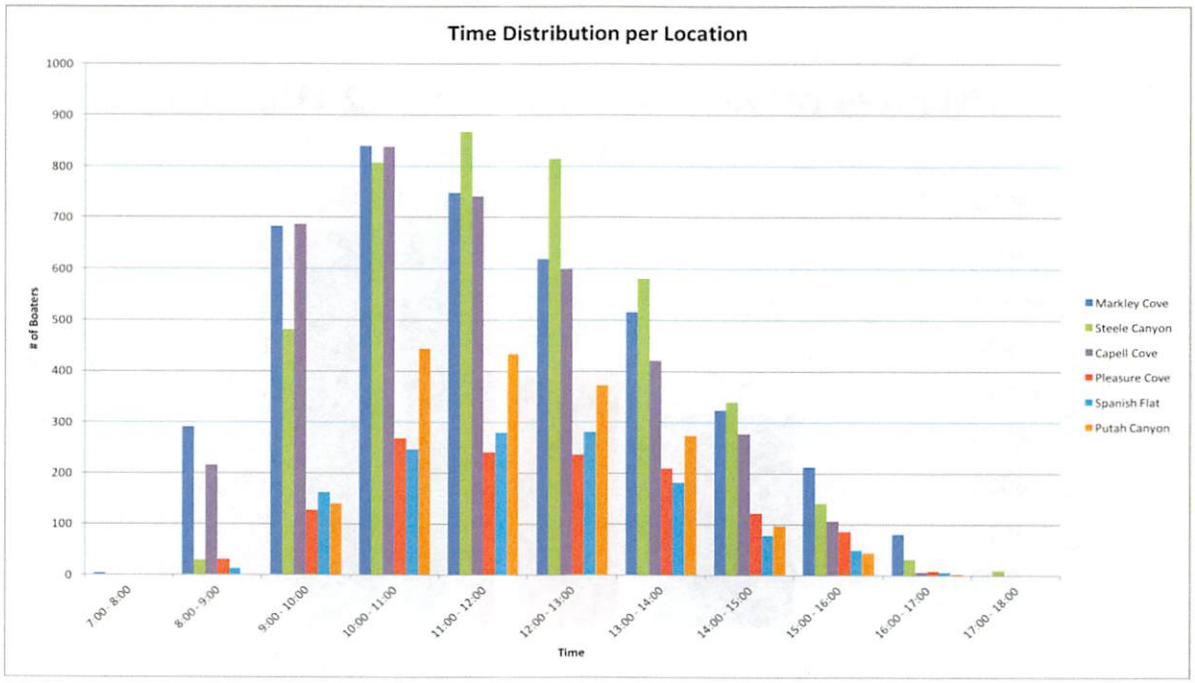


Figure 2: Time distribution by launch location.

Home County Data Analysis

Protecting Lake Berryessa from invasive mussels also requires knowledge of the geographic region from which boaters are coming and how many are coming from each region. As part of the invasive screening process, each boater's zip code is collected and corresponds to their county of residence. Figure 3 shows the geographic distribution of home counties of boaters launching at Lake Berryessa. In the majority, 31% of boaters that visited Lake Berryessa this season live in Solano County (Figure 4). This means that the population that most frequently uses Lake Berryessa for recreational boating is also dependent on it for drinking water, and would be the most personally affected by an infestation of invasive mussels. Of the Solano County boaters that visited Lake Berryessa, over 41% came from Vacaville and over 26% came from Fairfield. Contra Costa and Napa are also major counties of origin for Lake Berryessa boaters with 21% and 13%, respectively. Although residents of Contra Costa, Napa and other counties are not reliant on Lake Berryessa for drinking water, it is still critical to engage them in education and outreach for the sake of Solano County's principle water source and their own local reservoirs that could be affected by an invasive mussel infestation.

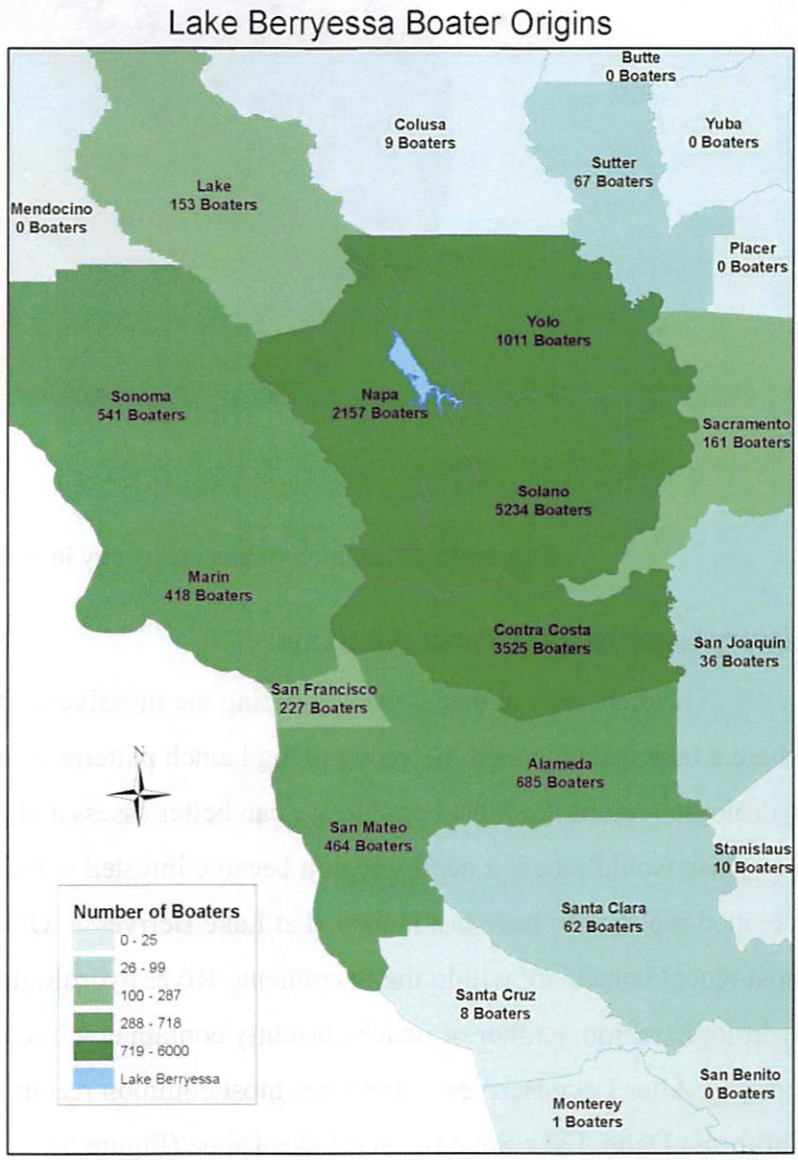


Figure 3: Lake Berryessa Boaters by county of origin.

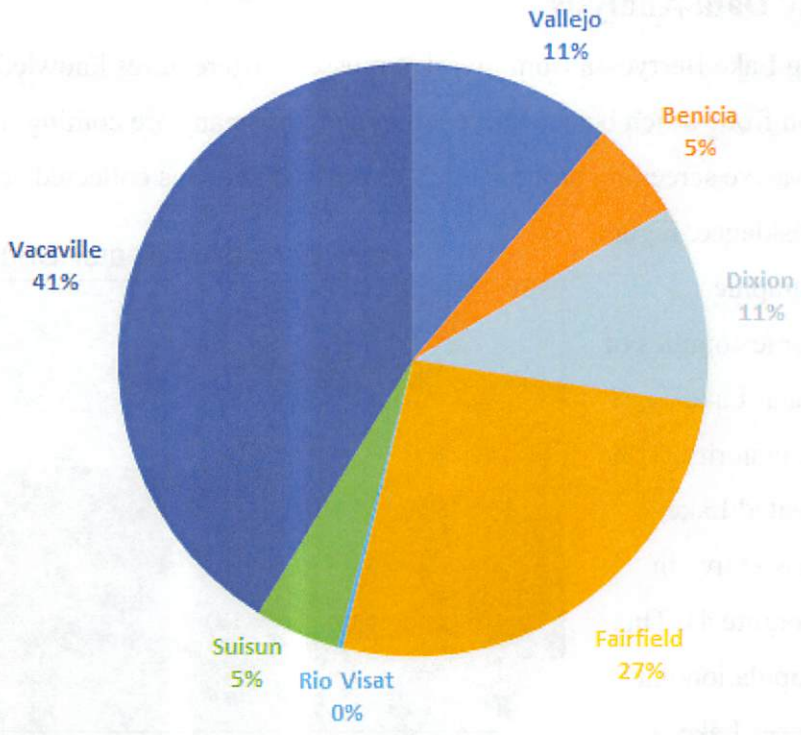


Figure 4: Distribution of boaters by city in Solano County.

Hydrologic Region Data Analysis

The most critical data collected during the invasive screening process is information on where a boat last launched. By recognizing launch patterns of boaters and determining which hydrologic regions are most popular, we can better assess and prepare for the risk Lake Berryessa would face if a nearby region became infested with invasive mussels. 76% of boaters screened reported to have last launched at Lake Berryessa. Other commonly reported places of most recent launch are within the Sacramento River hydrologic region or the San Joaquin hydrologic region, neither of which currently contain any infested bodies of water with invasive mussels. After Lake Berryessa, the three most common recent launch locations were the California Delta, Lake Sonoma, and Lake Tahoe (Figure 5).

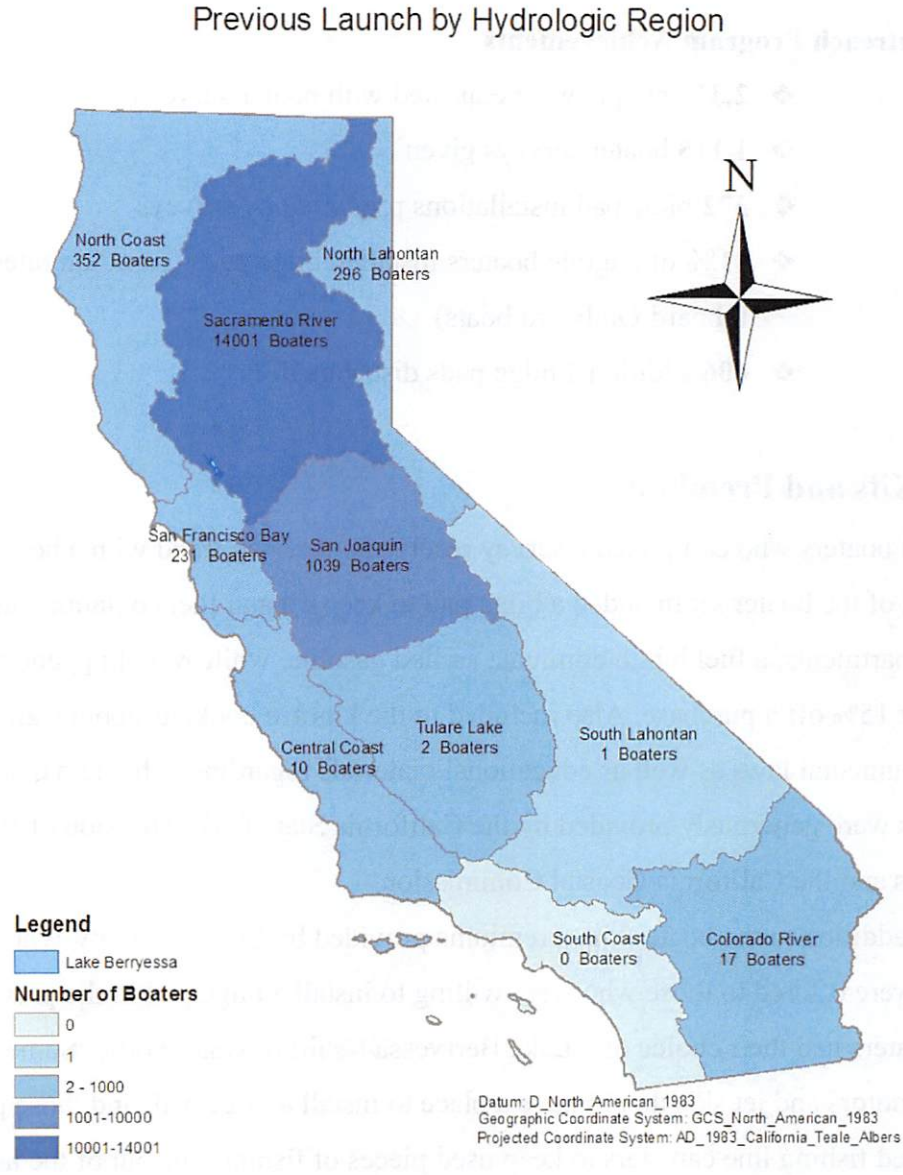


Figure 5: Hydrologic regions from which boats coming to Lake Berryessa were last launched.

Clean and Green Educational Outreach

Screening boats is the LBBO program's number one priority, but interns also conduct boater outreach regarding clean and safe boating practices. These educational efforts took place in the form of a survey testing the boater's knowledge of California's environmental boating laws, bilge pads (oil absorbents), and how Lake Berryessa water is used in Solano County. Surveys were a great opportunity to involve and educate the whole family beyond the boat owner.

Outreach Program Achievements

- **2,377** people were educated with boater surveys
- **1,115** boater surveys given
- **372** bilge pad installations prompted by surveys
- **41%** of eligible boaters installed bilge pads (based on rates of Inboard/Outboard boats)
- **606** additional bilge pads distributed

Boater Kits and Premiums

All boaters who completed a survey received a tote bag filled with a boater kit. Highlights of the boater kit included a bilge pad to keep oil and fuel contaminants from leaving bilge compartments, a fuel bib to eliminate spilled gasoline while refueling, and a West Marine coupon for 15% off a purchase. Also included in the kits are booklets about California boating and environmental laws as well as educational materials regarding zebra and quagga mussels. Boater kits were generously provided by the California State Parks Division of Boating and Waterways and the California Coastal Commission.

In addition to the boater kits, premiums provided by Solano County Water Agency (SCWA) were offered to those who were willing to install a bilge pad in the presence of an intern. Boaters had their choice of a Lake Berryessa t-shirt or water bottle. Some boats with outboard motors and jet skis do not have a place to install a bilge pad, and those participants were offered fishing line canisters to keep used pieces of fishing line out of the lake. Fishing line is a common form of litter in Lake Berryessa and the canisters provide a convenient place to store it until it can be properly disposed of. These canisters were developed by students in a program through the California State Parks Division of Boating & Waterways and California Coastal Commission and were made from recycled tennis ball containers.

Of the 1,115 boats surveyed, 82% were inboard or inboard/outboard (eligible for bilge pad installation) and 41% of those eligible boaters installed a bilge pad.

Boater Survey Questions and Responses

Questions on the Boater Survey aim to collect insight on how many Lake Berryessa users are familiar with the purpose of the lake as well as how to keep it clean. The response summaries for questions relevant to the Lake Berryessa program are depicted below.

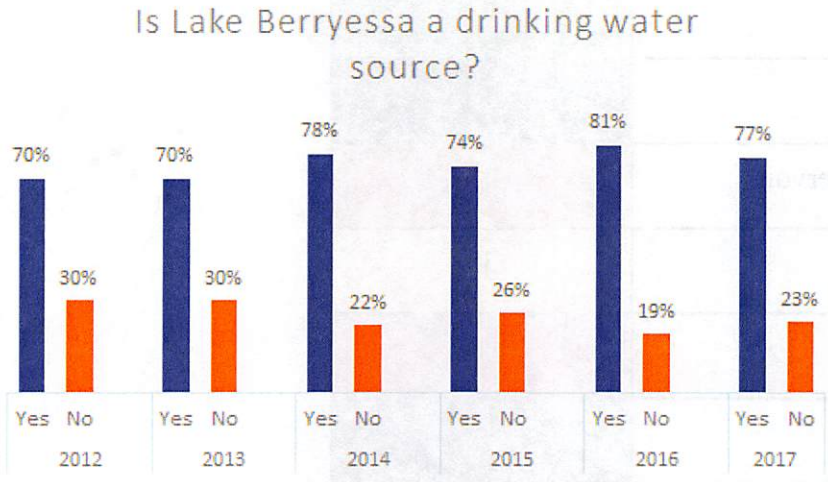


Figure 6: 77% of those surveyed knew that Lake Berryessa is a drinking water source.

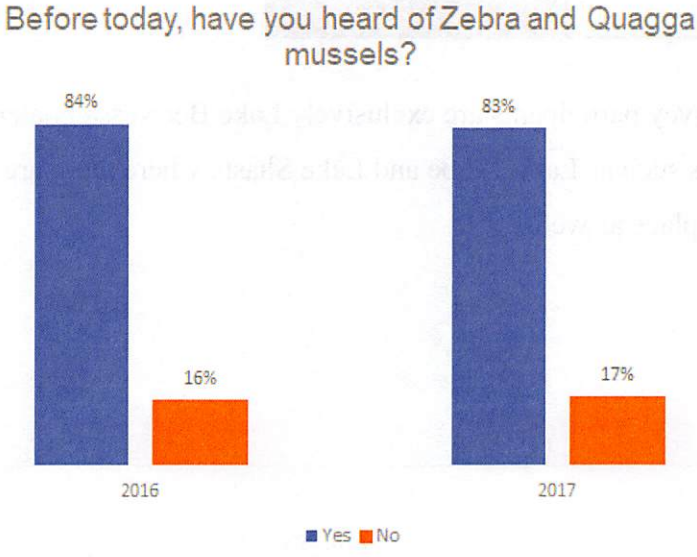


Figure 7: 83% had heard of zebra and quagga mussels and knew that it is important to prevent them from spreading into Lake Berryessa.

QUESTION: ***What other bodies of water do you visit?***

Name of Lake or Reservoir	Number of Visitors
Camanche Reservoir	36
Clear Lake	52
Delta	95
Don Pedro Reservoir	32
Folsom Lake	35
Lake Sonoma	41
Lake Tahoe	67
Sacramento River	36
Shasta Lake	68

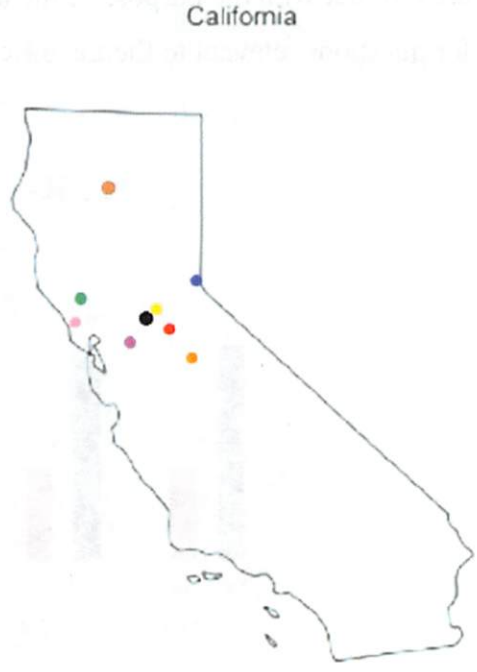


Figure 8 and 9: Distribution of other bodies of water visited by Lake Berryessa boaters.

While most of our survey participants are exclusively Lake Berryessa boaters, many of them had also come from places such as Lake Tahoe and Lake Shasta where there are other invasive species screenings in place as well.

Recreator Surveys

On weekends one intern goes to the Oak Shores Day Use Area to survey recreating users ("recreators") visiting the lake but do not have watercraft. The intern is accompanied by "Bilgee," an anthropomorphic bilge pad, who serves as the protector of clean waterways and encourages everyone to keep Lake Berryessa oil free (Image 2 & 3).

Recreator surveys give interns the chance to communicate and educate the day use visitors of Lake Berryessa, a demographic that otherwise would not be engaged. The program's goal with this audience is to teach them about the lake and how to protect it. The day users also provide great suggestions on how to keep the lake clean.

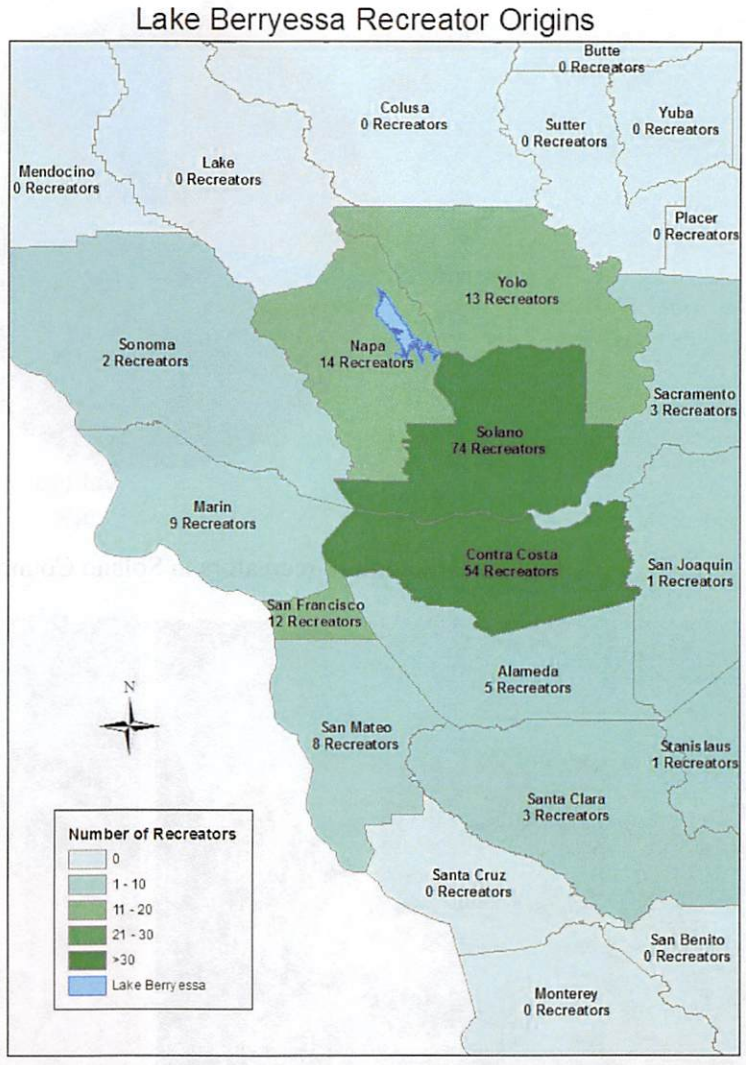


Figure 10: Lake Berryessa recreators by county of origin

This year interns conducted a total of 224 recreator surveys and educated 1,056 people. About 34% of participants were from Solano County. Figure 11 on the next page shows a breakdown from where Solano County recreators originated.

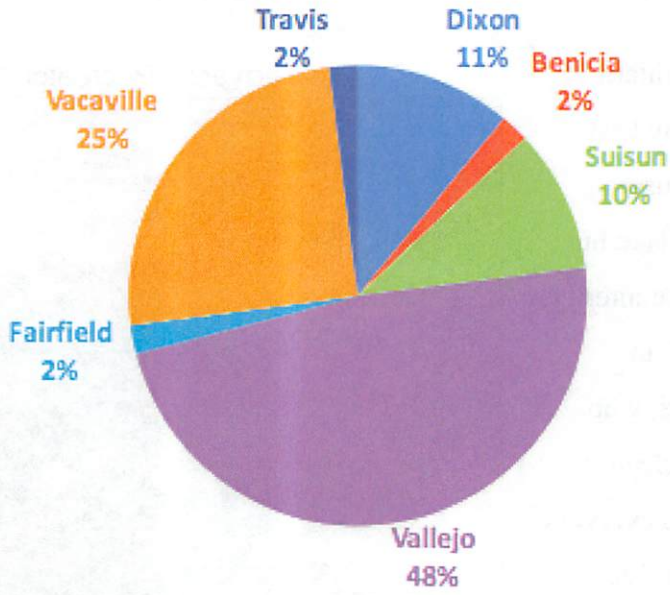


Figure 11: Graph of recreators in Solano County by home zip (city) code.

Image 2 & 3: Bilgee with excited recreators at Oak Shores.

Responses to Recreator Survey Questions

Figures 12 and 13 depict how recreators responded to the survey questions.

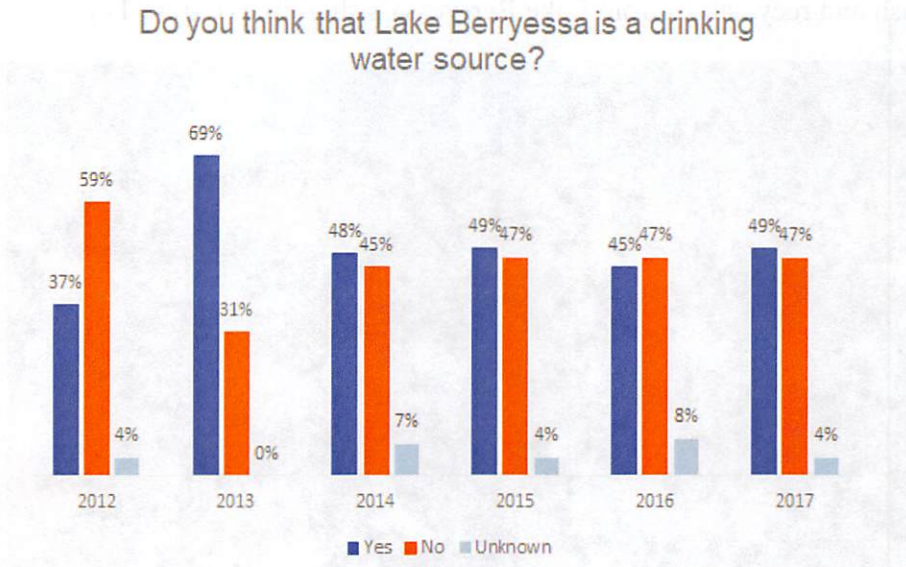


Figure 12: 49% of participants knew that Lake Berryessa is a drinking water

QUESTION: ***If yes, how many people does it provide drinking water to?***

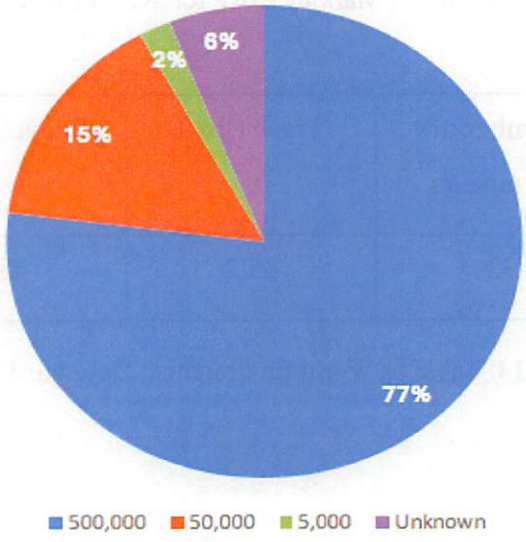


Figure 13: More than three-quarters of respondents that knew Lake Berryessa is a drinking water source also knew that it serves 500,000 people.

Interns also asked visitors "How can we keep the lake clean?" and the top responses were: don't litter, no 2-stroke engines allowed in the lake, and use the restroom facilities.

Community Volunteer Cleanup Events

On June 4, 33 volunteers at Markley Cove (Image 4) cleaned up about 6 miles of trails around the lake. The volunteers used trash pick-up sticks and reusable gloves to remove 100.8 pounds of trash and recyclables from Lake Berryessa's shoreline (Figure 14).

Image 4: Volunteers gathered at Markley Cove for World Environment Day.

Year	Number of Volunteers	Trash (lbs.)	Recycle (lbs.)	Total (lbs.)
2017	33	45.2	55.6	100.8

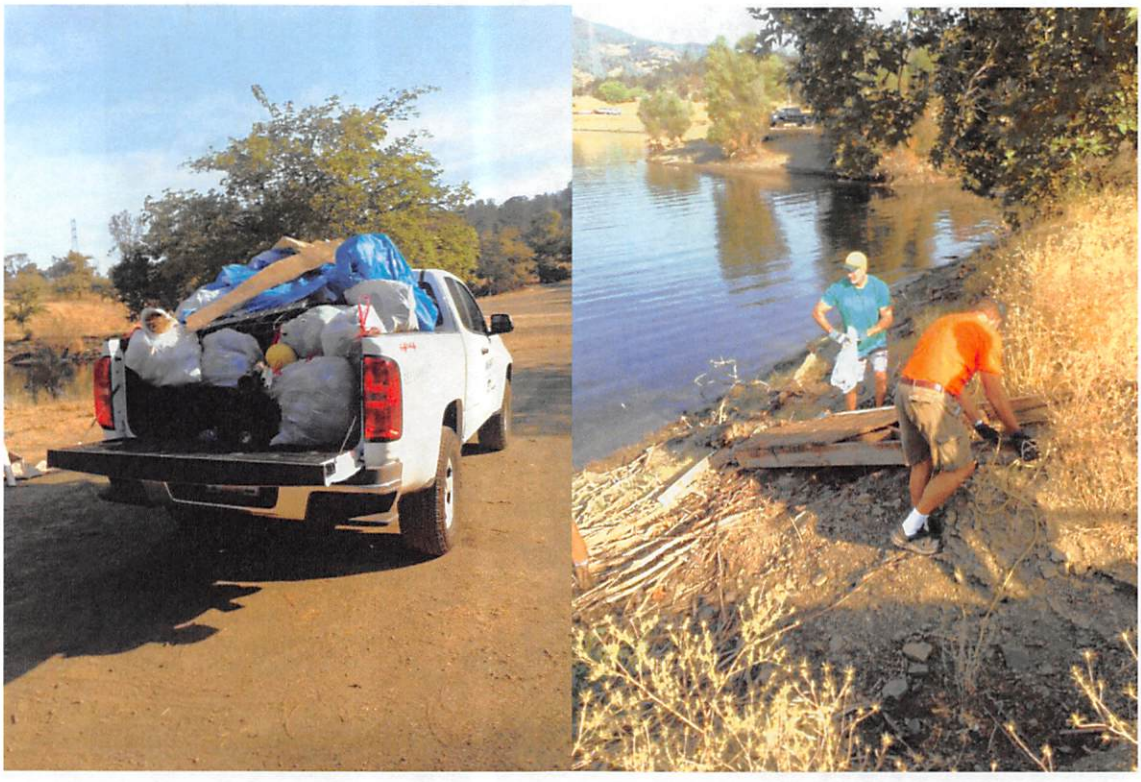
Figure 14: Table of World Environment Day statistics.

Image 5: Intern Sarah educating volunteers at World Environment Day about invasive mussels.

On September 16, 65 volunteers came out to Lake Berryessa to participate in the 33rd Annual Coastal Cleanup Day. The Markley Cove site had 20 volunteers and staff contributing to keeping our lake and drinking water source clean, beautiful, and safe for wildlife. They collected a total of 140 pounds of trash and recyclables. Steele Canyon had 28 volunteers and collected 500 pounds of trash and recyclables. Volunteers also found 100 yards of metal cable weighing over 120 pounds. The 17 volunteers at the Pope Creek site collected a total of 124 pounds of trash and recyclables.

Year	Number of Volunteers	Trash (lbs.)	Recycling (lbs.)	Total (lbs.)
2017	65	553	250	803

Figure 15: Table of Coastal Cleanup Day statistics.



Images 6 and 7: Ranger Jennifer helped pick up trash with her vehicle at Steele Canyon. Volunteers lifting a 30-pound wooden dock out of the water.

Conclusion

The main goal of the Lake Berryessa Boater Outreach Program is to protect the drinking water source for nearly 500,000 residents of Solano County through invasive screenings, cleanup events, and educational efforts. The 2017 LBBO Program was successful in screening a record number of boats for invasive species and educating over 3,400 visitors about the importance of keeping Lake Berryessa clean. Interns hope that visitors were inspired to help keep the water and shores of Lake Berryessa cleaner than when they arrived so that the lake continues to be one of the cleanest reservoirs in the state of California. Figure 16 on the following page summarizes the Lake Berryessa Boater Outreach Program's season totals over the past five years.

Season Totals	2013	2014	2015	2016	2017
# of Interns & Student Supervisors	6	6	14	12	16
Total Invasive Screenings	1,547	4,301	9,197	10,860	16,799
Total Boater Surveys	1,568	1,670	1,195	1,210	1,115
Total Recreator Surveys	325	300	392	265	224
Total Bilge Pads Distributed	2,214	2,191	1,848	1,577	1,721
Total Bilge Pads Installed	478	690	589	497	372
% of Boaters to Install a Bilge Pad	51%	50%	57%	50%	41%

Figure 16: A summary of LBBO activity since 2013. The total number of invasive screenings has increased by nearly 6,000 with a nearly comparable number of boater surveys completed.

This program would not be possible without the support of our partners and funders. We would like to thank the Lake Berryessa Watershed Partnership, including the Solano County Water Agency, the Bureau of Reclamation, and the Solano Resource Conservation District for working together and helping the program run smoothly and effectively. We would also like to thank Solano and Napa counties and their cities for their insights and collaboration in keeping Solano County's drinking water safe and clean. CalRecycle has also been a major player in funding this program and making sure that we have the resources we need to educate boaters and keep oil and other hazardous waste out of Lake Berryessa. Additional educational resources have been provided by the Division of Boating and Waterways and the California Coastal Commission. Finally, we would like to extend a huge thank you to everyone at the boat launches and concessions who allow us to use their amenities and strengthen our team everyday out at Lake Berryessa.

Acknowledgement of Partners and Funders

Citations

1. "Talking Points Regarding Western Quagga Mussels." 100th Meridian. March 25, 2007. 100thmeridian.org.

Environ Manage (2007) 40:105–112
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Economic Impacts of Zebra Mussels on Drinking Water Treatment and Electric Power Generation Facilities

Nancy A. Connelly · Charles R. O'Neill Jr. · Barbara A. Knuth · Tommy L. Brown

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Abstract Invasions of nonnative species such as zebra mussels can have both ecological and economic consequences. The economic impacts of zebra mussels have not been examined in detail since the mid-1990s. The purpose of this study was to quantify the annual and cumulative economic impact of zebra mussels on surface water-dependent drinking water treatment and electric power generation facilities (where previous research indicated the greatest impacts). The study time frame was from the first full year after discovery in North America (Lake St. Clair, 1989) to the present (2004); the study area was throughout the mussels' North American range. A mail survey resulted in a response rate of 31% for electric power companies and 41% for drinking water treatment plants. Telephone interviews with a sample of nonrespondents assessed nonresponse bias; only one difference was found and adjusted for. Over one-third (37%) of surveyed facilities reported finding zebra mussels in the facility and almost half (45%) have initiated preventive measures to prevent zebra mussels from entering the facility operations. Almost all surveyed facilities (91%) with zebra mussels have used control or mitigation alternatives to remove or control zebra mussels. We estimated that 36% of surveyed facilities experienced an economic impact. Expanding the sample to the population of the study area, we estimated $267 million (BCa 95% CI = $161 million–$467 million) in total economic costs for electric generation and water treatment facilities through late 2004, since 1989. Annual costs were greater ($44,000/facility) during the early years of zebra mussel infestation than in recent years ($30,000). As a result of this and other factors, early predictions of the ultimate costs of the zebra mussel invasion may have been excessive.

Keywords Aquatic nuisance species · Economic impacts · Invasive species · Zebra mussels

N. A. Connelly · B. A. Knuth · T. L. Brown
Human Dimensions Research Unit, Department of Natural Resources, Cornell University, Ithaca, NY 14853, USA

C. R. O'Neill, Jr.
Cornell University, New York Sea Grant Extension, Morgan Hall, State University College, Brockport, NY 14420, USA

N. A. Connelly (✉)
126 Fernow Hall, Cornell University, Ithaca, NY 14853, USA
e-mail: nac4@cornell.edu

Introduction

Invasions of nonnative species are one of the leading mechanisms of global environmental change, especially in freshwater ecosystems (Garcia-Berthou and others 2005). Human-mediated introductions are among the most important impacts affecting ecosystems (Mack and others 2000). Damage can be both ecological and economic, with zebra mussels and quagga mussels (*Dreissena polymorpha* and *Dreissena bugensis*) serving as excellent examples (for the purposes of this paper, the two species of dreissenids are hereafter referred to generically as "zebra mussels"). While ecological impacts are being debated elsewhere (e.g., Raikow 2004, Strayer and others 2004, Winkler and others 2005), economic impacts of zebra mussels have not been examined in detail since the mid-1990s, although predictions have ranged as high as $1 billion per year (Pimentel 2005).

Zebra mussels were first observed in North America in June 1988 (O'Neill and MacNeill 1989). The zebra mussel can now be found in 23 states (AL, AR, CT, IL, IN, IO, KS, KY, LA, MI, MN, MO, MS, NE, NY, OH, OK, PA, TN, VA,

VT, WI, WV) and two Canadian provinces (Ontario [ON], Quebec). All five of the Great Lakes are infested, as well as Lakes St. Clair and Champlain and inland lakes in Michigan, Missouri, New York, Ohio, Oklahoma, Pennsylvania, Vermont, Wisconsin, and Ontario. The Allegheny, Arkansas, Cumberland, Detroit, Genesee, Hudson, Illinois, Niagara, Mississippi, Missouri, Mohawk, Monongahela, Ohio, Oswego, Rideau (ON), St. Clair, St. Lawrence, Susquehanna, Tennessee, Vertigris (OK), and Wabash rivers are also home to zebra mussel populations. It is likely that they will continue to spread into additional rivers and inland lakes (Ram and McMahon 1996) that are currently uninfested but within the range of the invasion. GARP (genetic algorithm for rule-set production) analysis of the current distribution of zebra mussels in North America based on 11 important environmental and geological variables indicates that much of New England that is currently uninfested, as well as some areas of the Southeast and the West Coast, may be at considerable risk; however, much of the American West will likely be uninhabitable for zebra mussels (Drake and Bossenbroek 2004).

Zebra mussels have affected surface water-dependent electric power generation and drinking water treatment facilities since their arrival in North America by fouling intake pipes and other equipment, resulting in severely impeded flows of water into these facilities (MacIsaac 1996). Such infestations, once discovered, must be remediated and measures taken to prevent future fouling. This can involve construction of new intakes, physical removal of mussel accumulations, and/or chemical treatments of affected intake components. Preventive actions are possible as well; these generally include physical barriers, chemical treatments, and educational programs for recreational boaters to prevent introduction of mussels to new waters.

The economic impact of zebra mussels was studied most comprehensively in 1995 by two groups of researchers. A study conducted by Ohio Sea Grant estimated zebra mussel impacts in the Great Lakes Basin at $120 million for 1989 to 1994 (Park and Hushak 1999). That study was limited to municipal water plants, electric generation facilities, and other industries using surface water from the Great Lakes or its tributaries. A more comprehensive study, undertaken by New York Sea Grant for the National Zebra Mussel Information Clearinghouse (now the National Aquatic Nuisance Species Clearinghouse), covering the entire North American range of the mussels at that time (Great Lakes plus other water bodies), estimated zebra mussel-related expenditures in excess of $69 million for the period 1989 to 1995 (O'Neill 1997). The latter study included additional water uses beyond drinking water and electric generation, such as navigation locks, and institutional uses such as at universities, golf courses, and fish hatcheries. These uses, although affected negatively by zebra mussels, did not suffer economically to the extent experienced by municipal/industrial water users (O'Neill 1997). Both of these studies relied on small sample sizes, thus explaining the difference in estimates between the two. Extrapolations to overall population estimates should be considered tentative at best. No comprehensive study of the economic impact of zebra mussels in terms of control and prevention costs and lost production costs has been conducted since 1995. The New York Sea Grant coauthor, however, extrapolated forward the 1995 results, positing a cumulative impact from 1989 through 2005 of approximately $1 billion (taking into account additional infested waters, additional impacted facilities, and additional years of treatment expenses) (unpublished data).

The purpose of this study was to quantify the annual and cumulative economic impact of zebra mussels, from the first full year after their introduction (1989) to the present (2004) throughout the mussels' North American range, on surface water-dependent drinking water treatment and electric power generation facilities (as these were the facilities most impacted previously). (The study does not estimate other economic impacts of the invasion, such as on fisheries and recreational boating.) Research questions addressed included comparisons with the previous New York Sea Grant study to examine how closely current estimates match past estimates and predictions. With the expansion of the zebra mussels range, have costs expanded proportionally? Also, are there differences in the impacts on drinking water treatment and electric power generation facilities? Are there differences in costs as facility size increases? Given the importance of this species for water resources management throughout the central United States, an updated, comprehensive economic assessment of zebra mussel impacts was needed to inform decision making.

Methods

We used a mail questionnaire to gather information on the costs of implementing zebra mussel control or prevention measures as well as estimates of the economic value of lost production. We sought information for the period beginning in 1989, the first full year of possible infestation, to the fall of 2004, when the survey was implemented. We also obtained information on the history of infestation and the types of prevention and control measures used. We designed the questionnaire so that results would be comparable with those of the 1995 New York Sea Grant survey (O'Neill 1997).

We surveyed all identifiable electric generation and drinking water treatment companies which might use surface water in U.S. states and Canadian provinces within the range where zebra mussels were known to be present. We developed a list of 708 electric generation companies from Platts

2003 UDI Directory of Electric Power Producers and Distributors (Giles and Brown 2003) and a list of 876 drinking water treatment providers from EPA listings and contacts at health departments in states where zebra mussels exist. Identifying raw water intake from surface water was important because zebra mussels might be present in surface water sources and not groundwater. We generated a listing of water treatment facilities with surface water sources from the EPA records, but water source information was not known in advance for electric generation facilities.

We sent the mail questionnaire to all identified companies (1584) in the fall of 2004. We used the standard three follow-up reminder process advocated by Dillman (2000) to encourage response. We were aware that electric companies in particular might be reluctant to provide economic data, so we emphasized confidentiality in our correspondence. We conducted nonrespondent telephone interviews with 50 electric and 50 water companies to assess differences between respondents and nonrespondents.

Because companies could be responsible for more than one facility, we asked mail survey respondents to photocopy the questionnaire and respond for each facility for which they were responsible. In the nonrespondent telephone survey, we asked interviewees how many facilities they were responsible for but asked them to provide answers for the one facility they knew best. From this information we estimated the number of facilities in the study area.

We entered data on the computer and analyzed it using SPSS. Chi-square and *t*-tests were used to test for statistical differences between respondents and nonrespondents and between drinking water and electric generation facilities. To calculate a 95% confidence interval for the estimate of economic costs, the bootstrap bias-corrected accelerated (BCa) interval using 5000 resamples in S-PLUS was used because the distribution was not normal (Hesterberg and others 2006).

We conducted site visits at five facilities of different types to allow for a more in-depth examination of prevention and control methods used. During the site visit the questionnaire filled out previously by the facility manager was discussed in more detail to determine how he or she developed estimates of costs. This information was used to help interpret the findings from the mail survey.

Results

Response Rates and Population Size

Of the 708 electric generation companies contacted, 61 questionnaires were undeliverable and 81 responded, for an adjusted response rate of 13%. Of the 876 drinking water treatment companies contacted, 70 questionnaires were undeliverable and 321 responded, for an adjusted response rate of 40%. However, during the survey process (mail and telephone follow-up), we found that many companies, particularly those providing electric power generation, did not obtain their raw water from surface water but used wells and groundwater instead (Table 1). From the mail survey process we found that 34% of electric generation companies that contacted us either by responding to the questionnaire or via e-mail were using groundwater. These companies were not part of the intended population for the study and, therefore, were removed from our estimates of population size and response rate. We also assumed that mail survey nonrespondents we contacted via telephone were representative of all nonrespondents, and we removed nonrespondents according to the percentage not using surface water (66% for electric, 2% for water). The result is an estimated population of 259 electric and 787 drinking water companies that use surface water. The effective response rate, therefore, based on surface water users, was 31% for electric and 41% for drinking water.

Assuming that we began with a complete list of all electric and drinking water companies in the study area, we estimated that the population of companies that used surface water was 1046 and they were responsible for 1297 facilities. Our data were collected on a facility basis (n = 447 facilities), so we report data by facility and multiply by 2.9 to expand our estimates to population estimates reflecting the total costs borne by all companies and all facilities.

Nonresponse Bias

Nonrespondents contacted by phone (n = 100) did not differ from respondents (n = 447) on most variables compared. Nonrespondents were just as likely as respondents to have zebra mussels in their facility. The year when zebra mussels arrived at the specific facility did not differ between respondents and nonrespondents. The mussels were equally likely to have caused problems in the facility for respondents and nonrespondents. Nonrespondents were just as likely as respondents to have engaged in prevention and control of zebra mussels. Based on past research in which nonrespondents were found to be less interested in the topic being studied (Connelly and Knuth 2002), we expected nonrespondents would be less likely to have zebra mussels in their facility, but this was not the case.

The only variable for which we could detect a difference between respondents and nonrespondents was the percentage experiencing an economic impact due to zebra mussels. Almost half (46%) of the respondents spent money or had an economic loss, compared to one-third (31%) of nonrespondents. Estimates of economic impact discussed later are adjusted for this bias. The sample size

Table 1 Estimating the population of electric generation and drinking water treatment companies using surface water as their raw water source

	Electric generation companies	Drinking water treatment companies
Initial population	708	876
Undeliverable questionnaires	61	70
Responded "Not using surface water"	42	10
Responded to mail questionnaire	81	321
Nonrespondents to mail questionnaire	524	475
% "not using surface water" (based on nonrespondent phone interviews)	66%	2%
Nonrespondents using surface water	178	466
Estimated population using surface water	259	787

for nonrespondents reporting an economic impact was too small (n = 9) for comparison of average impacts experienced by nonrespondents in 2003 or 2004 vs. impacts experienced by respondents.

Facility Characteristics

Most responding facilities (76%) primarily provided public drinking water. These were sufficient in number to permit data analysis by facility size (as measured by million gallons per day of drinking water produced). A similar number of facilities (37% and 38%, respectively) produced ≤ 1 million or 2 million–10 million gallons per day; the remaining 25% produced ≥11 million gallons per day. Fifteen percent of facilities surveyed provided electric generation, with just over half (58%) being publicly owned as opposed to privately or investor-owned. Most of these facilities generated energy using fossil fuels (63%), followed by hydroelectric (32%) and nuclear (5%). The remaining facilities (9%) were some combination of drinking water, electric generation, and industrial facilities.

We received responses from facilities in 19 states and 2 Canadian provinces, thus covering almost the entire range of zebra mussels in North America. The top 10 water bodies used as a raw water source by respondents were (in descending order) Lake Michigan, Lake Erie, St. Lawrence River, Ohio River, Lake Superior, Lake Ontario, Tennessee River, Lake Champlain, Mississippi River, and Lake Huron.

Zebra Mussel Prevention and Control Activities

Over one-third of responding facilities reported finding zebra mussels in their facility (Table 2). Most discoveries occurred between 1989 and 1998, but some occurred in every year from 1989 to 2004. Most respondents thought the zebra mussels had been in the facility 6 months to 1 year before discovery. Only one-fifth of responding facilities had preventive measures in place prior to their discovery. About half are currently monitoring for zebra mussels. Over two-fifths have a plan in place for prevention and/or control. No significant differences were found between drinking water and electric power generation facilities for any of these comparisons.

Almost half of responding facilities have initiated preventive measures to prevent zebra mussels from entering the facility operations (Table 2). This was more often the case for drinking water facilities than for electric power generation facilities. The most commonly used preventive measures included sand filtration, restricting access to the water source, and oxidizing chemicals such as sodium hypochlorite, chlorine gas, and potassium permanganate.

The vast majority of surveyed facilities with zebra mussels have used control or mitigation alternatives to remove or control zebra mussels (Table 2). Proportionately fewer electric power generation facilities had used such alternatives, but their sample size was too small to support statistical comparisons. The most commonly used control measures included mechanical removal by divers and the use of oxidizing chemicals such as sodium hypochlorite, chlorine gas, and potassium permanganate. The chemicals were viewed as the most effective control measures.

Economic Impact of Zebra Mussels

About half (46%) of the responding facilities had some expenditures between 1989 and 2004 for controlling/preventing zebra mussels or had suffered lost production and revenues due to zebra mussels. The percentage reporting expenditures was lower for electric power generation facilities (32%) than for drinking water facilities (49%) (χ^2 = 5.5, df = 1, p = 0.02). Adjusting for nonresponse bias in the percentage of facilities reporting a loss, we estimate that 36% of surveyed facilities (or a total of 468) experienced an economic impact. Each of these facilities indicated total mean expenditures or costs of $500,000 between 1989 and the time they completed the questionnaire in October or November 2004. (These numbers were not

Table 2 Zebra mussel occurrence, prevention, and control in responding facilities.

Characteristic	Overall	Electric generation facilities	Drinking water treatment facilities
Facilities with zebra mussels	37%	41%	37%
Monitoring for zebra mussels	47%	47%	49%
Plan in place for prevention and/or control	44%	39%	46%
Preventive measures in place[a]	45%	50%	20%
Of those with zebra mussels			
Preventive measures in place prior to discovery	22%	37%	19%
Control measures in place[b]	91%	76%	94%

[a] Statistically significant difference between electric generation facilities and drinking water treatment facilities, $\chi^2 = 19.9$, df = 1, $p < 0.01$

[b] The sample size for electric generation facilities was too small for statistical comparisons with drinking water treatment facilities

adjusted for inflation, because of our desire to compare them with the results of other studies.) Expanding the sample to the population of the study area, we estimated $267 million in total economic costs for electric generation and water treatment facilities through late 2004. Using bootstrap methods, we estimated the BCa 95% confidence interval to be $161 million to $467 million. Costs were greater during the early years of zebra mussel infestation than in recent years (Table 3).

Analysis of expenditures by category (e.g., prevention, retrofit, chemical treatment) shows that most costs were associated with prevention efforts (Table 4). Lost production and revenues contributed significantly to the overall estimate of impacts. Expenditures for facilities producing electricity appeared to be greater than for those providing drinking water treatment, but the sample size for electric-only facilities was too small to support statistical comparisons.

As facility size increased, so did costs related to zebra mussels (Table 5). Affected facilities that produce ≤ 10 million gallons of drinking water per day spent on average $100,000 to $150,000 between 1989 and 2004, compared with $500,000 for affected facilities that produced >10 million gallons per day. The average expenditures for prevention, planning, and filtration were particularly high for larger facilities compared with those producing ≤ 10 million gallons.

Table 3 Mean and total economic impacts caused by zebra mussels by year

Year of expenditure	Mean per facility with some type of expenditures	Estimated total for study area
1989–1995	$312,424 ($52,070/yr)	$146,214,432
1996–2000	$144,984 ($28,996/yr)	$67,852,512
2001	$26,493	$12,398,724
2002	$29,106	$13,621,608
2003	$33,673	$15,758,964
2004 to date (Oct.–Nov.)	$24,328	$11,385,504
Total	$571,009	$267,232,212

Future Concerns

In response to an open-ended question about emerging issues for their facility, over one-third (37%) indicated at least one issue, most commonly algal blooms (32%) and taste and odor concerns (30%). Other topics mentioned by more than 10% of these respondents were toxic bacteria, disinfectant by-products, and possible new species or threats of which they were not yet aware.

Discussion

This study attempted to identify all surface water-dependent drinking water treatment and electric generation facilities within the current range of zebra mussels in North America. Using state/provincial lists, we included some facilities outside the zebra mussels' current range, choosing to err on the side of being inclusive rather than exclusive in our list of facilities. Thus, not all of the facilities surveyed had zebra mussels. However, many of these facilities anticipate problems in the future and are monitoring or taking preventive actions. Approximately one-third of all facilities had spent money on prevention or control measures.

The methodology used in this study gives us confidence in our estimate of the number of facilities affected. However, a caution about the lower response rate for electric power generation facilities is in order. With the advent of deregulation, many electric power generation facilities experienced a large turnover in staff and an increased concern for confidentiality of financial information. Although we went to greater lengths than usual in our survey implementation to assure respondents of the confi-

Table 4 Mean and total economic impacts caused by zebra mussels, 1989–2004 by expenditure category

Expenditure category	Mean per facility with some type of expenditures	Estimated total for study area
Prevention efforts	$186,557	$87,308,676
Lost production and revenues	$124,110	$58,083,480
Chemical treatment	$63,049	$29,506,932
Planning, design, and engineering	$58,459	$27,358,812
Retrofit and/or reconstruction	$48,314	$22,610,952
Filtration or other mechanical exclusion	$22,061	$10,324,548
Monitoring and inspection	$21,398	$10,014,264
Mechanical removal	$13,897	$6,503,796
Nonchemical treatment	$9,786	$4,579,848
Research and development	$4,208	$1,969,344
Personnel training	$2,976	$1,392,768
Customer education	$1,831	$856,908
Other	$14,360	$6,720,480

Table 5 Mean economic impacts caused by zebra mussels, 1989–2004 by expenditure category, for drinking water treatment facilities with different capacities

Expenditure category	Mean per facility with some type of expenditures		
	≤ 1 MGD	2–10 MGD	≥ 11 MGD
Prevention efforts	$17,078	$59,144	$152,468
Lost production and revenues	$0	$1,453	$0
Chemical treatment	$26,618	$21,981	$64,736
Planning, design, and engineering	$17,429	$13,140	$85,934
Retrofit and/or reconstruction	$20,989	$30,283	$53,916
Filtration or other mechanical exclusion	$2,893	$2,906	$47,352
Monitoring and inspection	$17,615	$11,387	$27,388
Mechanical removal	$2,956	$4,567	$19,179
Nonchemical treatment	$211	$0	$0
Research and development	$11	$0	$8,173
Personnel training	$911	$1,780	$3,036
Customer education	$3,571	$94	$3,443
Other	$0	$0	$39,836

Note. MGD, million gallons per day

dentiality of their responses, it is likely that our lower response rates for these facilities can be attributed to this change in management culture. Thus, our findings (particularly economic impacts) regarding electric power generation facilities are more limited than for water treatment plants.

Based on our estimate of the total number of facilities affected, we estimated a cumulative economic impact to drinking water treatment and electric generation facilities in North America of $267 million between 1989 and 2004. The 95% confidence interval ($161 million to $467 million) was large primarily because of the wide range of estimates of economic costs. This $267 million estimate does not account for all costs related to the zebra mussel invasion because it does not include costs associated with other infrastructure impacts on industry and navigation, natural resources impacts such as those to fisheries, or economic impacts related to recreational boating and tourism.

The average costs per facility have remained steady in recent years at approximately $30,000 per year. This differs from costs in the early years, which were roughly $44,000 per facility per year. Since none of the estimates have been adjusted for inflation, the disparity between early years and more recent times is even greater. It is probable that more money was spent in earlier years cleaning out facilities that were infested and developing control procedures than in more recent years, in part because staff at many facilities have learned from earlier experiences at other facilities what to do and how to be more proactive. From discussions with

Table 6 Comparison of mean economic impacts caused by zebra mussels in 1989–1995 overall and by expenditure category for drinking water treatment facility respondents who responded to the 1995 survey vs. 2004 respondents

Expenditure category	Mean per facility with expenditures in that category	
	2004 survey respondents	1995 survey respondents[a]
Total	$261,311	$214,356
Prevention efforts	$248,306	IS
Lost production and revenues	IS	IS
Chemical treatment	$39,476	$194,421
Planning, design, and engineering	$76,883	$113,263
Retrofit and/or reconstruction	$93,776	$182,445
Filtration or other mechanical exclusion	IS	IS
Monitoring and inspection	$12,922	$11,435
Mechanical removal	IS	IS
Nonchemical treatment	IS	IS
Research and development	IS	IS
Personnel training	IS	$4,257
Customer education	IS	IS
Other	IS	IS
Avg. production capacity (MGD)	36.8	56.8

Note. IS, insufficient sample; MGD, million gallons per day.

[a] Source: O'Neill (unpublished data)

electric generation facility managers outside the context of this study, we learned that after the initial early years of trial and error control implementation, managers found that continuous chemical treatment was not needed to control zebra mussels, only periodic treatment. This would decrease the costs for those facilities. However, continuous chemical treatment still would be used in drinking water treatment facilities because the chemicals served other purposes besides zebra mussel control.

We found no difference in the rate of infestation of electric power generation versus drinking water treatment facilities but did find that drinking water treatment facilities were more likely to be implementing preventive measures and spending some money on control. Perhaps this is another case of electric power generation facilities being reluctant to report financial information. However, among facilities reporting spending money, it appears that electric power generation facilities were spending more per facility than drinking water treatment plants (but we could not substantiate this statistically due to small sample sizes for electric power generation facilities).

We also found that as facility size increases, so do costs. We demonstrated this by comparing drinking water treatment plants that produced more versus less than 10 million gallons per day. Larger plants' costs were three to five times greater than those of smaller facilities.

Comparisons of data from the current study for the time period 1989–1995 with data collected from the same time period by O'Neill (1997) show the current estimates ($146 million) to be much larger than previous estimates ($69 million). The difference is similar when comparing mean expenditures per facility for drinking water treatment plants (Table 6). (Comparisons could not be made for electric power generation facilities due to insufficient sample sizes.) Even though current survey respondents on average are associated with smaller facilities than 1995 survey respondents, the average cost per facility during the 1989–1995 time period was greater for current survey respondents. Some differences in the opposite direction appear by expenditure category; expenditures for 1995 survey respondents were greater than for 2004 survey respondents (Table 6). The differences in these numbers may be explained by the more complete listing of facilities obtained for the current study compared with the lists available in 1995.

Early predictions of the ultimate costs of the zebra mussel invasion may have been overblown (e.g., Roberts [1990] estimated $4 billion over 10 years in the Great Lakes, including impacts to sportfishing). Using data from the 1995 Sea Grant study (O'Neill 1997), our Sea Grant coauthor predicted impacts of approximately $1 billion, well in excess of the $267 million estimate from this study (and its associated confidence interval of $161 million–$467 million). Several reasons may explain this difference. First, as suggested earlier and borne out by our data, facilities infested in the early years had to spend more money cleaning out their facilities and developing control procedures than facilities that were infested later. Second, facility staff may have learned what to do from the earlier infested facilities and are being more proactive now and therefore spending less than originally anticipated. For example, an unanticipated cost savings came in the change from continuous to periodic chemical treatments for electric generation facilities. Third, zebra mussels did not expand into new waters, particularly smaller inland lakes, as rapidly as anticipated.

The discrepancy between the predictions of costs and the current estimates also may be explained by information gathered in the site visits. Interviewees noted how difficult it was to separate costs associated with zebra mussels from other costs as they completed the questionnaire. For example, chlorine is used to kill zebra mussels at many intake pipes. However, chlorine is used normally as a disinfectant even without concerns about zebra mussels, perhaps not at the mouth of the intake but at some point in the treatment process. Interviewees indicated that they did their best when completing the questionnaire, but the difficulties reported in distinguishing specific costs attributable to zebra mussels suggests uncertainty about the magnitude of ongoing maintenance costs that should be attributed to zebra mussels vs. other operational requirements.

The focus of research efforts on costs and control may now naturally shift to new invasive species. Clearly more are on the way (Mack and others 2000; Roberts 1990). Facility operators expressed concern about them, how they would control them, and what the costs will be. This analysis suggests that costs will most likely be highest in the beginning years of dealing with a new invader, then level off over time, and perhaps be incorporated as part of the ongoing maintenance budget for normal operations.

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Estimated Potential Economic Impact of Zebra and Quagga Mussel Introduction into Idaho

Idaho Aquatic Nuisance Species Taskforce 2009
Prepared for the Idaho Invasive Species Council

Congressional researchers estimated that an infestation of zebra mussel in the Great Lakes cost the power industry alone $3.1 billion in the 1993-1999 period, with a total economic impact on industries, businesses, and communities of more than $5 billion. Given the well-documented impacts these species have had in the Great Lakes, many western states are on high alert to contain, control and prevent the spread of these mussels in the West. Nevada, California, Arizona, Colorado and Utah each have detected these species in critical water supply systems, and have launched aggressive eradication and control programs in an attempt to minimize impacts.

Zebra and quagga mussels have **not** been found in Idaho waters to date. In order to understand the potential impacts of these species to Idaho, staff examined existing databases and published research to generate estimates on comparable occurrences in Idaho. The results reflect an estimated cost due to direct and indirect impacts on infrastructure and facilities that use surface water. Most of the published data investigated does not report annual costs, however annual maintenance costs would be expected to increase for all of the categories examined. In some cases, economic impacts could not be estimated. For example, no comparable economic data exists for mussel impacts on irrigation systems, therefore they are excluded from the potential cost estimates. The estimates are considered conservative and for the most part are reported in 1997 dollars, not adjusted for inflation.

The following categories were examined:

- Hydro Power: These estimates were based on a Bonneville Power Administration-commissioned study that examined the estimated hydropower maintenance costs associated with zebra mussel by examining the Bonneville Dam First Powerhouse, costs associated with Asian clam control at Bonneville, and a survey of zebra mussel mitigation costs at other hydropower generation facilities in North America. The study estimated the costs for installing sodium hypochlorite systems and applying antifouling paint to 13 federal hydroelectric projects in the Columbia River Basin. The Idaho estimate was based on the BPA average cost per project ($1.8 million) for the 26 hydropower dams in Idaho (Phillips et al. 2005).
- Other Dams: Other dams include water impoundment structures not associated with power generation. These structures will incur maintenance costs associated with mussel fouling of pipes and structures. Estimate based on figures from O'Neil (1997) for navigational lock structures ($1,700 per structure) applied to 86 structures in the state.
- Drinking Water Intakes: The drinking water facilities included in this analysis are facilities that draw surface water for municipal or public drinking water use. Mussels foul intake piping and water processing infrastructure, increasing maintenance costs and degrading water flavor due to mussel waste and decomposition in water lines. Private single family home water intakes for drinking and irrigation are not included in this estimate. Estimates based on O'Neill (1997) figures from water treatment facilities ($42,000 per facility) applied to 100 facilities in Idaho.
- Golf Courses: Golf courses are at risk for additional maintenance costs for irrigation systems. Fouling of pipes and pumps and clogged sprinklers are projected to increase operating expenses. Estimates based on O'Neill (1997) costs from golf courses ($150 per facility) applied to 114 Idaho courses.
- Boating Facilities: Boating facilities include marinas, docks and boat launches. Increased cost estimates are based on maintenance associated with dock and boat launch fouling. Estimates based on O'Neill (1997) figures from marinas ($750 per facility) applied to 380 Idaho facilities.
- Fish Hatcheries and Aquaculture: Hatcheries and aquaculture facilities are vulnerable to zebra / quagga mussel fouling. Pipes, pumps and raceway structures are all subject to increased operations and maintenance costs. Estimates based on O'Neill (1997) figures for hatcheries and aquaculture impacts ($5,800 per facility) applied to 163 facilities in Idaho.

- Boater Costs: More than 90,000 motorized boats were registered in the state of Idaho in 2007. Potential increases in boater costs are based on estimates for anti-fouling paints and increased per-boat maintenance costs. Estimates based on Vilaplana et al. (1994) for increases in boater maintenance costs ($265 per boat).
- Fishing Use: Recreational fishing is a $430 million industry in Idaho. Research on impacts of mussels on fisheries is limited but reductions of fish numbers are likely. Vilaplana et al. (1994) found a 4% decrease in boater recreation because of mussel introduction. Estimate based on a 4% reduction of use applied to 2,917,972 Idaho fishing trips a year averaging $150 per trip (IDFG 2003).
- Irrigation: 56,175 points of diversion (POD) were identified in Idaho by the Idaho Department of Water Resources. Multiple points of use (POU) may be associated with each POD. Each POD and POU could be affected by the introduction of zebra or quagga mussels. These mussels can grow up to 0.5mm / day under ideal conditions and could impact water conveyances that are seasonally dry. Fouling from mussel establishment is cumulative and increased fouling and flow reduction would occur in ditches, pipes, pumps, fish screens and diversion structures over time. Published research on mussel related flow reduction in irrigation systems is minimal, but mussel establishment in pipes and pumps is well documented. The true impacts of zebra and quagga mussel introduction on irrigated agriculture in Idaho are uncertain, but there is a high likelihood that theses mussels will increase maintenance costs for operations that rely on surface water for irrigation.

Facility	Number	Estimated Cost Per Unit	Estimated Cost State-Wide	Citation
Hydro Power	26	$1,817,000.00	$47,242,000.00	Phillips et al. 2005
Other Dams	86	$1,730.00	$148,700.00	O'Neil 1997
Drinking Water	100	$42,870.00	$4,287,000.00	O'Neil 1997
Golf Courses	114	$150.00	$17,100.00	O'Neil 1997
Boat Facilities	380	$750.00	$285,000.00	O'Neil 1997
Hatcheries/Aquaculture	194	$5,860.00	$1,136,800.00	O'Neil 1997
Boat Maintenance	90,000	$265.00	$23,850,000.00	Vilaplana andHushak 1994
Angler Days (4% reduction)	2,917,927	$150.00	$17,507,500.00	Vilaplana andHushak 1994
Irrigation POD	56,175			Little current published data
Total Estimate			**$94,474,000.00**	

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