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NUTRIENT NUMERIC ENDPOINTS

CALIFORNIA'S FRESHWATER NUTRIENT NUMERIC ENDPOINT (NNE) APPROACH
RE-EVALUATING THE SANTA MARGARITA RIVER CASE STUDY

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INTRODUCTION

Regulatory agencies spend much time and energy attempting to control nutrient loading to surface waters. The regulated community expends significant public and private resources in compliance with laws and regulations that address discharges from: publicly owned treatment works; runoff from agriculture; runoff of municipal stormwater; and leaching from septic systems — all of these factors can elevate nutrient levels in rivers and streams. However, high nutrient levels alone may not be the problem due to the fact that, except at very high levels, nutrient concentrations do not directly impair beneficial uses. Rather, nutrients act indirectly in combination with sunlight, temperature, and flow volume/velocity to affect protected uses by promoting excessive algal growth. The problem arises when this algal growth reaches nuisance levels or when the algae dies and dissolved oxygen levels become depressed, especially in bottom waters, as microbes metabolize the excess detritus.

Because of the mediating factors, setting appropriate limits for nutrient levels in streams is a tricky business. The usual approach of setting regulatory limits for concentrations of nutrients in the water column does not directly address the problem because it does not account for the co-factors listed above. Moreover, in many instances the usual one-size-fits-all approach to setting nutrient limits does not work well because it does not acknowledge site-specific ecological differences, including differences between shaded, high-gradient mountain streams, deep slow-flowing rivers, and sunbaked, intermittent streams that flow seasonally in arid regions.

The US Environmental Protection Agency (EPA) and California State Water Resources Control Board (State Water Board or CSWRCB) have developed a process — the California Freshwater Nutrient Numeric Endpoint Approach (NNE) — intended to address the differences in streams by tailoring water quality objectives to fit local differences (Tetra Tech, 2006, CSWRCB, 2011). The NNE evaluates water quality using secondary indicators (such as algal density, chlorophyll, and dissolved oxygen levels) in order to establish water quality targets. In 2011, a California Environmental Quality Act (CEQA) scoping meeting was held, and an options document was prepared listing the potential alternatives to be considered in setting nutrient objectives for California. Those options included: the NNE (the preferred approach); an eco-regional approach; or no action (CSWRCB, 2011). The State Water Board is examining the Freshwater NNE approach this year and determining whether it is ready to adopt or more science is needed prior to adoption (CSWRCB, 2011 and 2013b; SMR NI Group, 2013).

Nutrient Numeric Endpoints

Previous NNE Articles

"Impaired" Waters

TMDLs

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The merits and faults of the NNE were discussed in detail in three previous articles for *The Water Report* (Butcher and Gorham-Test, 2007 (*TWR*#43); Jungreis and Thomas, 2007a (*TWR* #42) and 2007b (*TWR* #45)). Those articles outlined the scientific and regulatory basis for the NNE as well as how it may be used for preliminary "scoping" impaired water bodies, how it relates to the process of setting total maximum daily loads, and how it may affect the regulated community. The reader is referred to those articles for more extensive discussion on those topics than is provided here. [Editors' reminder — past issues of *The Water Report* are available to subscribers in PDF format upon emailed request to: thewaterreport@yahoo.com.]

Your authors recently conducted a study using the NNE spreadsheet models on the Santa Margarita River in southern California. This article discusses our findings. After briefly sketching the regulatory background, we compare our results to those from a previous case study on the same river conducted during the initial demonstration of the NNE approach (Tetra Tech, 2007). We examine how the use of site-specific data compares to literature values and estimates within the NNE spreadsheet models and draw conclusions about how the NNE spreadsheet models may best be used in a regulatory setting.

REGULATORY BACKGROUND

Forty-six States have received EPA's authorization to administer most aspects of the federal Clean Water Act (CWA) within their borders (Idaho, Massachusetts, New Hampshire, and Rhode Island being the exceptions). The CWA-authorized States are required, with EPA's assistance and oversight, to develop water quality criteria or objectives (either narrative or numeric or — in many cases — both) that will ensure attainment and maintenance of all identified beneficial uses in rivers and streams (see 33 U.S.C. § 1314(a)(7); Jungreis and Thomas, 2007a). Pollutants that can impair beneficial use can originate from point sources (typically "end-of-pipe") and/or non-point sources (typically diffuse runoff). While most point source dischargers operate under CWA National Pollutant Discharge Elimination System (NPDES) permits that require expensive technology to remove water pollutants, a high proportion of water pollution results from non-point sources (USGS, 1999). Many streams fail to consistently meet water quality standards, particularly in arid regions (USEPA, 2000; USGS, 2010b). When standards are not met, the CWA requires States to list the water body as "impaired," and this listing triggers further regulatory action under Section 303 (d) of the CWA (33 U.S.C. § 1313(d)). The States must then consult with EPA and prioritize efforts to develop a **t**otal **m**aximum **d**aily **l**oad (TMDL) for the impaired water body (33 U.S.C. § 1313(d)(1)(C)). In the process of setting the TMDL, the regulatory agency may establish "TMDL targets" — i.e., measured endpoints that demonstrate attainment of pertinent beneficial uses (33 U.S.C. § 1313 (d) (1) (c); Jungreis and Thomas, 2007a). The State Water Board is currently considering whether to establish the NNE as the primary, or one of several, approaches for setting these targets in California (Butcher and Gorham-Test, 2007; CSWRCB, 2011 and 2013a).

NUTRIENT NUMERIC ENDPOINT (NNE) ORIGINS

In 1998, EPA published the National Strategy for the Development of Regional Nutrient Criteria (USEPA, 1998) and began to establish the basis for eco-regional nutrient criteria. EPA evaluated data sets from 1990 to 1998 and proposed that the upper 25% of all nutrient data could be assumed to represent unimpacted reference conditions (e.g., natural background levels) for each eco-region. These 25th percentile values were characterized as criteria recommendations that could be used to protect waters against nutrient over-enrichment (USEPA, 2000).

In 1999 the EPA Region IX formed a Regional Technical Advisory Group (RTAG) with stakeholders from state water quality agencies, other state and federal agencies, tribes, and some representatives from industry and environmental groups. The RTAG conducted a pilot project to develop a water quality database organized by eco-region. The results suggested if the EPA reference-based values were adopted, then a large number of likely unimpaired water bodies might be misclassified as impaired. The RTAG responded by adopting a resolution to develop more predictive nutrient criteria (Tetra Tech, 2006).

EPA Region IX (AZ, CA, HI, NV), in cooperation with the State Water Board, decided to try the NNE approach, which considers dissolved oxygen and biological parameters as secondary indicators in addition to **n**itrogen and **p**hosphorus (N and P). The indicators or "response variables" include: benthic algal biomass; chlorophyll; dissolved oxygen; dissolved organic carbon; macrophyte cover; and water clarity. The NNE develops water quality targets for the response variables rather than targets for the nutrients themselves. It poses the question: "how much algae can be present without impairing designated beneficial uses?" Numeric models are then used to convert the initial water quality targets for the response variables into numeric targets for nutrients (Tetra Tech, 2006).

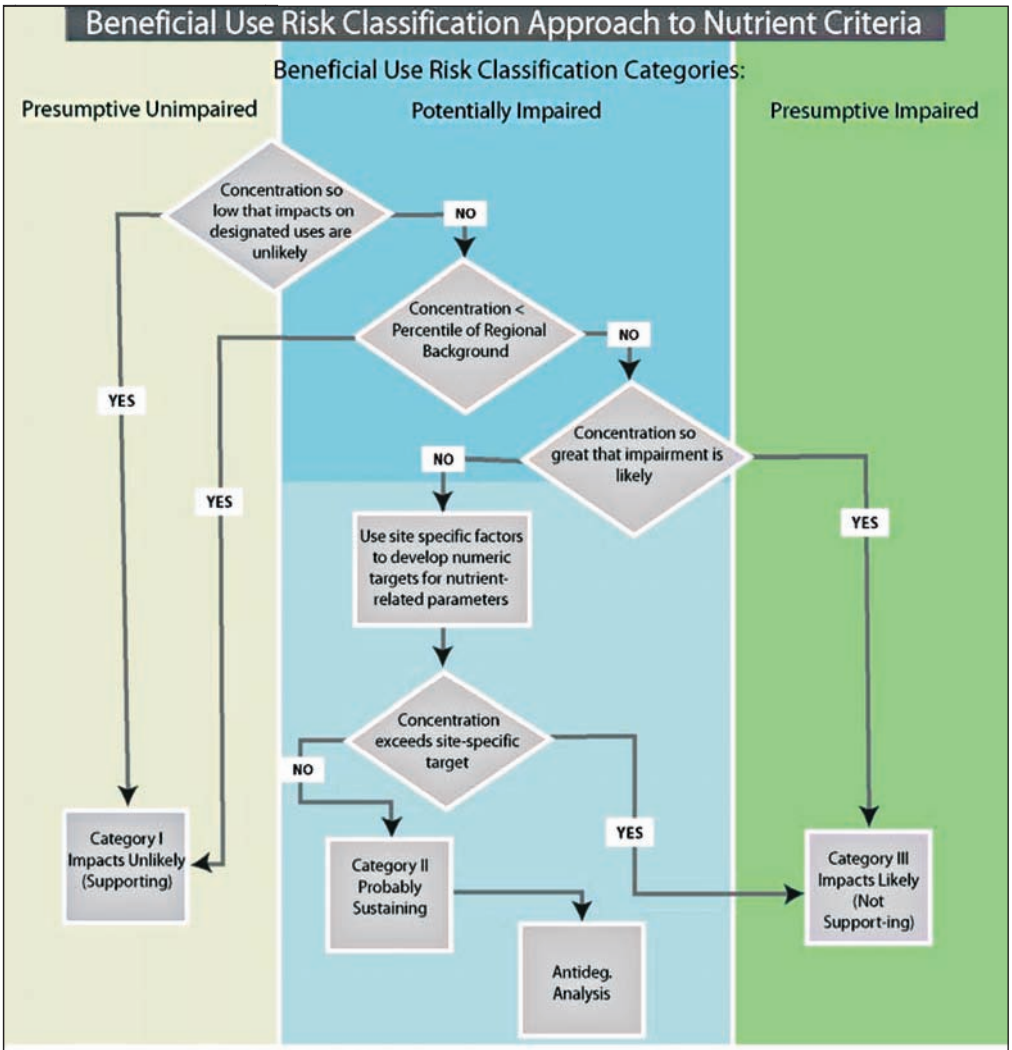


Figure 1: Adapted from Tetra Tech 2006

Table 1. Proposed Freshwater NNE Endpoints

Response Indicator	BURC Boundary	Beneficial Use						
		COLD	WARM	REC-1	REC-2	MUN[1]	SPWN	MIGR
Benthic Algal Biomass in streams (mg chl-a/m2)	I/II	100	150	C	C	100	100	B
Maximum	II/III	150	200	C	C	150	150	B
Planktonic Algal Biomass in Lakes and Reservoirs (as _g/L Chl-a)[2] – summer mean	I/II	5	10	10	10	5	A	B
	II/III	10	25	20	25	10	A	B
Clarity (Secchi depth, meters.)[3] – lakes summer mean	I/II	A	A	2	2	A	A	B
	II/III	A	A	1	1	A	A	B
Dissolved Oxygen (mg/l)	I/II	9.5	6.0	A	A	A	8.0	C
Streams – the mean of the 7 daily minimums	II/III	5.0	4.0	A	A	A	5.0	C
pH maximum – photosynthesis driven	I/II	9.0	9.0	A	A	A	C	C
	II/III	9.5	9.5	A	A	A	C	C
DOC(mg/l)	I/II	A	A	A	A	2	A	A
	II/III	A	A	A	A	5	A	A

A = No direct linkage **B** = More research needed to quantify linkage **C** = Addressed by Aquatic Life Criteria
[1] For application to zones within water bodies that include drinking water intakes.
[2] Reservoirs may be composed of zones or sections that will be assessed as individual water bodies.
[3] Assumes that lake clarity is a function of algal concentrations, does not apply in waters of high non-algal turbidity.

The NNE characterizes water bodies according to three Beneficial Use Risk Categories (BURCs), as depicted in Figure 1. BURC I waters are presumed not to be impaired for nutrients, while BURC III waters are presumed to be impaired. For BURC II waters, additional information and analysis are needed to determine if a beneficial use is supported or impaired (Tetra Tech, 2006). The NNE establishes target levels for response indicators delineating the boundaries between the BURCs. These proposed threshold values, presented in Table 1, were selected using literature sources and elicitation from the Regional Water Quality Control Boards in California.

EARLIER NNE STUDY

The NNE approach can be applied using complex hydrodynamic models or much simpler spreadsheet models (Tetra Tech, 2007; Butcher and Gorham-Test, 2007). In order to test the feasibility of the NNE approach, EPA and the State Water Board performed several case studies in California using the NNE Benthic Biomass Spreadsheet Tool (NNE spreadsheet models). One case study was performed for the Santa Margarita River in Southern California (Tetra Tech, 2007; SDRWQCB, 2007). Thomas and Jungreis (2007a and 2007b) examined that case study and found that it relied on estimates based upon literature values for many hydrologic and ecological conditions. Most of these values were generated based on systems distant from the Santa Margarita River. When site-specific datasets were used, few were of recent origin, which caused concern among stakeholders (Jungreis and Thomas, 2007a; SMR NI Group, 2013). Lacking empirical data, the case study also incorporated a number of assumptions about interrelationships of co-factors including: the impact of solar radiation and shading on algal biomass; grazing impact upon periphyton (i.e., algae, fungi, bacteria, and protozoa growing on substrates in aquatic habitats); and ratios of inorganic to organic nutrients in the river.

Nutrient Numeric Endpoints

Study Shortcomings

Specific criticism of the 2007 case study includes:

Sparse data regarding benthic algal biomass or chlorophyll *a* for the Santa Margarita River. Having current algal biomass and chlorophyll a data is crucial for applying the NNE process to the river. Also missing was a comprehensive data set on turbidity, which is used to estimate light extinction in the water column (Jungreis and Thomas 2007a and 2007b; SMR NI Group, 2013).

Lack of field data for canopy cover and topographic shading — important factors (particularly in the absence of actual algal biomass data) because of the relationship between shading/canopy and temperature/photosynthesis. Generally speaking, the less shading during low flow conditions, the greater the chances of impairment associated with algae (CCRWQCB, 2006 pages 23-27). Shading is a key parameter within the "QUAL2K" model, upon which the NNE numeric outputs are based (Jungreis and Thomas 2007a and 2007b).

Lack of periphyton data, resulting in an inability to establish a ratio of benthic chlorophyll a to **a**sh-**f**ree **d**ry **w**eight (AFDW). No site-specific data were available, and no such ratio existed in the literature for Southern California streams (Jungreis and Thomas 2007a and 2007b).

Appropriate Limits

SUBSEQUENT SITE-SPECIFIC RESEARCH

This article will now describe subsequent research conducted by the authors to address the criticisms listed above and fill the data gaps with current, site-specific data. The additional data enabled re-evaluation of the original case study to determine whether the NNE spreadsheet models accurately characterize conditions and predict appropriate limits for nutrient levels in the Santa Margarita River.

Variable System

Santa Margarita River

The Santa Margarita River, located in Southern California, drains a watershed of over 740 square miles. The river reaches the Pacific Ocean at Marine Corps Base Camp Pendleton. The river serves as valuable habitat for federal- and State-listed endangered or threatened species and other wildlife. Climate in the study area is "Mediterranean" — experiencing hot, dry summers and mild, wet winters. Occasional heavy rains and floods occur in the winter months between December and March. Precipitation and urban runoff comprise a significant majority of the surface flow. The amount of runoff generated by precipitation events is dependent on: soil characteristics; slope; soil moisture; storm intensity; and storm duration. Due to variation in these factors, runoff quality and quantity vary greatly from year-to-year, month-to-month, and location-to-location. During extremely dry years, no surface flow reaches the ocean. In extremely wet years, the mean daily flow has reached as high as 19,500 **c**ubic **f**eet per **s**econd (cfs) — making the Santa Margarita River a highly variable system (Stetson, 2010).

We applied the NNE spreadsheet model at three locations near United States Geological Survey (USGS) streamflow gages, as depicted in Figure 2 (the figure also depicts the sites used for the original case study). Our sites were selected because there were sufficient hydrologic and water quality data to support our intended analysis. In addition, these sites are being used by agencies in the watershed to monitor river flows and associated system behavior, so the findings of our study will have management relevance into the future.

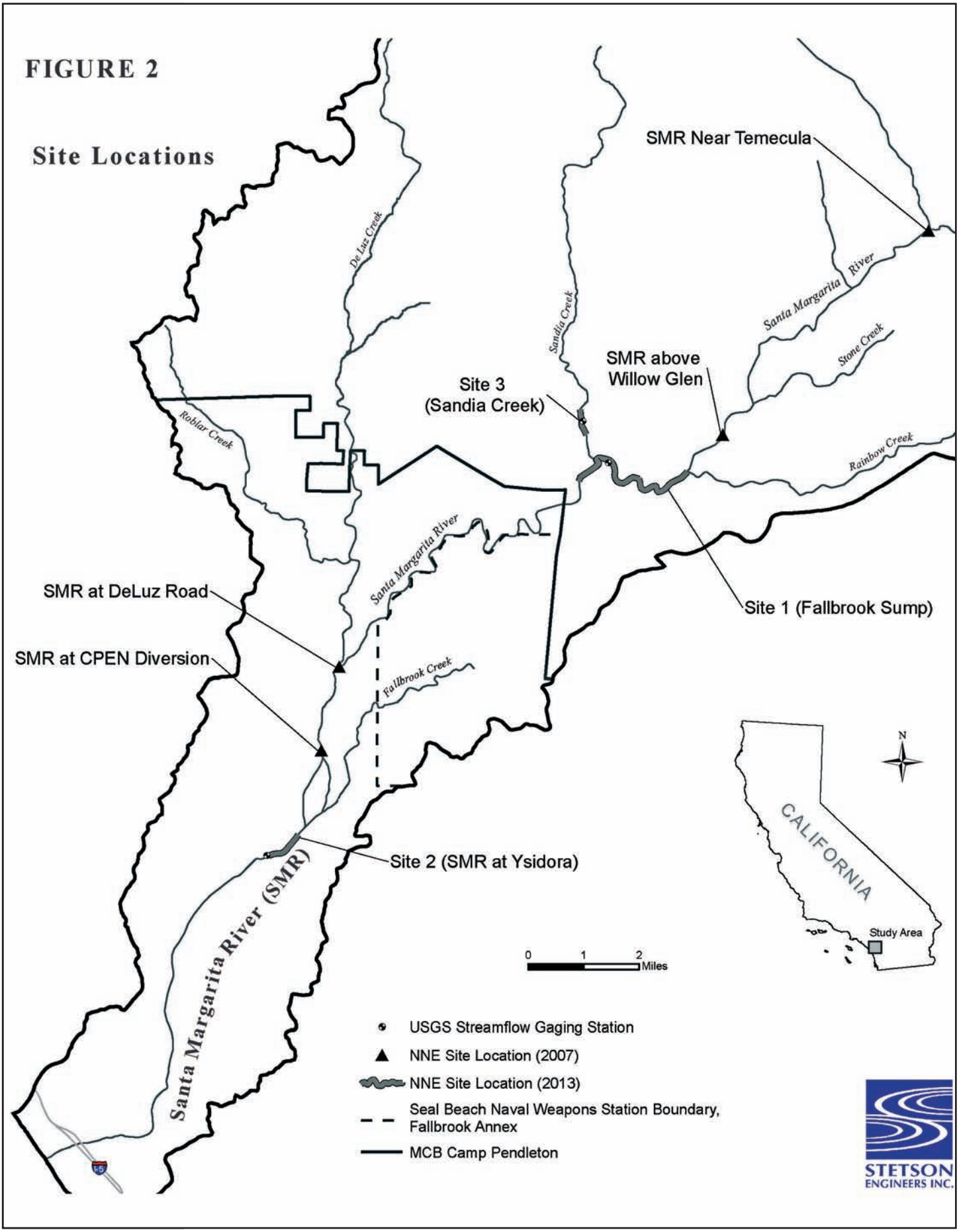
New Study's Sites

Study Locations included:

Site 1. The Santa Margarita River at the Fallbrook Sump reach is located several river miles upstream of the Marine Corps Base Camp Pendleton. This reach extends 0.6 river-miles downstream and approximately two river-miles upstream of USGS gage 11044300. This reach is characterized by large in-channel pools near Rainbow Creek transitioning to a narrow, fast moving channel near Sandia Creek. Riparian vegetation is tall and plentiful throughout this reach, providing much shade.

Site 2. The Santa Margarita River at Ysidora reach is located near the Topomai Bridge on Camp Pendleton. The USGS gage no. 11046000 is located at this site. This reach extends approximately 0.6 river-miles upstream of the bridge and is shallow, wide, sandy, and un-shaded.

Site 3. Sandia Creek is located upstream of Camp Pendleton and enters the Santa Margarita River immediately downstream of the Fallbrook Public Utility District (FPUD) Sump. Measurements for Sandia Creek were taken near USGS gage 11044350, which is approximately one river-mile upstream of the confluence with the Santa Margarita River. This reach of Sandia Creek is a gravelly, narrow, fast moving channel. Riparian vegetation is tall and plentiful throughout this reach, providing much shade.



Nutrient Numeric Endpoints

TN & TP Allowances

Hydrologic Parameters

Habitat Parameters

Periphyton Data

NNE Spreadsheet Model

The NNE spreadsheet tool that was used in the original case study as well as our subsequent research is called the "California Benthic Biomass Tool" (Tetra Tech, 2007b). This simple tool can "provide initial targets, although site-specific refinements may be needed for individual waterbodies" (Tetra Tech, 2006). This spreadsheet model utilizes water quality, hydrologic, habitat, and biological parameters in order to determine allowable **t**otal **n**itrogen (TN) and **t**otal **p**hosphorus (TP) concentrations, as well as maximum algal densities, for a given reach of stream.

Data Collection

Hydrological, chemical, and habitat input parameters were collected in 2008 and 2009 for Sites 1 and 3. Data for Site 2 were collected during 2009 and 2010. Data were collected between May and September (Stetson, 2010; USGS 2010a). Hydrologic parameters included: stream depth; water temperature; stream velocity; turbidity; and days of biomass accrual. Stream depth and velocity measurements were taken during multiple site visits over the course of the season. Supplemental velocity measurements were drawn from monthly USGS gage data. As can be seen in Figure 2, data were collected from reaches of the river and a tributary — rather than from discrete points on the river — in order to assemble a more representative data set.

The average water temperature and turbidity were derived from measurements taken during sampling events for the Monitoring Program and were supplemented with water temperature measurements from an in-situ water quality meter located at the Fallbrook Sump.

Water quality grab samples were collected in May, July, and September of each year (Stetson, 2010). The average, minimum, and maximum values of each parameter were input to the model.

The two habitat parameters included in the NNE spreadsheet model are canopy closure and unshaded solar radiation. Canopy closure was estimated in the field throughout the reaches while unshaded solar radiation was calculated based on latitude and date of field visits. It should be noted that canopy closure, for the purposes of NNE analysis, includes both canopy cover and topographic shading (Tetra Tech, 2006). In the Santa Margarita River gorge, topographic features provide significant shading to portions of the river.

Periphyton data were collected during one-day sampling events in June and September based on the EPA's Environmental Monitoring and Assessment Program (EMAP) reach-scale approach (Stetson, 2010). Periphyton was characterized by analysis of species richness, identifying diatoms and soft algae to lowest possible taxonomic level, analysis of relative abundance of taxa, as well as level of chlorophyll *a* (chl-*a*) content and **a**sh-**f**ree **d**ry **w**eight (AFDW) of periphyton biomass.

Table 2. Measured Parameters for NNE Modeling

Parameter[1]	Units	Santa Margarita River at FPUD Sump	Santa Margarita River at Ysidora	Sandia Creek
Hydrology				
Stream Depth	m	0.61	0.19	0.20
Stream Velocity	m/s	2.71	2.18	0.56
Water Temperature	deg C	22.9	23.0	20.6
Turbidity	NTU	4.02	3.36	0.92
Days of Biomass Accrual	days	14.53	6.34	18.58
Water Quality[2]				
Nitrate-N	mg/L	1.170	0.004	3.020
Total N (TN)	mg/L	1.437	0.579	3.261
Inorganic P	mg/L	0.002	0.034	0.016
Total P (TP)	mg/L	0.026	0.167	0.040
Habitat/Periphyton				
Canopy Closure	%	61	27	73
Chl-*a* to AFDW Ratio	$(mg/m^2)/(g/m^2)$	2.406	3.535	0.775

[1] Additional data were collected that are not reflected in this summary table.
[2] Water quality values presented are averages.

Nutrient Numeric Endpoints

Dodds Method

QUAL2K Method

Data Set Comparison

Results Comparison

Analytical Methods

Available analytical methods in the NNE spreadsheet model include different variations of "Dodds" and "QUAL2K" methods.

The Dodds method (Dodds et al. (1997)) developed nutrient criteria to address the nuisance growth of benthic algae in the Clark Fork River, Montana. The criteria were developed based on the empirical relationships between seasonal mean values for benthic chl-*a* and nutrient concentrations. As discussed in Tetra Tech (2006), Dodds' analysis was based on a wide range of sites through temperate zones of the world, but lacking data representing arid and semi-arid climates, is not necessarily well suited to much of California. Use of the Dodds methods requires long runs of nutrient data which are not available for the site locations used in this study. Due to lack of large datasets and concerns regarding applicability of the method to the Santa Margarita River, Dodds methods were not used for our study.

The QUAL2K method is a water quality model for streams. It provides estimates of benthic algal responses due to light and nutrient availability. There are three variations of QUAL2K available within the spreadsheet framework: standard; revised; and revised with accrual adjustment. Standard QUAL2K incorporates a benthic algal component while Revised QUAL2K incorporates a benthic algal component and adjusts its solutions to achieve general agreement with the Dodds methods. Revised QUAL2K with Accrual Adjustment takes into consideration the days of biomass accrual (based on the frequency of scouring flows that reset the system).

Input parameters were compared to the original case study of the lower Santa Margarita River (Tetra Tech, 2007). An important difference to note is that the time period of field data in Tetra Tech's case study is approximately 20 years whereas this study considers two recent years of more intensive data collection for all relevant parameters, including periphyton — which is a vital parameter for assessing the river using the NNE. The original case study used a dataset that describes an earlier period when wastewater was still being discharged into the river. In addition, upper basin water districts were mining groundwater and thereby reducing base flows (MCBCP and RCWD, 2002). This new study used more recent data that describe a different system transformed by changes in management; this new system has higher water quality; no wastewater discharges; and flow augmentation due to an intervening water rights settlement (Stetson, 2010, MCBCP and RCWD, 2002).

The original case study used stream depth and velocity field measurements taken by the USGS at their gaging stations for their entire period of record (approximately 20 years). The water quality data used in the case study spanned 1986 to 2001 with a maximum number of samples per parameter of 37. The case study used the default value of 2.5 for the chl-*a* to AFDW ratio and the extreme percentages of 0% and 80% for canopy cover because no substantial field data were available (Tetra Tech, 2007).

Results and Discussion

We performed NNE spreadsheet model runs for the three sites using three methods: "Standard QUAL2K," "Revised QUAL2K," and "Revised QUAL2K with Accrual Adjustment." The results provided by the three methods were analyzed in order to determine which is most appropriate for characterizing the Santa Margarita River Watershed. The model was run for both the BURC I/II threshold (100 mg/m2 chl *a*) and the BURC II/III threshold (150 mg/m2 chl *a*).

Table 3. Beneficial Use Risk Categories Designations for the Sites

Sites	Spreadsheet Models		
	Standard QUAL2K	Revised QUAL2K	Revised QUAL2K + Accrual
1. Santa Margarita River at FPUD Sump	NOT IMPAIRED	IMPAIRED	Cannot be applied[1]
2. Santa Margarita River at Ysidora	NOT IMPAIRED	IMPAIRED	
3. Sandia Creek	NOT IMPAIRED	NOT IMPAIRED	

[1] Method is not advised for this region because the procedure for calculating biomass accrual is not representative of the scouring regime in southern California. See section below titled "Sensitivity to Model Parameters."

Comparison of Results by Site

Table 3 presents the mixed results for the three sites. The Standard QUAL2K method indicates no impairment, BURC I, for all the sites. The Revised QUAL2K method indicates impairment, BURC III, for the two river sites, but not for the Sandia Creek site. The Revised QUAL2K with Accrual Adjustment method does not function properly for the watershed due to faulty model assumptions regarding seasonality of scouring flows.

Nutrient Numeric Endpoints

Secondary Indicators

A key feature of the NNE is linking the BURC, which is based on the secondary indicators, with allowable levels, or targets, for nutrient concentrations. This linkage enables the establishment of numeric limits based on the secondary indicators. Table 4 shows the allowable **t**otal **n**itrogen and **t**otal **p**hosphorus (TN and TP) concentrations that correspond with the BURC designations in Table 2. For designation as BURC I, the concentrations shown represent the maximum that can be detected at the site to still be considered unimpaired. For the BURC III designations, the concentrations shown are at the threshold between BURCs II and III, indicating the lower limit for being considered impaired.

Table 4. Allowable Total N and Total P Concentrations[1]

	Standard QUAL2K			Revised QUAL2K		
Site	Target Limit: Benthic chl-*a*	Total N	Total P	Target Limit: Benthic chl-*a*	Total N	Total P
Santa Margarita River at Fallbrook Sump	100	0.21	0.097	150	1.44	0.025
Santa Margarita River at Ysidora	100	0.99	0.010	150	0.36	0.004
Sandia Creek	100	--[2]	--[2]	100	11.00	0.159

[1]Total N and Total P concentrations shown per BURC designation at each site.
[2]The Standard QUAL2K method was unable to provide allowable total N and total P concentrations for this location.

Based on the outputs of the spreadsheet model, Sandia Creek overall has the highest allowable concentrations although these concentrations seem unlikely for this stream based on San Diego Regional Water Quality Control Board's Basin Plan (Basin Plan) limits (discussion below). For Standard QUAL2K, only concentrations for the two Santa Margarita River sites were calculated. The Fallbrook Sump location has a higher allowable total P concentration while the Ysidora location has a higher allowable total N concentration. As for Revised QUAL2K on the Santa Margarita River, the Fallbrook Sump location has higher allowable total N and total P concentrations.

Nutrient Concentrations

Comparison with Basin Plan Limits

Maximum allowable concentrations of nutrients are set by water quality objectives listed in the Basin Plan. The Basin Plan limit for total P is 0.1 mg/L. The Basin Plan does not specify a limit for total N, but rather sets that limit as 10 times the total P value; therefore it is assumed to be 1.0 mg/L unless a special study is completed to determine the appropriate site-specific ratio of N to P. In addition to functioning as a scoping tool to determine whether water bodies are impaired, the NNE spreadsheet also provides "allowable levels" for TN and TP. Table 5 indicates how the NNE spreadsheet allowable levels for nutrients compare to the Basin Plan. The results are mixed, with the NNE providing allowable levels that are either more restrictive or more lenient than the Basin Plan limits, depending on which spreadsheet models are used.

Table 5. Comparison of NNE and Basin Plan Limits for Total N and P

	SMR at FPUD Sump		SMR at Ysidora		Sandia Creek	
Method: Constituent as Compared to the Basin Plan	BURC I	BURC II	BURC I	BURC II	BURC I	BURC II
Standard QUAL2K for TN	Lower	Lower	Same[1]	Higher	No Result	No Result
Revised QUAL2K for TN	Lower	Higher	Lower	Lower	Higher	Higher
Standard QUAL2K for TP	Lower	Higher	Lower	Lower	No Result	No Result
Revised QUAL2K for TP	Lower	Lower	Lower	Lower	Higher	Higher

[1]The NNE result (0.99 mg/L) is statistically identical to the Basin Plan limit (1.0 mg/L).

Best-Fit Method for the Santa Margarita River Watershed

Comparing the three model methods currently available within the spreadsheet tool, it remains unclear which method operates best within the Santa Margarita River Watershed. Standard QUAL2K does not agree with Dodds relationships and produced an error message for one of the three sites. The error message states that the method is not reliable for corresponding algal densities greater than 125 g/m^2. The corresponding algal densities for Sandia Creek for benthic chl-*a* target limits of 100 mg/m^2 and 150 mg/m^2 were 129 mg/m^2 and 194 mg/m^2, respectively.

Nutrient Numeric Endpoints

Inappropriate Method

Revised QUAL2K presented no errors while calculating results, and it incorporated the Dodds relationships between periphyton growth and nutrient levels (Dodds et al., 2002; Tetra Tech, 2007). However, the method provided reasonable estimates of nutrients and biomass levels for only two of the three sites. Neither Standard nor Revised QUAL2K adequately models the Sandia Creek site, as the former provides no result and the later provides a result that appears to be too high compared to the Basin Plan (RWQCB, 1994) and other streams in the watershed.

Revised QUAL2K with Accrual Adjustment, as currently fielded, is clearly not an acceptable method for the Santa Margarita River Watershed. The associated days of biomass accrual value calculated for each location is so low that it forces the model to its extremes. At all three locations, the allowable total N and total P concentrations reached unrealistic maximum levels of 150 mg/L and 2 mg/L, respectively. These nutrient concentrations are well over an order of magnitude above national background estimates for streams (USGS, 2010b) and are likely false.

Sensitivity to Model Parameters

Canopy Closure

Canopy Closure Inputs

The NNE spreadsheet is not set up to allow manual input of a precise estimate for canopy closure; categories are limited to the following inadequate list: 0%, 20%, 40% or 80%. A sensitivity analysis revealed that the NNE spreadsheet model is highly sensitive to the canopy closure estimate. Field estimates for all locations differed significantly from the available selections (often lying in the middle of two selections) for canopy closure. Therefore, two runs were performed using the available canopy closure selections (to "bracket" the actual estimated amount) and the results were linearly interpolated.

Days of Biomass Accrual

Hydraulic Scour Impacts

Periphyton is affected by hydraulic scour; a sudden increase in water flow velocity can cause scouring of periphyton mats. The simple statistic "days available for biomass accrual" was developed based on data from streams in New Zealand, where it was determined that biomass accretion increases significantly in response to nutrients when the accrual period is approximately 50 days or higher (Tetra Tech, 2006). The calculation for determining the days of accrual statistic is based on determining how many times during the year flows exceed three times the median flow rate. Using the prescribed methodology, the calculated days of accrual for the three reaches studied, as shown in Table 6, are quite low.

Table 6. Calculated Days of Biomass Accrual

Location	Days of Accrual
Santa Margarita River at FPUD Sump	14.5
Santa Margarita River at Ysidora	6.3
Sandia Creek	18.6

Accrual Relationships

The 50 days of accrual relationships derived for New Zealand streams appear not to be applicable to southern California's Mediterranean climate characterized by winter precipitation and long, dry periods during the summer. In southern California, the scouring events are clustered into a short wet season with the long dry season having fewer scouring flows — indeed, the actual period between scouring flows is likely measured in months rather than days. The prescribed simple calculation based on three times the median flow rate throughout the year leads to unrepresentative characterization of the scouring regime, implying shorter accrual periods than actually occur.

Variable Flow Impacts

Since the Santa Margarita River is a "flashy" system with a significant amount of variability around a naturally low median flow, incorporating the days of accrual statistic into Revised QUAL2K significantly reduces the calculated benthic chl-*a* level and maximum algal biomass density. This raises the allowable TN and TP concentrations to extremely high, seemingly unreasonable, concentrations for each of the three sites.

Stream Depth

Gage Site Influences

Since all three locations have USGS gage height data available, a sensitivity analysis was performed in order to determine if it is acceptable to use gage height to represent stream depths for a reach of a stream. Gages are located at naturally channelized or altered sites to facilitate flow measurement, and these spots likely exhibit deeper, higher velocity flows than is the case upstream or downstream of the gage. Therefore gage measurements for velocity and depth are likely unrepresentative of the system and may alter the results of the NNE spreadsheet model.

Nutrient Numeric Endpoints

A sensitivity analysis was performed for the Fallbrook Sump reach using Standard QUAL2K, with results shown in Table 7. This analysis revealed using gage heights at USGS gage locations increases allowable TN and TP concentrations, actually increasing TN and TP concentrations to levels where the spreadsheet was unable to calculate actual concentrations. It also resulted in decreases indicated chl-*a* levels and algal densities. These differences are significant in comparison to Basin Plan limits for nutrients. It appears that relying upon USGS gage height data to define river depth for purposes of the NNE would yield inaccurate results.

Table 7. Stream Depth Sensitivity Analysis — Fallbrook Sump

Stream Depth Estimate	Depth (m)	Allowable Total N (mg/L)	Allowable Total P (mg/L)	Benthic chl-*a* (mg/m2)	Max Algal Density (g/m2)
Stetson (2010) Field Measurements	0.61	0.29	0.1312	15	35

CONCLUSIONS

Inadequate Predictors

The NNE approach appears to offer promise for how States might set nutrient limits that account for the bio-physical cofactors discussed in this article. Unfortunately, this study found that application of the NNE spreadsheet models — touted as "scoping level tools" for assessing whether a stream is healthy or impaired for nutrients, and which are a key feature of the NNE program — are not yet good predictors in this regard.

As noted above, the California State Water Resources Control Board is currently evaluating whether to perform additional scientific research on the NNE, possibly incorporating additional State-specific data and convening an expert panel to provide scientific oversight. The additional work being contemplated in California may rectify the problems discussed in this article.

Doubts Remain

The NNE spreadsheets are designed for use in forming rapid judgments based on readily available data or literature values, but in the case of the Santa Margarita River, they failed. This reassessment of the 2007 Case Study using recently collected site-specific data resulted in significantly different results from the original case study, which relied upon a number of assumptions based on literature values. Did the 2006 Case Study accurately predict key response variables? No. Are the literature-derived values (chosen absent site-specific empirical data) valid for the Santa Margarita River? No. These findings cast doubt on the utility of the NNE spreadsheet models for rivers like the Santa Margarita.

Improvements Advised

It is difficult to envision under what circumstance the NNE spreadsheet models, as they currently stand, would be the appropriate tool to support formal regulatory processes, so the authors urge additional work to improve them. The spreadsheets depend upon input for parameters such as canopy cover and topographic shading, water depth and velocity, and periphyton biomass. Prior to the 2007 Case Study, the Santa Margarita River was the subject of a number of hydrologic, water quality, and hydrogeomorphologic studies. The fact that the relatively broad datasets available to the 2007 Case study were insufficient to accurately characterize the river using extant data and the NNE spreadsheet models raises a number of questions about their utility in less-studied rivers.

Considerations

Important nne considerations include:

- How much confidence should we have in applications of the NNE that rely heavily upon literature values and estimates?
- Are there environmental justice implications for use of the NNE spreadsheets? Might large, well-funded stakeholder groups choose to use a more powerful, more expensive hydrodynamic water quality model rather than the NNE spreadsheet models…leaving only the poorer watersheds to comply impairment listings or regulatory limits based on use of the spreadsheet models?
- Should the regulated community and other stakeholders trust the results of these scoping efforts?
- Is it reasonable to expect that these spreadsheet models, as they currently stand, can be used to characterize a large, complex system?

Mistrust Confirmed

The Santa Margarita stakeholders did not trust the original case study (SDRWQCB, 2006), and they expended scarce resources to collect data and redo the spreadsheet models (Stetson, 2010). The results of our study confirm their initial mistrust in this NNE scoping tool.

Nutrient Numeric Endpoints

Addressing Variation

Sophistication Needs

Based on application of the NNE, and using recent, site-specific, empirical data, would the Santa Margarita River be listed as impaired for nutrients? It depends on which of the Spreadsheet models is to be believed. One method indicates no impairment for all the sites. Another method indicates impairment for the two river sites, but not for the tributary site. The Revised QUAL2K with Accrual Adjustment method does not function properly for any of the sites due to faulty model assumptions regarding seasonality of scouring flows. Clearly, no consensus result can be discerned.

How do the results of the NNE spreadsheet models compare with existing Basin Plan water quality objectives? Again, the results are mixed, indicating targets for nutrients that are either more restrictive or more lenient than the Basin Plan limits, depending on which spreadsheet models are used.

In addition to the findings from this recent study, questions and concerns from 2007 remain, including whether the one-size-fits all approach of State-wide BURCs can adequately address the degree of variation across the State. It seems evident that arid and semi-arid regions should be assessed based on BURC thresholds that are different from wet northern coastal areas or mountain streams.

The NNE is a good concept, and when applied using sophisticated hydrodynamic models, it may perform well and provide decision-makers with an improved basis for setting water quality objectives for nutrients and eutrophication. Indeed, the stakeholders involved in the Santa Margarita River Nutrient Initiative are preparing to perform such modeling and are considering use of the NNE approach as they work toward developing TMDLs, site-specific objectives, or perhaps delisting of reaches and tributaries in the watershed (SMR NI Group, 2013). However, this study indicates that the less sophisticated NNE spreadsheet models need to be upgraded prior to widespread use as a scoping tool to support decisions on listing streams as impaired or in other formal regulatory processes.

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Nutrient Numeric Endpoints

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Acquavella

ACQUAVELLA UPDATE

WASHINGTON'S 36-YEAR OLD WATER RIGHTS ADJUDICATION NEARS AN END

by Jeff Kray, Marten Law Group (Seattle, WA)

INTRODUCTION

Recent Decision

Lengthy Adjudication

Tribal Rights

Nonuse Exception

The Washington State Supreme Court's recent opinion in *Department of Ecology v. Acquavella (Acquavella V)* brings water users in eastern Washington significantly closer to the end of a 36-year battle over water allocation in the state's most fertile agricultural region. Generally, *Acquavella* refers to the Washington State Department of Ecology's (Ecology's) lengthy effort to adjudicate approximately 40,000 claimed rights to surface water in the Yakima River Basin in eastern Washington. The latest Washington State Supreme Court (hereafter "Washington Supreme Court" or "Court') ruling is significant for several reasons. First, it affirms that the Yakama Tribe's "reserved" water rights include the right to store water during non-irrigation season. Second, the Court held that the trial court in the *Acquavella* Adjudication (trial court) failed to determine the amount of irrigation water available to the Yakama Indian Nation and, therefore, remanded the case to determine that amount. Third, the Court also held that the trial court erred when it applied the "determined future development" exception to excuse a private party's nonuse of its water rights.

On remand, once the trial court resolves the remaining issues with the Conditional Final Order (CFO) for the final subbasin of the Yakima Basin — the Ahtanum Subbasin — it can move to enter a Final Decree to resolve the case. Water rights confirmed in the CFOs for each of the subbasins will be integrated into the Final Decree and Ecology will issue certificates for each confirmed water right. The Final Decree is intended to assist Ecology and, as applicable, the US Bureau of Reclamation, in regulating water use in the Yakima Basin. Each certificate of water right issued under the decree will include a priority date, purpose of use, quantity, point of diversion, place of use, and any applicable limitations. Issuing those certificates should bring to a close Washington's longest-running general adjudication.

ADJUDICATION BACKGROUND

General Adjudication

Surface Water Claims

Ecology began the *Acquavella* "general adjudication" in October 1977 after meteorologists predicted record drought for the Basin. A general adjudication is a statutorily authorized judicial process similar to a "quiet title" action, in which all parties "claiming to use waters of a river or stream are joined in a single action to determine water rights and priorities between the claimants." *Dep't of Ecology v. Acquavella*, 100 Wn.2d 651, 652-53, 674 P.2d 160 (1983)(*Acquavella I*); Chapter 90.03 RCW. The Washington Department of Ecology currently has eighty petitions on file requesting general adjudications and started preliminary work in 2007 for a Spokane-area adjudication. Adjudications are intended to sort out all claims to surface water in a basin, establishing the extent, validity, and priority of existing water rights. RCW 90.03.110, et seq.; RCW 90.44.245. Each defendant-claimant is given the opportunity to present evidence: (1) supporting the validity of its claim; and (2) contesting the claims of the other defendants-claimants. Ultimately, the trial court enters a judgment setting forth all confirmed rights so that in times of shortage all water right holders know who is entitled to exercise their rights and in what order (priority) those rights apply.

Federal & Tribal Reserved Rights

A general adjudication does not create new water rights, it only confirms existing rights. RCW 90.03.245. Under Washington's priority system, most water claims are administratively addressed by Ecology and the state's Pollution Control Hearings Board. *See* Ch. 90.03 RCW (surface water) and Ch. 90.44 (groundwater). However, federal reserved water rights and Indian reserved water rights are based on principles of federal law. Under the "McCarran Amendment" (43 U.S.C. § 666(a)), Congress consented to the states naming the United States as a defendant in a general adjudication, both in its direct capacity and as a trustee for one or more Indian Tribes. Thus, a general adjudication is the most appropriate means to address uncertainties over federal and Indian reserved water rights. *See Metro. Water Dist. of So. California v. United States*, 830 F.2d 139 (1987)(citations omitted).

THE *ACQUAVELLA* ADJUDICATION

Acquavella

Many Claims

Large Basin

Federal Irrigation Projects

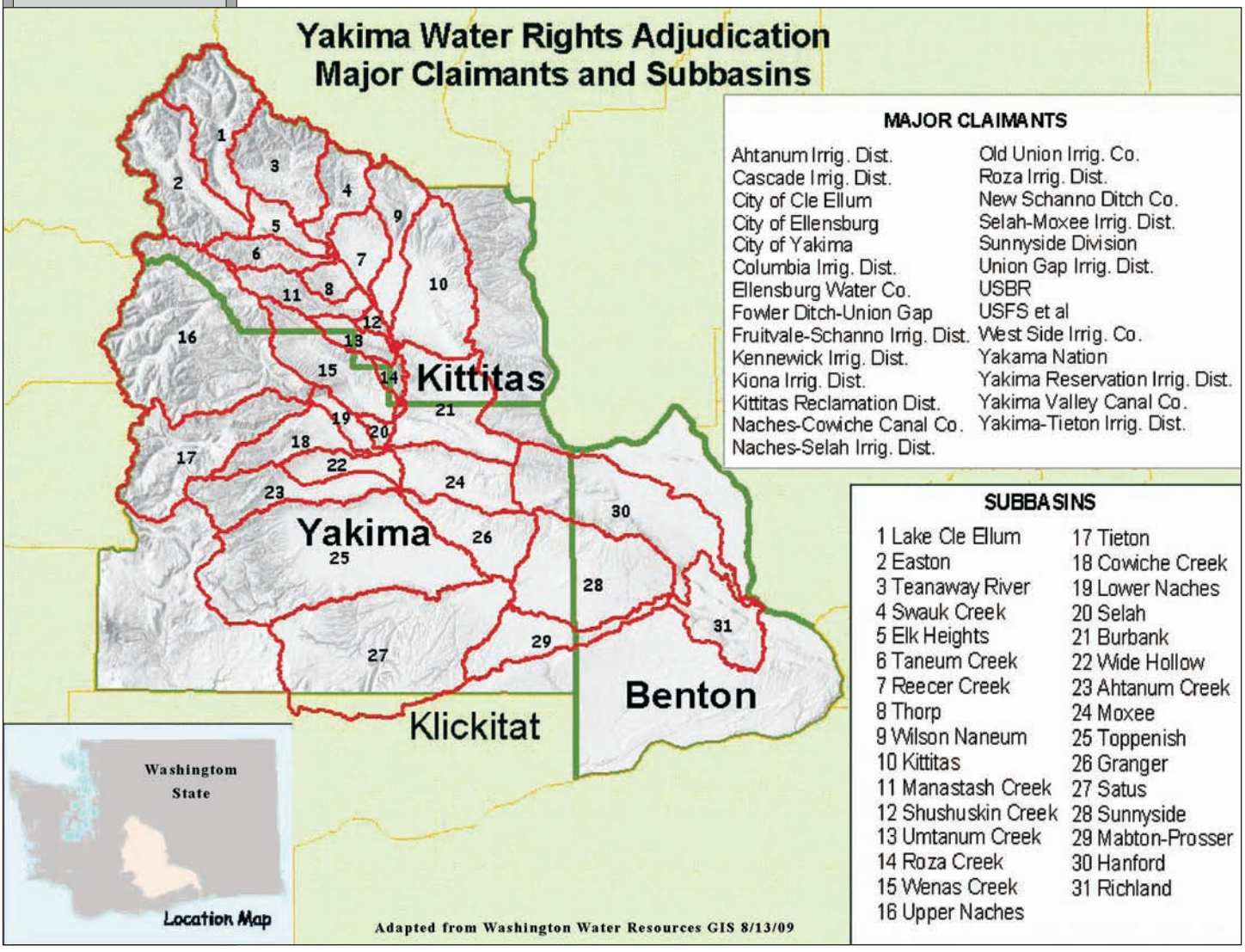
Figure 1.

The *Acquavella* adjudication is an action to quiet title to all surface water rights in the Yakima River Basin, including the entire Yakima Reclamation Project. *Acquavella* has more than 6,600 defendants, including individual water users, irrigation districts, state agencies, the Yakama Indian Nation, and the federal government. The case demonstrates the substantial time and resources necessary for a basin-wide adjudication and raises the question whether such adjudications are cost efficient or effective.

The *Acquavella* adjudication involves parties whose lands are spread over a vast 6,062 square mile basin. The Yakima River commences at the crest of the Cascade Range near Snoqualmie Pass and flows generally southeasterly 175 miles, where it empties into the Columbia River. Its major tributaries are the Kachess River, the Cle Elum River, the Teanaway River, Ahtanum Creek, Toppenish Creek, Satus Creek, and the Naches River. The Yakima River Basin includes a large part of the Yakama Indian Reservation. It also includes six large reservoirs with a total storage capacity of 1,070,700 acre-feet of water and six hydroelectric plants — two operated by the US Bureau of Reclamation (Reclamation), two operated by the US Bureau of Indian Affairs, and two operated by Pacific Power and Light Company. *See* Figure 1: Map of Major Claimants and Subbasins.

Reclamation began building a large irrigation project in the Yakima River Basin in 1905. The Yakima Reclamation Project, as it is known, has 1,946 miles of canals. The Bureau of Indian Affairs constructed the Wapato Project, which has 786 miles of canals, and receives its water under a contract with Reclamation. As of 1973, approximately 475,000 acres were under irrigation in the Yakima River Basin.

Prior to *Acquavella V* (discussed below) this adjudication was the subject of several Washington Supreme Court decisions. In *Sunnyside Valley Irrigation District v. Department of Ecology,* 100 Wn.2d 651, 674 P.2d 160 (1983)(*Acquavella I*), the Court held that Ecology met its procedural due process burden



Acquavella

Earlier Decisions

when it served notice of the adjudication on water suppliers rather than serving all individual water users who got their water under contract from water distributing entities. In *Department of Ecology v. Yakima Reservation Irrig. Dist*., 121 Wn.2d 257, 850 P.2d 1306 (1993)(*Acquavella II*), the Court addressed the scope of the Yakama Nation's tribal reserved water rights. Finally, in *Department of Ecology v. Acquavella,* 131 Wn.2d 746, 935 P.2d 1306 (1997)(*Acquavella III*), the Court addressed the validity of the trial court's water award to the Yakima-Tieton Irrigation District.

Subsequently, Division Three of the Washington Court of Appeals in *Department of Ecology v. Acquavella*, 112 Wn. App. 729, 51 P.3d 800 (2002)(*Acquavella IV*), affirmed the trial court's ruling that a decree from a different adjudication, which declared various water rights in a tributary to the Yakima River (the Teanaway River), meant the doctrine of res judicata barred a claimant from relitigating those rights in the *Acquavella* proceeding. [Editor's Note: Under res judicata, a litigant cannot relitigate an issue that was properly determined previously in another court case].

Res Judicata

Because the *Acquavella* case is so large, the trial court divided claims into four pathways to be determined in the following order:

1) Federal reserved rights for Indian claims
2) Federal reserved rights for non-Indian claims
3) State-based rights of major claimants
4) State-based rights for other claimants, by sub-basin

There are thirty-one total sub-basins in the Yakima River Basin. The Washington Supreme Court's *Acquavella V* decision focuses on surface water rights in the Ahtanum Creek Subbasin (Subbasin 23), the final subbasin to be considered in the Yakima adjudication. *See* Figure 2: Map of Ahtanum Creek Subbasin. The Court had entered Conditional Final Orders (CFOs) for each pathway and for each subbasin — except Ahtanum. The Ahtanum Creek Subbasin is unique because it forms the northern boundary of the Yakama Indian Reservation and is thus home to many major water claimants, including: the United States as trustee to the Yakima Nation; the Nation; Ahtanum Irrigation District; and the John Cox Ditch Company.

Acquavella V

Tribal Rights & *Winters*

The US acts as trustee for the Yakima Nation's federal reserved water rights, rights impliedly reserved in the agreement between an Indian nation and the US government creating an Indian reservation. These types of water rights are also called *Winters* rights after *Winters v. United States*, 207 U.S. 564 (1908), the case that first recognized such rights. *Winters* rights presume that when a reservation was established by treaty, sufficient water was reserved to meet the present and future needs of the reservation. These rights are based in federal common-law rather than the state water code. The Yakima Nation joined the adjudication in its own right, as opposed to relying solely on the US acting as trustee. The Nation was formed in 1855 when 14 confederated tribes and bands in the Yakima Valley signed a treaty with the US, establishing the Yakima Indian Reservation. Ahtanum Irrigation District uses Ahtanum Creek to deliver water to users on the north side of the creek. John Cox Ditch Company is a private corporation formed in the late-1880s. It serves water diverted from Ahtanum Creek to users on the north side of the creek for irrigation, stockwatering, and domestic uses.

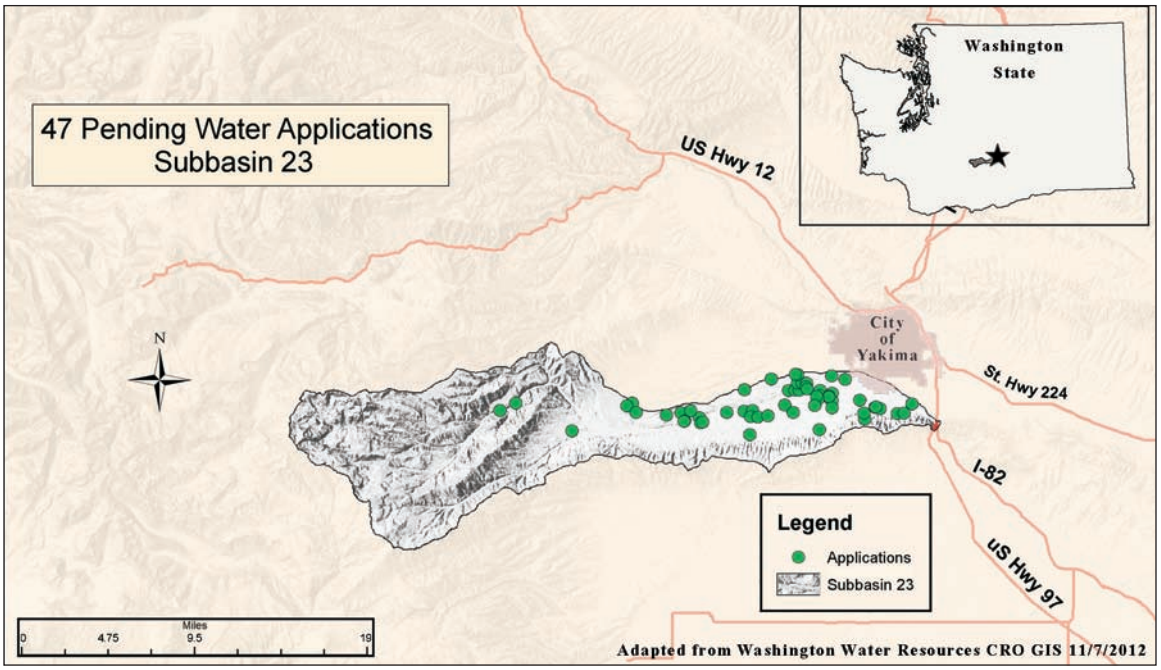


Figure 2.

Acquavella

CFO Appeal

With the entry of the CFO for the Ahtanum Creek Subbasin the adjudication was essentially concluded. However, each of the major entities involved in that Subbasin and several individuals appealed the CFO. In 2002, the trial court issued a 481-page report concerning water rights for the Ahtanum Creek Subbasin. The parties filed exceptions to the 2002 report and conducted additional evidentiary hearings, and in 2008 the trial court issued a 388-page supplemental report. In May 2009, the trial court issued a CFO on the Subbasin and the parties appealed to the Washington Supreme Court.

THE *ACQUAVELLA V* DECISION

On March 7, 2013, the Washington Supreme Court issued its *Acquavella V* decision on those appeals in the Ahtanum Creek Subbasin. The complex legal history underlying the *Acquavella V* decision includes the following milestones:

Historical Milestones

- 1855 Treaty between the Yakama Nation and the United States
- 1908 "Code" Agreement entered on behalf of the Yakima Nation by the chief engineer of irrigation for the Bureau of Indian Affairs, W.H. Code, and the United States Secretary of the Interior
- 1926 "*Achepohl* Decree" apportioning Ahtanum Creek water among users north of the creek, except the Yakama Nation, who was not a party to that adjudication process. The Washington Supreme Court affirmed the *Achepohl* Decree in *State v. Achepohl*, 139 Wash. 84, 101, 245 P. 758 (1926)
- *United States v. Ahtanum Irrigation Dist*., 236 F.2d 321 (9th Cir. 1956)(*Ahtanum I*) decision recognizing the Yakima Nation's *Winters* rights and affirming the Code Agreement
- *United States v. Ahtanum Irrigation Dist.,* 330 F.2d 897 (9th Cir. 1964)(*Ahtanum II* or "Pope Decree") decision decreeing water rights in Ahtanum Creek among the United States, the Yakama Nation, and the "Northside users" (John Cox, Ahtanum Irrigation District, La Salle High School, and several individuals)

PIA″ Standard

Several of the key issues addressed in *Acquavella V* involve the quantity of water allocated to the Yakama Nation, particularly under the Pope Decree. A tribe's water rights reserved for irrigation are determined by the "**p**racticably **i**rrigable **a**creage" standard (PIA). PIA is determined by calculating "the amount of water sufficient to irrigate all the practicably irrigable acreage on a reservation." *Arizona v. California*, 373 U.S. 546, 600, 83 S. Ct. 1468, 10 L. Ed. 2d 542 (1963), overruled on other grounds by *California v. United States*, 438 U.S. 645, 98 S. Ct. 2985, 57 L. Ed. 2d 1018 (1978). It is a measure of how much land is and could feasibly be irrigated in the future. *See Arizona v. California*, 373 U.S. at 600. The trial court looked to the record established in *Ahtanum I* and *II* to determine that the reservation's PIA is 4,107.61 acres. *Acquavella V Slip Opinion* at 17.

Issues on Appeal (US)

On appeal to the Washington Supreme Court, the US asked the Court to reverse and remand the case and determine, among other things, that:

- The reservation's PIA is 6,381.3 acres, based on evidence the US presented to the trial court. *Id.* at 18
- The trial court erred when it limited the reservation's water use to the irrigation season from April 1 to October 1, with the US arguing that the Pope Decree allows the tribe to exercise its treaty rights and divert water year-round
- The trial court erred when it determined that the Pope Decree precludes the Nation from exercising a storage right
- The trial court improperly included in its confirmation of the US' right a number of non-Indian successors to what was once tribal land

Yakama Nation Position

The Yakama Nation joined the US on these arguments. Ecology also agreed with the US and the Nation that the trial court should have used the PIA standard — rather than relying on the federal Ahtanum litigation — to quantify the reservation's irrigation right, and that the trial court erred in holding there was no right to take water outside the irrigation season and no right to store water. *Id*. at 19-20.

Remand for PIA Determination

Central to each of these issues was a question of whether the federal *Ahtanum* cases "constituted merely an allocation of water rights as between the reservation and the Northside users or an adjudication of the Northside users' water rights." *Id*. at 27. The Court determined that the federal *Ahtanum* litigation was an adjudication of the Northside users' rights. The Court went on to hold that although there were several figures available from the *Ahtanum* record quantifying or approximating the Yakama Reservation's PIA, "[n]owhere in the *Ahtanum* federal district court proceedings was there a finding of fact as to the reservations practicably irrigable acreage." *Id*. at 35. For that reason, the Court remanded the case to the trial court to determine the Reservation's PIA.

Storage Rights

Significantly, the Court also held that the trial court erred when it denied the Yakama Reservation a right to store water during the non-irrigation season from October to April. *Id*. at 37. The Court simply determined that the Pope Decree did not — by its plain language — foreclose a storage right and, therefore, that the trial court erred. The Court did not, however, provide any further analysis or guidance for determining when a federal reserved water right includes a storage right. The Court directed the trial court to determine the extent of the Reservation's storage rights as part of its PIA determination.

Acquavella

"Excess Water"

Relinquishment

Nonuse Exception

"Future Use" Exception

With respect to the irrigator's issues, the Court affirmed the trial court's confirmation of certain rights to "excess water" (available when all water rights confirmed in the federal decree are satisfied), and the trial court's denial of other claims to excess water, including such claims for use of excess water after July 10 of each year. The Court rejected the latter claims because they were not confirmed in the federal litigation over Ahtanum Creek water rights. The Court similarly affirmed the trial court's decisions to deny other water rights claims, including the claim of La Salle High School.

The Court also held that the trial court erred when it confirmed a water right for the Hagemeiers (individual water claimants). The Hagemeiers bought irrigated land in approximately 1986 intending to live on it and use it as pasture. Career obligations, however, kept them from carrying out their plans for nine years, at which point they began to irrigate the land. Ecology argued that the Hagemeiers had relinquished their right to water by failing to continuously use the water. The trial court disagreed, finding that the Hagemeiers nonuse was excused under Washington's "future use" statute. RCW 90.14.140(2)(c); also called the "determined future development" exception to relinquishment. Under that statute, "there shall be no relinquishment of any water right…if such right is claimed for a determined future development to take place either within fifteen years of July 1, 1967, or the most recent beneficial use of the water right, whichever date is later." In Washington, water rights are relinquished after five consecutive years of nonuse. RCW 90.14.160, .170, .180. The trial court reasoned that the Hagemeiers made it into the future use safe harbor by resuming water use within fifteen years.

The Washington Supreme Court disagreed, concluding that the trial court read the "future use" exception too broadly. The Court held that the facts showed that the Hagemeiers did not take any steps toward "development" and, therefore, did not meet their burden of establishing the exception. The Court's opinion on this issue does not break any new legal ground because the Court simply concluded that there was no evidence on the record to support the Hagemeiers' determined future development claim. For the Court's articulation of the appropriate legal standards applicable to this exception, see the Court's opinion in *R.D. Merrill Co. v. Pollution Control Hearings Bd*., 137 Wn.2d 118, 142-43, 969 P.2d 458 (1999).

RECONSIDERATION MOTIONS

Seasonal Extension

In March 2013, four parties filed motions for the Washington Supreme Court to reconsider portions of its opinion. Appellant Ahtanum Irrigation District sought an order modifying the opinion to provide Ahtanum with seasonally less restrictive rights to excess water. Appellant Yakama Nation sought an order clarifying the scope of the remand to the trial court. Appellant John Cox Ditch Company sought an order modifying the opinion to provide John Cox with less restrictive rights to excess water. Appellants La Salle High School and Donald and Sylvia Brule sought an order modifying the opinion with regard to its applicability to those parties. On May 22, 2013, the Court issued an Order Changing Opinion and an Order Denying Further Consideration. The Order Changing Opinion granted John Cox Ditch Company's request for seasonally less restrictive water rights, expanding its right to use excess water from a May 15 end date to a July 10 end date. The Court also made a few other minor changes to the opinion but generally denied reconsideration for any party other than John Cox Ditch Company.

Tribal Rights Quantification

On remand, the Yakama Nation and the US will now have an opportunity to demonstrate that they should be awarded a right for additional water to irrigate more acres than they were confirmed in the trial court's April 2009 Conditional Final Order. In April 1994, the US filed a trial brief making an offer of proof on the quantity of the Yakama Nation's rights to water in the Ahtanum Basin. The brief summarized eight experts' analyses of issues related to quantifying the Nation's water rights including: irrigation land classification; hydrograph surveys; land use studies; dam studies; soil studies; irrigation systems designs; municipal studies; water supply studies; water availability investigations; analysis of hydrology and hydraulics for Ahtanum Dam and a possible future dam to capture spring flood flows; and related cost estimates.

PIA Extent

The trial court has previously determined that the Yakama Nation's PIA is 4,107.61 acres. The April 2009 brief claimed that as of 1987 the Yakama Nation was irrigating 2728.7 acres, that in the future the Nation could practicably irrigate another 3652.6 acres, and, therefore, that the Nation's total practicably irrigable acreage within the reservation to be serviced by surface waters of Ahtanum Creek is 6381.3 acres. On remand to the trial court, the US and the Yakama Nation now rely on that brief as their proof that the Nation is entitled to a right to irrigate an additional 2,273.69 acres (mostly for orchards) more than the trial court previously determined.

Remaining Issue

The other parties have until October 10, 2013 to file briefs challenging the US' offer of proof. If the offer is not challenged, then the trial court may be able to issue a Final Decree in a few months. If, however, the offer is challenged, then the case will move into a new phase of complex discovery, experts' depositions and declarations, and trial, with the possibility of several more years of litigation.

Acquavella

Future Adjudications

CONCLUSION

Despite the possibility that the Ahtanum Subbasin may require further resolution, the *Acquavella* Adjudication has reached a significant milestone. The trial court has adjudicated the rest of the Yakima Basin, issuing over 60 CFOs — each a mini-final decree for those subbasins and pathways. As a result, the process has adjudicated approximately 15% of Washington's surface water rights, providing stable expectations for water users in those areas.

The possibility of Washington State initiating future adjudications is primarily budget driven. The best candidate for a future adjudication is the Spokane River Basin, which lies partially in Washington and partially in Idaho. Idaho is conducting the Northern Idaho Adjudication of the portion of the basin in that state. Ecology has completed preliminary work in preparation for a Spokane River adjudication. However, the Washington legislature did not appropriate any money for a Spokane adjudication in the budget for the current biennium, which runs from July 1, 2013 to June 30, 2015. Thus, further action leading to a formal start of an adjudication in Washington is currently on hold, pending funding and a formal decision to proceed.

For Additional Information:
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Acquavella V available at:
www.courts.wa.gov/index.cfm?fa=controller.managefiles&filePath=Opinions&fileName=862117.pdf

Jeff Kray's practice focuses on water quality, water resources, and complex environmental litigation, including Clean Water Act permitting and regulatory compliance, and CERCLA (Superfund) site remediation. He has represented public and private clients throughout the west. Over a nearly 20-year career, Jeff has litigated administrative hearings, conducted numerous trials, and appeared in federal and state appeals. Jeff regularly advises businesses in water quality permit compliance and defense matters, stormwater pollution prevention, hazardous waste spill prevention and cleanup, and cost recovery litigation. He also frequently consults with water right owners and purchasers on preserving, acquiring, and transferring water rights. He has assisted a broad range of clients, including manufacturers, commercial and timberland owners, interstate transporters, lumber mills, ports, water suppliers, and municipalities. Jeff is a frequent speaker and writer on water law and policy. He recently authored a chapter on water and climate change for the treatise *Waters and Water Rights* (Michie 3rd Ed. 2009). He has lectured extensively on the Clean Water Act, state water quality laws, and state and federal water rights. He holds leadership positions in the Water Resources and Water Quality and Wetlands Committees of the American Bar Association's Section on Environment, Energy, and Resources.

Please Note:
Author Jeff Kray will be delivering a presentation on "*Water Transfers: What They Are and What They Can Do for a Water Right*" at the upcoming
6th Annual Water Transfers Conference
to be held October 9th and 10th in Seattle.
Program Co-Chair will be **Ecology Director Maia Bellon**,
whose interview appeared in last month's issue of *The Water Report*.

Colorado River Management

2014 Lake Powell Release Forecast

24-Month Studies

Figure 1: Lakes Mead & Powell Storage History

COLORADO RIVER MANAGEMENT & DROUGHT

LAKE POWELL RELEASES TO BE LOWERED SIGNIFICANTLY

by David Moon, Editor

INTRODUCTION

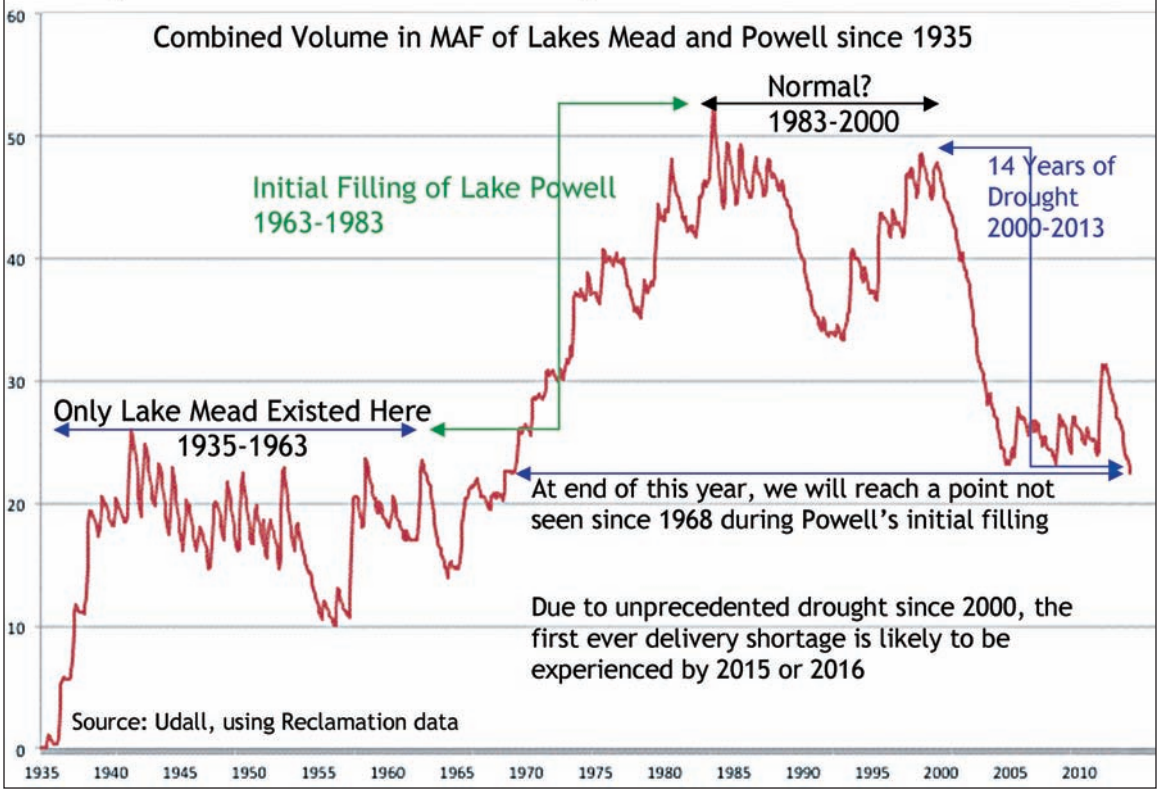
The Colorado River is the virtual lifeblood for seven southwestern states in the US, including its largest user, California. The River provides critical economic, environmental, and cultural underpinnings for the entire region. The allocation of its finite waters — particularly in a time of drought and scarcity — is a source of ongoing controversy and considerable public expenditure.

On August 16th, the US Bureau of Reclamation (Reclamation) issued its latest 24-month forecast concerning projected operations of Colorado River system reservoirs over the next two years. The projected release from Lake Powell for upcoming water year 2014 (running from October 1, 2013 through September 30, 2014) is roughly 750,000 acre-feet less than what will have been released during the current (2013) water year and, if unchanged, will be the lowest release from Lake Powell since its initial filling in the 1960s. (*See* Sidebar (next page) and Figure 1).

Reclamation's 24-Month Studies are projections that are updated monthly and are subject to change as the year progresses and actual hydrology, operations and forecasts diverge from those used to produce specific 24-Month Study projections. However, coming after 14 years of regional drought, the historically low projection in itself provides yet another clear indication that water managers in the Southwest are dealing with unprecedented pressures on their water distribution systems. [The August 24-Month Study is available on the Reclamation websites for the Upper and Lower Colorado Regions: Upper Colorado Region: www.usbr.gov/uc/water/crsp/studies/index.html; and Lower Colorado Region: www.usbr.gov/lc/region/g4000/24mo/index.html.]

This article provides a brief overview of Reclamation's management of Colorado River Basin reservoirs before reporting on a conference presentation focused on Southwest water management challenges given by Pat Mulroy, General Manager of the Las Vegas Valley Water District and the Southern Nevada Water Authority — a presentation which happened to coincide with Reclamation's August 16th announcement.

Figure 1: Contents of the Two Largest Reservoirs in the United States



Specific Reclamation Figures

CURRENT DATA & CURRENT FORECASTS

Reclamation's August 16th forecast projected the release of 7.48 **m**illion **a**cre-**f**eet (maf) from Lake Powell for water year 2014. Releases from Lake Powell into the Colorado River were set at 8.23 maf volume for water year 2013.

The "Inflow Forecasts and Model Projections" on Reclamation's website for Lake Powell (as of 9/3/13) noted that the hydrologic forecast for Lake Powell for water year 2014 projects that the most probable (median) unregulated inflow volume will be 8.32 maf (77% of average based on the period 1981-2010). At this point in 2013, there is significant uncertainty regarding next year's water supply. The forecast ranges from a minimum probable (90% exccedence) of 5.0 maf (46% of average) to a maximum probable (10% exceedence) of 15.5 maf (143% of average). There is a 10% chance that inflows could be higher than the maximum probable and a 10% chance they could be lower than the minimum probable (*see* www.usbr.gov/uc/water/crsp/cs/gcd.html).

The August 2013 24-Month Study set out the detailed explanation of Reclamation's decision to release 7.48 maf based on its forecast, as follows: "Consistent with Section 6.C.1 of the Interim Guidelines, if the August 24-Month study projects the January 1, 2014, Lake Powell elevation to be less than 3,575.0 feet and at or above 3,525.0 feet and the Lake Mead elevation to be at or above 1,025.0 feet, the operational tier for Lake Powell in water year 2014 will be the Mid-Elevation Release Tier and the water year release volume from Lake Powell will be 7.48 maf. This August 2013 24-Month study projects that, with an 8.23 maf annual release pattern in water year 2014, the January 1, 2014, Lake Powell elevation would be 3,573.69 feet and the Lake Mead elevation would be 1,107.39 feet. Therefore, consistent with Section 6.C.1 of the Interim Guidelines, the Lake Powell operational tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf. This determination will be documented in the 2014 AOP [Annual Operating Plan], which is currently in the final stages of development."

As of September 3rd, Lake Mead was at 47% capacity at elevation 1106.31 (feet above mean sea level) and Lake Powell was at 44% capacity at elevation 3589.60 (*see* Lower Colorado Water Supply Report at: www.usbr.gov/lc/region/g4000/weekly.pdf). The September 3rd report also stated that water year 2013 precipitation to date for the Upper Colorado Basin was 83% of normal.

The August 2013 24-Month Study included a short summary of other pertinent information which led to Reclamation's determination. According to Reclamation, current runoff and runoff projections into Lake Powell are as follows: Observed unregulated inflow into Lake Powell for the month of July was 0.143 maf or 13 percent of the 30-year average from 1981 to 2010. The forecast for August unregulated inflow into Lake Powell is 0.160 maf or 32 percent of the 30-year average. The preliminary observed 2013 April through July unregulated inflow is 2.56 maf or 36 percent of average. In this study, the calendar year 2013 diversion for Metropolitan Water District of Southern California (MWD) is forecasted to be 0.992 maf. The calendar year 2013 diversion for the Central Arizona Project (CAP) is forecasted to be 1.597 maf. Consumptive use for Nevada above Hoover (SNWP Use) is forecasted to be 0.239 maf for calendar year 2013.

RECLAMATION'S RESERVOIRS MANAGEMENT

Management Guidelines

The August forecast by Reclamation was made as part of its ongoing management of Colorado River reservoirs which proceeds in accordance with the *2007 Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead* (2007 Interim Guidelines). Based on the best available data projections of Lake Powell and Lake Mead reservoir elevations, Reclamation decided that a release of 7.48 **m**illion **a**cre-**f**eet (maf) from Lake Powell is required for water year 2014 ("Mid-Elevation Release Tier"). Lake Mead (downstream of Lake Powell) is projected to decline an additional eight feet during 2014 as a result of the reduced Lake Powell annual release. The Lake Powell operational tier for water year 2013 is the "Upper Elevation Balancing Tier" which involves a release of 8.23 maf. (*See* Figure 2).

The 2007 Interim Guidelines Record of Decision was signed by the Secretary of the Interior after extensive consultation with the seven Colorado River Basin states, Native American Tribes, federal agencies, environmental organizations, and other stakeholders and interested parties. The Colorado River Basin is comprised of the "Upper Basin States" of Wyoming, Utah, Colorado, and New Mexico and the "Lower Basin States" of Nevada, Arizona, and California. The Interim Guidelines were adopted to coordinate reservoir management strategies and address annual operations of Lake Powell and Lake Mead, particularly under low reservoir conditions. The Interim Guidelines are available for download at: www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf.

It is important to note that, in its press release concerning the August forecast, Reclamation stated that Lake Mead will operate under "normal conditions" in calendar year 2014 — i.e., water users in the Lower Colorado River Basin and Mexico will receive their full water orders (allocations) in accordance with the 2007 Interim Guidelines and the 1944 Treaty with Mexico.

By planning ahead for varying reservoir levels, the 2007 Interim Guidelines are intended to provide Colorado River users, especially those in the Lower Basin States of Arizona, Nevada and California, with a greater degree of certainty about annual water deliveries. The 2007 Interim Guidelines also define the specific lower reservoir levels that would trigger delivery shortages and specify those reduced delivery amounts to the Lower Colorado River Basin. Further information about the 2007 Interim Guidelines is available at www.usbr.gov/lc/region/programs/strategies.html.

Drought Consequences

In recent years, stakeholders throughout the Colorado River Basin have become increasingly aware that allocations stipulated under the Colorado River Compact of 1922 — and the numerous federal laws, court decisions, contracts, and regulatory guidelines collectively known as "The Law of the River" — were based on an assumptions of water availability in the Colorado River that were simply too high. [For a thorough yet concise compilation of the relevant pieces of the Law of the River, including the 2007 Interim Guidelines and the 1944 Treaty with Mexico, see MacDonnell, *TWR* #112.] Persistent drought is bringing these overly optimistic assumptions into sharp focus.

Colorado River Management

Future Availability

Arizona v. California

Figure 2.

In an August 16th press release, Reclamation's Upper Colorado Regional Director Larry Walkoviak noted, "This is the worst 14-year drought period in the last hundred years." He added that, "Reclamation's collaboration with the seven Colorado River basin states on the 2007 Interim Guidelines is proving to be invaluable in coordinating the operations of the reservoirs and helping protect future availability of Colorado River water supplies."

Reclamation's Lower Colorado Regional Director Terry Fulp pointed out the variability of Basin conditions: "With a good winter snowpack next year, the outlook could change significantly as it did in 2011, but we also need to be prepared for continuing drought. Currently, the longer-term projections from Reclamation's hydrologic models show a very small chance of lower basin delivery shortages in 2015, with the first significant chance of reduced water deliveries in the lower basin in 2016. These projections will be updated monthly and will reflect changes in weather and the resulting hydrology." (*See* Figure 1).

BASIN FUTURE

CONFLICT OR COLLABORATION?

Coinciding with Reclamation's August announcement and involving particularly timely presentations, the Getches-Wilkinson Center for Natural Resources, Energy, and the Environment held its "Annual Clyde Martz Conference" on August 15-16, 2013, in Boulder, Colorado. This year the conference focused on the 50th anniversary of the landmark Colorado River decision in *Arizona v. California*. Entitled "*Arizona v. California* at 50: The Legacy and Future of Governance, Reserved Rights, and Water Transfers" — the conference featured an outstanding lineup of speakers and panelists from all over the Colorado Basin who shared their expertise concerning the Colorado River. As noted in the conference materials, *Arizona v. California*, 373 U.S. 546 (1963), is an important landmark in the continually evolving relationship between these two states. The case allocated 7.5 million acre-feet (maf) of annual consumptive use of the Colorado River to California (4.4 maf), Arizona (2.8 maf), and Nevada (0.3 maf), based on an interpretation of the Boulder Canyon Project Act. It also clarified federal rights and responsibilities concerning the use of water from the Colorado River, the role of the Secretary of the Interior in water management of the River, and the ability of Congress to allocate water.

Lake Powell & Lake Mead: Operational Diagrams and Conditions on 9/2/2013

Lake Powell			Lake Mead		
Elevation (feet)	Operation According to the Interim Guidelines	Live Storage (maf)[1]	Elevation (feet)	Operation According to the Interim Guidelines	Live Storage (maf)[1]
3,700	**Equalization Tier** Equalize, avoid spills or release 8.23 maf	24.3	1,220	**Flood Control Surplus or Quantified Surplus Condition** Deliver > 7.5 maf	25.9
3,636 - 3,666 (2008-2026)	**Upper Elevation Balancing Tier**[3] Release 8.23 maf; if Lake Mead < 1,075 feet, balance contents with a min/max release of 7.0 and 9.0 maf	15.5 - 19.3 (2008-2026)	1,200 (approx.)[2]	**Domestic Surplus or ICS Surplus Condition** Deliver > 7.5 maf	22.9 (approx.)[2]
3,590		10.78	1,145		15.9
9/2/2013		9/2/2013	1,106 9/2/2013	**Normal or ICS Surplus Condition** Deliver ≥ 7.5 maf	12.31 9/2/2013
3,575	**Mid-Elevation Release Tier** Release 7.48 maf; if Lake Mead < 1,025 feet, release 8.23 maf	9.5	1,075	**Shortage Condition** Deliver 7.167[4] maf	9.4
3,525		5.9	1,050	**Shortage Condition** Deliver 7.083[5] maf	7.5
3,490	**Lower Elevation Balancing Tier** Balance contents with a min/max release of 7.0 and 9.5 maf	4.0	1,025 1,000	**Shortage Condition** Deliver 7.0[6] maf Further measures may be undertaken[7]	5.8 4.3
3,370		0	895		0

Diagram not to scale

[1] Acronym for million acre-feet

[2] This elevation is approximate as it is determined each year by considering several factors including Lake Powell and Lake Mead storage, projected Upper Basin and Lower Basin demands, and an assumed inflow.

[3] Subject to April adjustments which may result in a release according to the Equalization Tier

[4] Of which 2.48 maf is apportioned to Arizona, 4.4 maf to California, and 0.287 maf to Nevada

[5] Of which 2.40 maf is apportioned to Arizona, 4.4 maf to California, and 0.283 maf to Nevada

[6] Of which 2.32 maf is apportioned to Arizona, 4.4 maf to California, and 0.280 maf to Nevada

[7] Whenever Lake Mead is below elevation 1,025 feet, the Secretary shall consider whether hydrologic conditions together with anticipated deliveries to the Lower Division States and Mexico is likely to cause the elevation at Lake Mead to fall below 1,000 feet. Such consideration, in consultation with the Basin States, may result in the undertaking of further measures, consistent with applicable Federal law.

Colorado River Management

Las Vegas & Lake Meads' Intake 1

Third Intake

Release Forecast

Potential Solutions & Climate Change

Message to DC

Collaboration

Pat Mulroy, the General Manager of the Las Vegas Valley Water District and the Southern Nevada Water Authority (SNWA) for over 20 years, directly addressed the then-just-released Reclamation forecast. SNWA is responsible for acquiring, treating, and delivering water to local agencies that collectively serve two million residents and nearly 40 million annual visitors to Las Vegas. Thus, the Colorado River and the operation of Lakes Powell and Mead are intricately tied to SNWA's water operations.

Ms. Mulroy continues to be very active and vocal concerning both regional water issues and western water issues in general. Her presentation discussed in some detail what she believes is the approach Basin water users must take in order to address the challenges posed by water shortages.

Ms. Mulroy initially discussed certain SNWA-specific problems, including some of the Lake Mead issues facing SNWA. "We [SNWA] have a facilities problem. We need to declare an emergency for a $12.2 million fix for a relatively minor but urgently needed modification to the existing Intake 1 facility at Lake Mead, which will effectively buy us some more time before it goes out of service." Her statement addressed the fact that the Intake 1 facility will go "out of service" when Lake Mead's water level drops below that facility's intake level — thereby rendering it useless. Over the last few years Ms. Mulroy has been deeply involved in planning for Las Vegas' future in relation the dropping water levels at Lake Mead. Ms. Mulroy explained that SNWA will need a third intake to keep its customers supplied when Lake Mead water levels drop below certain elevations, stating, "It will cost us $817 million to build a third intake from Lake Mead — and that is with the same amount of ratepayers." This conundrum of high facilities costs, with the base of ratepayers remaining nearly the same, is one that many other municipalities in the US face due to aging infrastructure — though perhaps not with per capita costs as steep as those faced by Las Vegas. The third intake is discussed on SNWA's website as follows: "In order to address unprecedented drought conditions and provide long-term protection of Southern Nevada's primary water storage reservoir — Lake Mead — the Southern Nevada Water Authority (SNWA) Board of Directors approved the construction of a new drinking water intake in May 2005. The intake is designed to maintain SNWA's ability to draw upon Colorado River water at lake elevations as low as 1,000 feet above sea level. This will ensure system capacity if lake levels fell low enough to put Intake No. 1 out of service. It also will protect municipal water customers from water quality issues associated with declining lake levels. Construction on this third intake is scheduled for completion in 2014."

Ms. Mulroy then turned to Reclamation's forecast and announcement — released the morning of the day she spoke — which stated that delivery from Lake Powell to Lake Mead would be dropping from 8.23 maf to 7.48 maf. She first alluded to a local reporter's attempt to goad her into taking sides and drawing battle lines, when he asked her what her reaction was to what Reclamation "had done to Las Vegas." Though well known as a feisty protector of the needs of Las Vegas and her customers, Ms. Mulroy's theme on this day was one of collaboration and education as opposed to confrontation. "If we leave a vacuum, [others] will define it. We [Colorado River water users] must define it, so they will accept it. It's up to us to tell the public how we want it defined…We should stand up and say, 'All of us have a problem. Get real here!' "

Speaking of potential solutions, Ms. Mulroy pointed out two issues she felt must be addressed within the context of increasing climate change. "There are two solutions going forward. One, money. We have impatience with a dysfunctional [federal] government. There is no national water strategy. What we need is not a policy, but a strategy going forward — a strategy recognizing climate change. Don't pay for damage afterwards, but use dollars to mitigate and avoid problems. Don't fix damage after damage occurs — spend dollars to avoid damages. Second, science. If sequester cuts come to NOAA [the National Oceanic and Atmospheric Administration], we're all in big trouble — we need good science. It's time to stop the religious discussion over climate change! The climate change scenario is moving faster than any of us anticipated. We have to adapt! I don't know long the drought will last or how deep the drought will go."

Ms. Mulroy continued her discussion regarding collaboration and eventually addressed the message that needed to be sent back to Washington, DC. "We're [Colorado River water users] looking for the new fulcrum — the new balance point. Stop looking for what was, look for what can be: an equal stake and an equal say at the table. We need to find the language the public can understand. Don't talk about winners and losers or they [the public] will talk about winners and losers. Build on successes of the last twenty years and make that work for us. We need to deliver a message to the dysfunctional body [Congress] — you have an interest; you are a partner, [including being] a partner financially."

Stressing the need to work together to address the Basin's water needs, Ms. Mulroy pointed back to previous battles between water users. "If we look to create winners and losers over the next 24 months there will be only one loser — all of us. We have to stop pointing fingers, stop vilifying. We're entering an introspective period: how do I have to change…to alleviate the burden — [From the viewpoint of such introspection] there is no Upper Basin or Lower Basin."

In closing, Ms. Mulroy reiterated the need to work together to deal with the inevitable shortages facing the Basin. "My final urging is that attitude can make a difference; that there is a pathway and it can be done. [The focus of our] energy has to be around 'Yes, we can.' We need to make sacrifices and get

Colorado River Management

Collaboration?

through it. Find that positive energy and that willingness — what can we [everyone] bring to the table? Use that attitude and rattle some cages back in DC."

In conclusion, Ms. Mulroy related her own worst nightmares as a water agency manager: water shortages and uncertainty. "[The] 1025 [elevation level at Lake Mead] is a super scary number — I have a facility problem. And it will snow again. I just don't know how deep or how long the drought will be."

CONCLUSION

The theme of collaboration as the preferred approach, given the significant reductions in Lake Powell releases, was carried on by other speakers at the conference in Boulder. Several speakers also touched on the impact of climate change on water shortages in the Colorado Basin and elsewhere. Whether or not that spirit of collaboration and cooperation can be carried back to Washington, DC — along with the realization that climate change is occurring and that delaying our response only increases our costs — remains to be seen.

Meanwhile, the reality of growing water demands and shrinking water supplies remains daunting.

Shrinking Supplies

Reclamation's "Upper Colorado River Basin Hydrology" website points out that the Basin "has experienced significant year to year hydrologic variability. During the period 2005 through 2012, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, averaged a water year volume of 10.22 maf (94% of average (period 1981-2010)). The unregulated inflow has ranged from a low of 4.91 maf (45% of average) in water year 2012 to a high of 15.97 maf (147% of average) in water year 2011." (*See* www.usbr.gov/uc/water/crsp/cs/gcd.html).

Unfortunately, Reclamation is predicting that water year 2013 unregulated inflow "is expected to be 4.33 maf (40% of average), which would be a second significantly below-average year in a row. If this occurs, the period 2000-2013 would be the driest 14-year period on record with an average annual unregulated inflow of 8.20 maf per year." That prediction has only the month of September left within which to change — everyone in the Basin has already experienced a dry spring and summer.

The current drought shows no sign of abating at present. It may well be the driver that leads Colorado Basin water users to collaborate and coordinate so that the needs of the Basin are brought to the attention of decision-makers in Washington, DC, as well as in the seven Colorado Basin states.

For Additional Information:
Terry Fulp, Reclamation, 702/ 293-8411 or TFulp@usbr.gov
Annual Clyde Martz Conference (videos of the presentations):
http://lawweb.colorado.edu/events/mediaDetails.jsp?id=4897

AVC Project

ARKANSAS VALLEY CONDUIT IN COLORADO

REGIONAL WATER PIPELINE PROJECT

Condensed/Edited from US Bureau of Reclamation documents

INTRODUCTION

Regional Project

In August, the US Bureau of Reclamation (Reclamation) released its **f**inal **e**nvironmental **i**mpact **s**tatement (FEIS) for the Arkansas Valley Conduit, a $400 million water pipeline project designed to supply water to some 74,000 people in southeastern Colorado. Reclamation is the lead federal agency for preparation of this FEIS. The FEIS states that the proposed actions would deliver high quality water to water providers that meets US Environmental Protection Agency (EPA) and state water quality requirements and recommendations, and would help water providers throughout the Arkansas River Basin reliably meet existing and future water demands. The FEIS discloses potential environmental consequences associated with the proposed project.

BACKGROUND

NEED FOR THE PROJECT

Groundwater Supply Issues

Currently, the Lower Arkansas River Basin communities in southeastern Colorado use groundwater wells to supply most of their drinking water. That supply is questionable, as more and more towns find that their groundwater contains cancer-causing radioactive contaminants such as naturally occurring radium and uranium. Fourteen water providers are currently under orders by the Colorado Department of Public Health and Environment (CDPHE) to remove the radioactivity using expensive treatment technology or to find a better quality water source. Seven additional AVC water providers have elevated levels of natural radioactivity, but do not currently violate Health Department standards. Long-term exposure to radioactivity that exceeds primary drinking water standards could increase the risk of cancer.

AVC Project

Salts & Sulfates

AVC water providers also generally have difficulties meeting nonmandatory secondary drinking water standards for salts and sulfate. The median salts concentration over the past 40 years has been about 3,400 mg/L in Lower Arkansas River Basin groundwater (Miller et al. 2010), which is nearly seven times greater than the secondary drinking water standard. Some AVC water providers also are not meeting the secondary drinking water standard for iron. Similar to radionuclides, salts and sulfate are not removed by conventional water treatment methods. The dissolved salts in the Lower Arkansas River Basin groundwater, although not a public health threat, also cause taste and odor issues and burden residents with higher maintenance and replacement costs when using water-based appliances such as dishwashers and water heaters.

Water Demands

AVC water providers also have a need to meet future water demands. Estimated future (2070) AVC water provider demand is 12,569 acre-feet. Future demand was estimated by applying projected population growth rates to future per capita water use rates — which were reduced from current per capita water use rates based on estimated water conservation savings.

River Contamination

Simply replacing contaminated groundwater supplies with surface water from the Arkansas River is problematic because the river is also contaminated with high levels of selenium, sulfates, uranium, and salts. Lower Arkansas River Basin water providers have worked for years with CDPHE to resolve water quality challenges and have committed to find an alternative water supply as part of a long-term solution.

Backup System

Interconnect water providers need a backup system between the north and south outlet works of Pueblo Reservoir to serve about 1.5 million people in the future. Municipal and industrial water providers are vulnerable to any outlet works outage (for example, during maintenance) because these outages often disrupt service to customers. Need for the Interconnect includes the following: prevent disruption of water service from short or long outages, depending on internal system storage varying from a few days to weeks; improve water quality and reduce operational costs during outlet works maintenance and emergency activities for water providers with backup river diversions; and prevent disruptions of water delivery to the Pueblo Fish Hatchery during fish rearing. If a short-term outage of either outlet occurs, the Interconnect would allow participating water providers to receive water from Pueblo Reservoir through the other working outlet.

Storage Water

For Master Contract water providers not participating in AVC, demand is projected to increase to 54,493 acre-feet by 2060. Although some Master Contract water providers have sufficient supplies to meet future demands on an annual basis, the Master Contract is needed to fulfill demand in winter months when streamflow is low. Other water providers have sufficient senior water rights to supply future average annual demands, but are requesting the Master Contract to store water for use in drought and emergency situations. The Lower Arkansas Valley Water Conservancy District would also use Master Contract storage space for agricultural water use.

Proposed Actions

PROPOSED PROJECT COMPONENTS

Along with obtaining clean water supplies, water providers need to reliably manage and deliver it. To meet these needs, Reclamation has proposed three federal actions: 1) building the Arkansas Valley Conduit (AVC), which was originally proposed as part of the Fryingpan-Arkansas (Fry-Ark) Project; 2) allowing water providers to use a pipeline connecting the Pueblo Dam north and south outlet works (Interconnect); and 3) allowing use of available storage space (excess capacity) in Pueblo Reservoir (Master Contract) when the reservoir is not filled to capacity with Fry-Ark water. While serving similar water purposes, the proposed actions are independent of each other. (See Table 1: Proposed Federal Actions). All proposed actions would be part of, or use features of, the Fry-Ark Project, which is owned and operated by Reclamation. The Southeastern Colorado Water Conservancy District (Southeastern) is a cooperating agency and has an administrative role that would include being the local contracting agency responsible for repayment of locally funded construction costs of the AVC and Interconnect, and working with Fry-Ark beneficiaries.

Table 1. Proposed Federal Actions

PROPOSED ACTION	PURPOSE	WATER PROVIDERS	RECLAMATION CONTRACT
AVC construction and operation	Bulk water supply pipeline and related facilities for municipal and industrial water delivery	Southeastern (or a duly authorized Enterprise) and forty AVC participants within Southeastern's boundaries	AVC Repayment, Operation and Maintenance, and Conveyance Contract: 50 years
Issuance of a Pueblo Dam North and South Outlet Works Interconnect Long-Term Conveyance Contract to water providers	Construction of a pipeline connection as part of AVC to allow flexibility in delivery of water between the north or south outlets, if either outlet is temporarily shut down	AVC water providers, Board of Water Works of Pueblo, Pueblo West, Southern Delivery System water providers, and Fountain Valley Authority within Southeastern's boundaries	Pueblo Dam North-South Outlet Works Interconnect Conveyance Contract: 40 years
Issuance of a Long-Term Excess Capacity Master Contract to Southeastern	Long-term excess capacity storage in Pueblo Reservoir to improve water supply	Twenty-five AVC water providers and twelve other water providers within Southeastern's boundaries	Long-Term Excess Capacity Master Contract: 40 years

AVC Project

Transbasin Diversion

The Fry-Ark Project is a multipurpose, transbasin water diversion and delivery project in Colorado, built between 1964 and the mid-1980s by the federal government. It annually diverts an average of 48,500 **a**cre-**f**eet (AF) of water from the Fryingpan River and other tributaries of the Roaring Fork River on the West Slope of the Rocky Mountains to the Arkansas River Basin on the East Slope. West Slope imports are stored on the East Slope in Turquoise Lake, Twin Lakes, and Pueblo Reservoir. The Fry-Ark Project reservoirs also store Arkansas River Basin water that is primarily available during wet years, and other non-Fry-Ark water supplies through contracts with water users. Fry-Ark yield is a supplemental supply for municipal, industrial, and irrigation use in the Arkansas River Basin of Colorado.

Cost Sharing

AVC was authorized by Congress in the original Fry-Ark legislation in 1962 (Public Law 87-590). AVC would not increase Fry-Ark Project water diversions from the West Slope; rather it was intended to improve drinking water quality. However, AVC was not constructed with the original project primarily because of the beneficiaries' inability to repay construction costs. In 2009, Congress amended the original Fry-Ark legislation in Public Law 111-11, which authorized annual federal funding, as necessary, for constructing AVC, and included a cost sharing plan with 65 percent federal and 35 percent local funding. The locally funded portion of AVC and the Interconnect would be repaid by Southeastern to the federal government over a period of 50 years. Annual storage costs charged by Reclamation under the Master Contract would be paid entirely by water providers participating in these contracts.

Municipal & Industrial Demands

ARKANSAS VALLEY CONDUIT CONSTRUCTION

AVC would be a water supply pipeline that would help meet existing and future municipal and industrial water demands of water providers in the Arkansas River Basin within Southeastern's boundaries. This water supply is needed to supplement or replace existing poor quality water and to help meet AVC water providers' projected water demands through 2070 (the term of the contract). Physical features would include constructing over 200 miles of buried pipeline, a water treatment facility, and other related facilities. Forty towns and rural domestic water supply systems within Southeastern boundaries located in Pueblo, Crowley, Otero, Bent, Prowers, and Kiowa counties (population 74,255) would participate in AVC. Water providers are requesting water deliveries of 10,256 acre-feet to help meet 2070 water demands. AVC water treatment would include filtering, which would require the water provider to add disinfectant, or filtering and disinfection. AVC water would not be used for agricultural irrigation because such use is not a congressionally authorized purpose for AVC.

Disruption Backup

PUEBLO DAM NORTH-SOUTH INTERCONNECT CONVEYANCE CONTRACT

During short-term maintenance and emergency situations, the Interconnect would move water between the north and south outlet works at Pueblo Reservoir. The Interconnect would be a short section of pipeline to be constructed as part of AVC between the two outlet works. The purpose of the Interconnect is to provide a backup Pueblo Dam outlet to participating water provider delivery systems. The Interconnect contract is needed through 2060 (the term of the contract) to move water during short-term disruption of service from either the north or south outlet works at Pueblo Reservoir by transferring water to the working outlet.

Interconnect operations would require a long-term (40-year) contract between Reclamation and the Interconnect water providers for use during periodic maintenance or emergencies activities. The Interconnect contract would also support partial deliveries of water to water connections at Pueblo Reservoir for the AVC, Pueblo Fish Hatchery, Board of Water Works of Pueblo, Pueblo West Metropolitan District, Southern Delivery System, and Fountain Valley Authority.

Excess Storage Use

MASTER CONTRACT

The Master Contract would allow use of extra storage space in Pueblo Reservoir when this space is not filled with Fry-Ark water. The purpose of the Master Contract is to allow water providers within Southeastern's boundaries to store water in unused storage space in Pueblo Reservoir. A long-term storage contract provides surety and convenience not found in a short-term contract. The Master Contract secures a reliable water supply for water providers to help meet projected demand through 2060 (the term of the contract).

Storage of non-Fry-Ark water in Pueblo Reservoir would be subject to existing Reclamation contract rules. Southeastern could then subcontract with the participating water providers to divide the requested storage space, totaling 29,938 acre-feet. The water providers in the Master Contract are all located within Southeastern boundaries. Some AVC water providers are also participating in the Master Contract and would store non-Fry-Ark water for delivery through AVC. Non-AVC water providers would use existing water systems or the Arkansas River to receive their Master Contract water deliveries.

Preferred Action

PREFERRED ALTERNATIVE: COMANCHE NORTH

Reclamation compared all alternatives in terms of how well each addressed the purpose and need, relevant environmental and non-environmental issues identified by Reclamation during the EIS process,

AVC Project

Comanche North Project Details

and estimated costs. Based on these considerations, Reclamation has identified the Comanche North Alternative as the preferred alternative. A final preferred alternative will be selected by Reclamation in a Record of Decision.

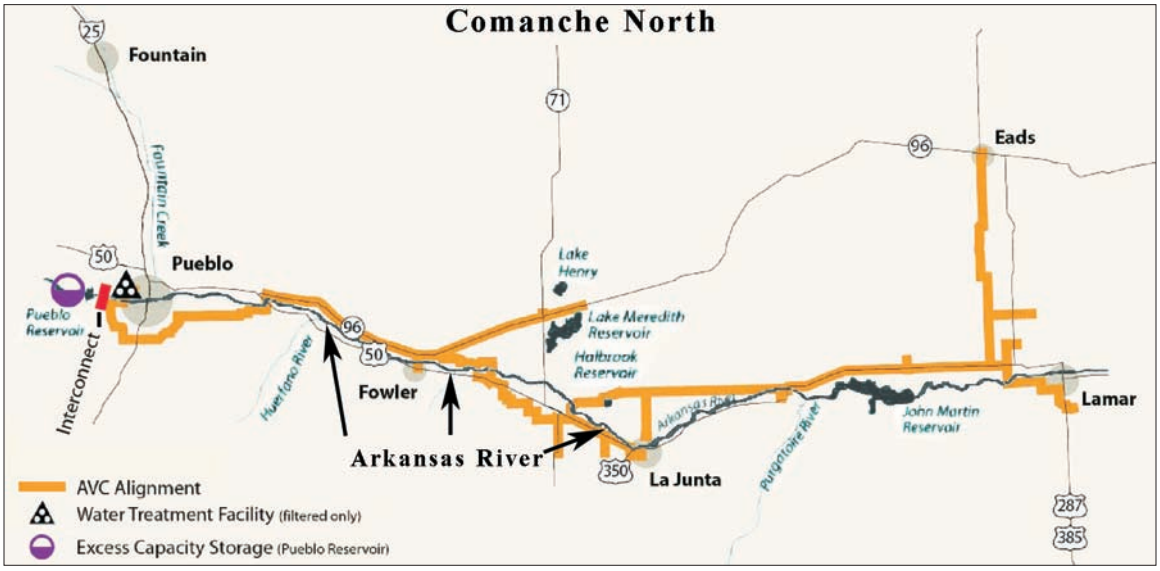
The Comanche North Alternative includes constructing the AVC and Interconnect, and issuing the Master Contract to store water in Pueblo Reservoir (Figure 2, Map of Comanche North). Water would be diverted from Pueblo Reservoir through the south outlet works and delivered through the existing **j**oint **u**se **p**ipeline (JUP) immediately upstream from Pueblo Boulevard north of the Arkansas River. AVC would use excess capacity in the JUP upstream from the "Y" (a three-way pipeline connection) and would construct a new pipeline downstream from the "Y" to the existing Board of Water Works of Pueblo Whitlock Water Treatment Plant. From the Whitlock Water Treatment Plant site, new pipeline would be constructed along a route south of Pueblo to St. Charles Mesa and Avondale, crossing Interstate 25 southwest of the Xcel Energy Comanche Powerplant. East of Pueblo, the pipeline would generally be located north of the Arkansas River except between Manzanola and Rocky Ford. The pipeline for the Comanche North Alternative, including spurs, would be about 227 miles long. Primary spur pipelines would be constructed from Fowler north to State Highway 96, then east to Sugar City; between Rocky Ford and La Junta; and a spur to serve Eads. Pipeline sizes would range from 36 inches in diameter at the JUP "Y" to 4 inches at some water provider tie-ins.

New Water Treatment

New water treatment plant components would be integrated into the existing Whitlock Water Treatment Plant. The integrated water treatment plant would filter water; disinfection would be the responsibility of AVC water providers at their point of delivery. Under this alternative, the St. Charles Mesa Water District would receive filtered water. Pumping stations would be built at the Whitlock Water Treatment Plant and on the south end of the pipeline spur to Eads. Surge tanks (to manage pipeline pressure) would be built near Fowler and La Junta.

Cost Estimates

Estimated present worth construction cost of the preferred alternative is $400 million. Estimated annual costs of operations, maintenance and replacement costs would be about $3.5 million. Estimated annual costs for the Master Contract account would range from about $0.8 million to nearly $1.1 million.



NEXT STEP: RECORD OF DECISION

No sooner than 30 days after EPA has published the notice of availability for the FEIS, Reclamation will issue a Record of Decision.

The Record of Decision will identify the following:

- Significant comments received and issues raised in the Final EIS
- Reclamation's selected alternative for implementation
- Alternative(s) considered environmentally preferable

The Record of Decision will also discuss factors considered with respect to the alternatives and how these considerations entered into the decision. Reclamation will include environmental commitments, means to avoid or minimize environmental harm, and any monitoring or enforcement activities to ensure that environmental commitments would be met if proposed action(s) is/are selected, constructed, and put into operation.

For Additional Information:

Final EIS, Engineering Reports & Environmental Memos are available at: www.usbr.gov/avceis/

WATER BRIEFS

MONO LAKE SETTLEMENT CA

TRIBUTARY DIVERSIONS

A decision concerning how much water could be diverted out of four key Mono Lake tributaries for the benefit of Los Angeles water users was addressed by the Board of the Los Angeles Department of Water and Power (LADWP) in August with a vote to approve a settlement agreement among LADWP, California Trout (CalTrout), the California Department of Fish and Wildlife and the Mono Lake Committee.

The settlement agreement lays out the details of a plan to implement several actions, including: a significant investment in upgrading Grant Dam and the subsequent delivery of long-term flows; an extensive monitoring program; oversight; and bringing to closure earlier requirements stemming from the 1994 decision and subsequent Restoration Orders from the California State Water Resources Control Board (CSWRCB). The agreement fully implements the Stream Ecosystem Flows (SEFs) presented in the mandated 2010 Synthesis Report. In 1998, CSWRCB ordered intensive study by designated Stream Scientists that resulted in the development of specific day-by-day, stream-by-stream flow regimes. The SEFs mimic natural runoff patterns and activate the natural processes that will restore the streams.

LADWP will modify Grant Dam by constructing an outlet that reliably delivers SEFs to Rush Creek. Synthesis Report peak SEFs are currently impossible to deliver due to the aqueduct's WWII-era infrastructure, specifically the lack of an adequate outlet facility. LADWP will complete outlet construction and begin operation within four years of CSWRCB approval. In order to offset the cost of the Grant Outlet, LADWP will be allowed to export an additional 12,000 acre-feet of water from the Mono Basin if timely construction progress is achieved. This one-time allowance will defray approximately half of the cost of the outlet without delaying Mono Lake's long-term rise to the management level of 6,392 feet above sea level.

The agreement lays out how the fishery, stream, waterfowl, and Mono Lake monitoring work required by CSWRCB will proceed in coming years. Fish and geomorphology monitoring tasks, consistent with the 2010 Synthesis Report, are specified and thus initiate a new phase of stream monitoring. Mono Lake limnology monitoring, a source of dispute over the past year, is assigned to the expert scientists who have run the program for decades.

The agreement also provides for adaptive management in order to apply the knowledge learned through scientific monitoring for better stream recovery. Flexibility is provided to adjust the timing, duration, and magnitude of the Stream Ecosystem Flows to maximize their ecological benefit. Limitations assure that adjustments will not violate established minimum flows or reduce water exports to Los Angeles.

The agreement requests deferral of the scheduled CSWRCB hearing on LADWP's water licenses from 2014 to 2020. This will allow the Grant Outlet to be constructed and put into operation without a surrounding swirl of legal proceedings.

To reliably manage annual budgeting and contracting, the settlement creates a new oversight team. The team is made up of LADWP, the Mono Lake Committee, the Department of Fish and Wildlife, and CalTrout. LADWP will fund monitoring — and several previously-ordered restoration actions — at specified levels and the team will assure efficient implementation.

A collaborative approach is specified in the settlement for multi-year and annual Mono Basin aqueduct operations planning. This assures that expertise from all parties is used to develop the plans. Operating the aqueduct to achieve both stream restoration and water export goals will take careful planning and the Mono Lake Committee will play an active role.

"Lee Vining and Rush Creeks once supported some of the finest rainbow and brown trout fisheries in California, but ongoing diversions to support urban growth in Los Angeles devastated these fish populations," said CalTrout Executive Director Jeff Thompson. "Although the conditions of these Mono Lake tributaries have improved since their low point in the early 1980s, more work needs to be done to create lasting improvements. With the settlement finally in place, Mono Lake and four of its most important tributaries will receive flows that will improve the Mono Basin fisheries and LADWP will be in compliance with important state regulations."

LADWP's diversions out of the Mono Basin supported an exploding urban population at the expense of the health of a unique and ancient ecosystem. The resulting dramatic environmental degradation led to a series of landmark lawsuits challenging LADWP's water export license under the Public Trust doctrine, the California Environmental Quality Act, and State Fish & Wildlife (formerly Fish & Game) regulations. California Trout was a lead plaintiff in two of the most important lawsuits leading up to the settlement now under consideration by LADWP.

"California Trout, Audubon Society, and the Mono Lake Committee were some of the earliest groups to recognize the importance of restoring and protecting the entire Mono Basin watershed. The litigation that led up to these successful negotiations played an important role not just for Mono Lake and its tributaries, but also for protecting riparian habitat throughout California," added attorney Richard Roos-Collins, legal counsel for CalTrout.

The 48-page settlement agreement was approved by the LADWP Board at its August 27, 2013 meeting. The agreement will now be presented to the State Water Resources Control for final approval and implementation.

For info: Agreement available at: http://www.monolake.org/mlc/20130823monobasinsettlementagreement.pdf

WATER BRIEFS

HYDRO RIGHTS BATTLE NE
FORFEITURE & PRIORITY CASE

The Nebraska Supreme Court (Court) has accepted an appeal from groundwater irrigators in the Niobrara River basin of an order issued by the Nebraska Department of Natural Resources (NDNR) that rejected irrigators' assertions of abandonment and forfeiture involving hydropower water rights owned by the Nebraska Public Power District (NPPD). NDNR was ordered by the Court in 2012 "to determine whether NPPD's appropriations have been abandoned or statutorily forfeited in whole or in part." The Court also noted that "[T]he junior appropriators therefore bear the burden of proof to establish the allegations contained in their petition." (*In Re 2007 Appropriations of Niobrara River Waters*, 283 Neb. 629, 820 N.W.2d 44, 67 (2012)). For details on the Court's 2012 decision, *see* Moon, *TWR* #99.

NDNR determined that the "junior appropriators' claims that the water rights held by NPPD associated with the Spencer Hydropower facility have been abandoned or forfeited are DENIED." *Final Order* in Case No. 001-007CC, page 15 (July 31, 2013). The irrigators had argued that NPPD had failed to exercise the full extent of its water rights for multiple, consecutive five-year periods — by failing to "call" the river in order to receive its water rights to generate electricity when shortages occurred. NPPD did not call the river, asking for regulation, until 2007. At that time, NDNR ordered the irrigators to shut off their pumps to protect NPPD's senior rights. NDNR concluded in the *Final Order*, however, that failure to "place a call for administration in order to avoid abandonment is…meritless." *Id*. at 12. NDNR also found that "not placing a call is not a basis for statutory forfeiture." *Id*. at 13.

In addition to the issues of forfeiture and abandonment that will be dealt with by the Court on appeal, another issue looms. NDNR, in its *Final Order*, prominently pointed out what it views as a nightmare stemming from the Court's earlier opinion. The Court had stated that "[A]n appropriation's priority date is the date when the Department approves the appropriator's right to divert water." *In Re 2007 Appropriations*, 820 N.W.2d at 51. NDNR then noted that the "Court provided no authority for its position on that point. It is in direct conflict with Neb. Rev. Stat. § 46-205 which has been the law of Nebraska for over 100 years. It also is in conflict with Neb. Rev. Stat. § 46-235(1). It is unclear how the Court can legislate this change, which would require likely changing the priority date of every water right maintained in the records of the Department. Although the Department acknowledges that the Court is the final authority for interpreting and applying the laws adopted by the legislature, without some further explanation of this statement by the Court, the Department is unclear how to implement this apparent change in the law." *Final Order* at 1.

For info: NDNR *Final Order* available at: http://dnr.ne.gov/legal/SurfaceWater/Orders/pdf_files/20130731_FINAL_ORDER.pdf

HIGH PLAINS AQUIFER KS
OGALLALA DEPLETION DETAILED

The National Academy of Sciences on August 26th released a new study entitled "*Tapping Unsustainable Groundwater Stores for Agricultural Production in the High Plains Aquifer of Kansas, Projections to 2110*" by David R. Steward, Paul J. Bruss, Xiaoying Yang, Scott A. Staggenborg, Stephen M. Welch, and Michael D. Apley. The authors sum up the future for the High Plains Aquifer (also known as the Ogallala Aquifer) — which stretches from Texas to South Dakota — if current use patterns persist: "The future is bright in the near term but bleak beyond, and increased agricultural production may be realized before imminent reductions occur." *Id*. at 6.

Anyone interested in the wise management of groundwater resources and freshwater supplies is encouraged to review the additional details of the study at length. The study's abstract concisely lays out the problem faced by the region, as follows: "Groundwater provides a reliable tap to sustain agricultural production, yet persistent aquifer depletion threatens future sustainability. The High Plains Aquifer supplies 30% of the nation's irrigated groundwater, and the Kansas portion supports the congressional district with the highest market value for agriculture in the nation. We project groundwater declines to assess when the study area might run out of water, and comprehensively forecast the impacts of reduced pumping on corn and cattle production. So far, 30% of the groundwater has been pumped and another 39% will be depleted over the next 50 y[ears] given existing trends. Recharge supplies 15% of current pumping and would take an average of 500–1,300 y[ears] to completely refill a depleted aquifer. Significant declines in the region's pumping rates will occur over the next 15–20 y[ears] given current trends, yet irrigated agricultural production might increase through 2040 because of projected increases in water use efficiencies in corn production. Water use reductions of 20% today would cut agricultural production to the levels of 15–20 y[ears] ago, the time of peak agricultural production would extend to the 2070s, and production beyond 2070 would significantly exceed that projected without reduced pumping. Scenarios evaluate incremental reductions of current pumping by 20–80%, the latter rate approaching natural recharge. Findings substantiate that saving more water today would result in increased net production due to projected future increases in crop water use efficiencies." *Id*. at 1.

Society's opportunity, however, requires water policy that isn't simply a "race to the bottom." As noted in the study's conclusion at page 6: "Although agricultural practices and technologies have led to advances in crop and cattle production…water policies have not yet realized significant reductions in the rate of groundwater use. Instead, pumping decreases as wells go dry. Short-term crop production leads to long-term sustainability challenges due to groundwater depletion, and tradeoffs exist… Our scenario analysis provides a foundation toward understanding the impacts of changes in groundwater tapping on agricultural production today and into the future. Society has an opportunity now to make changes with tremendous implications for future sustainability and livability. The time to act will soon be past."

For info: Study available in full at Proceedings of the National Academy of Sciences website: www.pnas.org/content/early/2013/08/14/1220351110

WATER EXCHANGES CO
"LAWN IRRIGATION RETURN FLOWS"

On July 1, the Colorado Supreme Court (Court) held that "properly quantified transmountain LIRFs are legally indistinguishable from reusable

transmountain effluent [returning to the stream as wastewater effluent] and, therefore, the water court correctly determined that Denver may use its properly quantified transmountain LIRFs [i.e., **l**awn **i**rrigation **r**eturn **f**lows] as substitute supply for the appropriative rights of exchange decreed in C.A. 3635. In addition, we affirm the water court's holding that junior appropriators, like Englewood, cannot claim injury premised solely upon the proper operation of the C.A. 3635 exchanges." *City of Denver v. City of Englewood, et al*., Case No. 12SA196, 2013 CO 50 (July 1, 2013); *Slip Op*. at 1.

The Court's opinion is worth reading for its discussion about "imported transmountain water" and the right to use and reuse such water, exchanges of water, LIRFs (previously unknown to this author!), and the use of "foreign water" (used for substitute supply uses in a plan for augmentation).
For info: Decision at: www.cobar.org/opinions/opinion.cfm?opinionid=9014&courtid=2

MINE PERMIT APPEALED AZ
OPEN-PIT COPPER MINE

On August 16, the Center for Biological Diversity (CBD) joined the Save the Scenic Santa Ritas coalition in filing a lawsuit against the Arizona Department of Environmental Quality (ADEQ) to overturn its approval of an aquifer-protection permit for Rosemont Copper Co.'s (Rosemont's) proposed open-pit copper mine in the Santa Rita Mountains near Tucson. The appellants asserted that the permit, as approved, does little to protect the region from mining pollution.

A coalition of conservation and community groups, businesses and residents appealed to the Arizona Water Quality Appeals Board (Board) in 2012 to overturn the permit. In July 2013 the Board voted 2-1 to uphold the permit, despite an admission by Board members that they hadn't thoroughly reviewed the appeal or the science and data supporting it, according to CBD.

CBD maintains that the aquifer-protection permit: allows Rosemont to construct the mine and discharge such toxic pollution as mercury, arsenic and lead to the aquifer for at least two years before implementing discharge limits; and fails to consider the mine's effects on Davidson Canyon and Cienega Creek. CBD notes that these riparian areas are downstream from the proposed mine site and contribute up to 20 % of Tucson's annual groundwater recharge and provide surface water habitat for several imperiled species, including endangered Chiricahua leopard frogs and Gila chubs. CDB asserts that surface water in these areas is almost entirely dependent on groundwater coming to the surface, which could be contaminated by the mine's toxic pollution. Among other assertion, CDB maintained that the permit is based on an outdated mining plan that has been completely overhauled by Rosemont, which ADEQ nonetheless continues to defend.

The lawsuit was filed in the Superior Court for Maricopa County. It alleges that the Board's 2-1 vote in favor of the permit was "arbitrary, capricious, contrary to law, an abuse of discretion and not supported by substantial evidence…" *Complaint* at 4. The lawsuit seeks to reverse the decision and remand it to ADEQ to "consider…the surface water impacts" of Rosemont's proposal, the "impact to the groundwater that will arise from the likely construction of the project, which is substantively different from the project plan set forth in the permit application" and "biological factors, as required by A.A.C. R18-9-A202(A)(4)." The lawsuit also seeks attorneys' costs.
For info: Randy Serraglio, CBD, 520/784-1504; *Complaint* available at: www.biologicaldiversity.org/programs/public_lands/mining/pdfs/Rosemont-complaint-8-16-13.pdf

STORMWATER CLEANUP CA
PROOF FOR LIABILITY IN CWA SUIT

On remand from the US Supreme Court, the US Ninth Circuit Court of Appeals (Court) on August 8 held that "[B]ecause the results of County defendants' pollution monitoring conclusively demonstrate that pollution levels in the Los Angeles and San Gabriel Rivers are in excess of those allowed under the Permit, the County Defendants' are *liable* for Permit violations as a matter of law." *NRDC v. Cnty. of Los Angeles*, Case No. 10-56017 (August 8, 2013) at 32-33 (emphasis in original). The decision clarified the level of proof necessary to establish liability for a violation of the Clean Water Act and forces Los Angeles County and the County Flood Control District to take action to clean up stormwater flowing into two polluted waterways in Los Angeles.

Natural Resources Defense Council and Los Angeles Waterkeeper (plaintiffs) alleged that Los Angeles County and the County Flood Control District (County) were discharging polluted stormwater in violation of the terms of their National Pollutant Discharge Elimination System (NPDES) permit. Plaintiffs relied exclusively on the County's own monitoring reports to prove the violations — reports the County was required to file under its NPDES permit. The County has stormwater outfalls upstream from their monitoring locations (for mass emissions) that are located in the middle of the Los Angeles and San Gabriel Rivers. The permittees argued that they could not be held liable based solely on this data since: 1) the monitoring required under its permit was not intended to measure compliance; and 2) the data could not show precisely whose discharge(s) contributed to any specific exceedance.

The Court explained why it rejected the arguments of the County Defendants. "But while otherwise more flexible than the traditional NPDES permitting system, nothing in the ms4 permitting scheme relieves permittees of the obligation to monitor their compliance with their NPDES permit in some fashion." *Id*. at 31. The Court went on to further explain why the choice of monitoring locations was critical to their decision. "County Defendants themselves chose the locations of the Monitoring Stations, locations that are downstream from a significant number of their outfalls. And, as required by law, the County Defendants chose locations that they certified were necessarily 'representative' of the monitored activity (i.e., the Permittees' discharges of stormwater runoff into the navigable waters of the United States). Now, however, County Defendants claim that their compliance with the Permit cannot be measured using the results of the representative monitoring they themselves agreed to, that the Regional Board approved, and that the Permit itself contemplates is to be used to assess compliance with its terms." *Id*. at 31-32.
For info: Decision available at: http://cdn.ca9.uscourts.gov/datastore/opinions/2013/08/08/10-56017.pdf

WATER BRIEFS

WELL PROTECTION US

NEW USGS CIRCULAR

The US Geological Survey (USGS) National Water-Quality Assessment (NAWQA) Program recently released: "*The Quality of Our Nation's Waters — Factors Affecting Public-Supply-Well Vulnerability to Contamination — Understanding Observed Water Quality and Anticipating Future Water Quality*" (2013, Eberts, Sandra M.; Thomas, Mary Ann; Jagucki, Martha. USGS Circular: 1385).

Based on a study that was conducted from 2001 to 2011, this 132-page USGS circular examines factors that affect the vulnerability of water from public-supply wells to contamination ("public-supply-well vulnerability"). The study was designed as a follow-up to earlier NAWQA studies that found mixtures of contaminants at low concentrations in groundwater near the water table in urban areas across the nation and, less frequently, in deeper groundwater typically used for public supply. Besides the factors affecting public-supply-well vulnerability to contamination, this circular describes measures that can be used to determine which factor (or factors) plays a dominant role at an individual public-supply well. Case-study examples are used throughout to show how such information can be used to improve water quality.

In general, the vulnerability of the water from public-supply wells to contamination is a function of contaminant input within the area that contributes water to a well, the mobility and persistence of a contaminant once released to the groundwater, and the ease of groundwater and contaminant movement from the point of recharge to the open interval of a well.

The following measures described in this circular are particularly useful for indicating which contaminants in an aquifer might reach an individual public-supply well and when, how, and at what concentration they might arrive:

- Sources of Recharge: Information on the sources of recharge for a well provides insight into contaminants that might enter the aquifer with the recharge water and potentially reach the well.
- Geochemical Conditions: Information on the geochemical conditions encountered by groundwater traveling to a well provides insight into contaminants that might persist in the water all the way to the well.
- Groundwater-Age Mixtures: Information on the ages of the different waters that mix in a well provides insight into the time lag between contaminant input at the water table and contaminant arrival at the well.

The circular also provides insight into the potential for in-well dilution of contaminated water by unaffected groundwater of a different age that simultaneously enters the well. Preferential flow pathways — pathways that provide little resistance to flow — can influence how all other factors affect public-supply-well vulnerability to contamination. For example, preferential flow pathways can influence whether a contaminant source is physically linked to a well, whether contaminant concentrations are substantially altered before contaminated groundwater reaches a well, and whether contaminated groundwater can arrive at a well within a timeframe of concern to the well owner. Methods for recognizing the influence of preferential flow pathways on the quality of water from a public-supply well are presented in this circular and can provide opportunities to prevent or mitigate the deterioration of a water supply. Knowing what water-quality variables to measure, what spatial and temporal scales on which to measure them, and how to interpret the resulting data makes it possible for samples from public-supply wells to provide a broad window into a well's past and present water quality — and possibly future water quality. Such insight can enable resource managers to prioritize actions for sustaining a high-quality groundwater source of drinking water.
For info: USGS Circular 1365 is available for download at: http://pubs.usgs.gov/circ/1385/pdf/Cir1385.pdf

SDWA ENFORCEMENT CO

EPA ACTION - SOUTHERN UTE RESERVATION

In early August, EPA announced that Maralex Disposal, LLC (Maralex) has been found liable for violations of the Safe Drinking Water Act at its commercial brine disposal injection well in La Plata County, Colorado, on the Southern Ute Reservation. Maralex was assessed a penalty of $89,000.

The decision, which was issued by an administrative judge following a hearing in October 2012, upheld EPA's finding of violations of Underground Injection Control (UIC) permit requirements at Maralex's Dara Ferguson Injection Well #1, a large-capacity disposal well that injects brine and production wastes to an injection zone approximately 8,000 feet below the surface. These violations — which include failure to maintain mechanical integrity of the well, failure to monitor as required, and inaccurate reporting — were discovered through EPA inspections and reports received from the company.

On May 5, 2010, EPA inspected the Maralex injection well and observed excess annulus pressure, indicating a problem with the well's mechanical integrity and the likelihood of a leak in the system. A follow up inspection on May 26 again indicated excess pressure. EPA issued a Notice of Violation and instructed Maralex to submit a work plan to fix the violations. Although a letter from the company, dated July 8, 2010, described the potential for a leak and steps the company would take to repair the well, an EPA inspection in April 2011 discovered that the disposal well, although still in operation, had not been repaired as described. EPA subsequently issued a second NOV and ordered the company to shut down the well until repairs were complete. Maralex completed the repairs and conducted a successful mechanical integrity test on May 24, 2011, at which time EPA authorized the company to resume injection into the well.

An EPA-issued UIC permit authorizes Maralex to inject produced water into Dara Ferguson Well #1, which disposes over 60,000 barrels of waste fluids monthly to a designated injection zone. These fluids contain high concentrations of saline produced water, benzene, toluene, ethylbenzene, and xylene.

Compliance with UIC permit requirements protects overlying aquifers from contamination. Groundwater contamination, especially brine, is often very difficult or not possible to address and can destroy underground sources of drinking water. Routine monitoring and the maintenance of mechanical integrity in waste disposal wells are critical requirements of EPA's UIC regulations.
For info: Sarah Roberts, EPA, 303/ 312-7056; EPA UIC program website: http://water.epa.gov/type/groundwater/uic/

CALENDAR

September 17-18 MT
13th Annual Montana Water Law Seminar, Helena. Great Northern Hotel. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

September 17-19 MT
Monitoring & Assessment of Wetland & Riparian Restoration Sites Course, Bozeman. MSU. Presented by Montana Water Center & Montana DEQ. For info: http://watercenter.montana.edu/training/wetlands/

September 18-19 TX
The UST & AST Management Workshop, San Antonio. Saint Anthony Wyndham. For info: EPA Alliance Training Group, www.epaalliance.com

September 18-19 CA
California Bioresources Alliance Symposium: A Call to Action, Sacramento. California EPA, 1001 I Street. For info: UC Davis Extension, http://extension.ucdavis.edu/

September 19 WA
4th Fisheries & Hatcheries: Legal & Regulatory Frameworks Seminar, Seattle. Washington State Convention Ctr. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

September 19-20 CA
GIS for Watershed Analysis: Beginning (Course), Davis. 1137 Lab, Plant & Environmental Sciences, UC Davis. For info: UC Davis Extension, http://extension.ucdavis.edu/

September 20 WA
Hot Environmental Issues for the Puget Sound Region (Conference), Seattle. Seattle Central Library. Presented by Center for Environmental Law & Policy and Futurewise. For info: www.celp.org

September 20 WA
Model Toxics Control Act Seminar, Seattle. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

September 20 OR
Source Control Conference: The Intersection of Environmental Cleanup & Water Quality (CERCLA & the Clean Water Act), Portland. World Trade Ctr. Two, 25 S.W. Salmon. For info: Holly Duncan, 503/ 282-5220 or www.elecenter.com

September 20 WA
Floodplains Seminar, Seattle. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

September 20-22 CO
Home/Land Security: Deep Sustainability in the Headwaters Conference, Gunnison. Western State Colorado University. Hosted by The Center for Environmental Studies, Western State Colorado University. For info: www.western.edu/headwaters

September 23-24 ID
Water in Real Estate Transactions Seminar, Boise. Red Lion Hotel Downtowner. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

September 23-24 NM
New Mexico Water Law Conference, Santa Fe. La Fonda Santa Fe. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

September 23-25 MO
Ground Water Protection Council 30th Anniversary Annual Forum, St. Louis. Chase Park Plaza Hotel. For info: www.gwpc.org/events/2013-annual-forum

September 23-26 CA
One Water Leadership Summit, Los Angeles. Omni Hotel at California Plaza. Presented by the U.S. Water Alliance. For info: Hope Hurley, U.S. Water Alliance, 202/ 223-2299, hhurley@uswateralliance.org or www.uswateralliance.org/2013/06/06/registration-open-one-water-leadership-summit/

September 24-26 TN
2013 Water Education Summit, Chattanooga. Sheraton Read House Hotel, 827 Broad Street. For info: www.h2osummit.org/

September 25 CA
CEQA: A Step by Step Approach (Course), Sacramento. Sutter Square Galleria, 2901 K Street. For info: UC Davis Extension, http://extension.ucdavis.edu/

September 25-26 TX
Water & Energy 2013: Looking Beyond the Shales Conference, Houston. The Houstonian Hotel. Presented by Westwater Research & Global Water Intelligence. For info: www.waterenergystrategy.com/

September 26 CA
Statewide Water Resources Management Workshop, Los Angeles. Sanitation Districts of Los Angeles. Presented by Southern California Water Committee. For info: www.SoCalWater.org

September 26 WA
Future Directions in Water Resource Management - AWRA Washington State Conference, Seattle. Mountaineers Seattle Program Ctr. Presented by American Water Resources Ass'n (WA Section). For info: www.waawra.org

September 26 WA
Northwest Toxics Conference: Reducing Toxins in Fish, Sediment & Water, Seattle. Washington State Convention Ctr. For info: Holly Duncan, 503/ 282-5220 or www.elecenter.com

September 26 CO
Cottonwoods & Cold Ones Tour, Grand Junction. Edgewater Brewery. Presented by Tamariks Coalition. For info: Cara at Ckukuraitis@tamariskcoalition.org

September 27 CA
Understanding the Sacramento-San Joaquin Delta: An Overview of Delta Governance & Regulation Course, Sacramento. Sutter Square Galleria, 2901 K Street. For info: UC Davis Extension, http://extension.ucdavis.edu/

September 29-Oct. 5 Turkey
1st World Irrigation Forum & 64th Meeting of the IEC (WatSav Awards), Mardin. Presented by Int'l Comm'n on Irrigation & Drainage. For info: www.worldirrigationforum.org/en/#.UYwKvXBK4-Y

September 30-Oct. 3 CA
Water Challenges: Working Together Towards Solutions - 2013 Annual CA-NV AWWA Fall Conference, Sacramento. Sacramento Convention Ctr. Presented by CA-NV Seciton of the American Water Works Ass'n. For info: http://ca-nv-awwa.org/canv/web/

October 1-4 NV
WaterSmart Innvovations 2013 Conference & Esposition, Las Vegas. South Point Hotel & Conference Ctr. Presented by Southern Nevada Water Authority & Others. For info: www.watersmartinnovations.com/index.php

October 2 MT
Oil & Gas Development in Montana Seminar, Billings. Hilton Garden Inn. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

October 2 WA
Wetlands in Washington Seminar, Seattle. Renaissance Seattle Hotel. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

October 2-4 SD
Western States Water Council Fall (173th) Council Meeting, Deadwood. The Lodge at Deadwood. For info: www.westernstateswater.org/upcoming-meetings/

October 2-4 NV
6th Annual WaterSmart Innovations Conference & Exposition, Las Vegas. South Point Hotel & Conference Ctr. Presented by Southern Nevada Water Authority & Others. For info: www.watersmartinnovations.com/index.php

October 2-4 MT
Water & Energy: Montana Section AWRA Annual Conference, Bozeman. GranTree Inn. Field Trip on 10/2 to Hyalite Reservoir (Bozeman Water System). For info: http://state.awra.org/montana/

October 3-4 TX
TCEQ 2013 Water Quality/Stormwater Annual Seminar, Austin. DoubleTree Hotel. Sponsored by Texas Commission on Environmental Quality+I137. For info: www.tceq.texas.gov/p2/events/stormwater.html

October 5-9 IL
WEFTEC: 86th Annual Water Environment Federation Technical Exhibition & Conference, Chicago. For info: Water Environment Federation, 800/ 666-0206 or WEFTEC website: www.weftec.org

October 7 CO
Valuing Colorado's Agriculture Workshop, Colorado Springs. Cheyenne Mt. Resort. Presented by Colorado Agricultural Water Alliance & Colorado Water Institute. For info: http://coagwater.colostate.edu/

October 7-8 TX
Texas Water Law Conference, Austin. Omni Hotel at Southpark. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

October 8-9 CA
California's Groundwater Future in the Balance: Integrating Quantity & Quality in a Changing Climate: 29th Biennial Groundwater Conference & GRA 22nd Annual Meeting, Sacramento. For info: Water Education Foundation, www.watereducation.org

October 9-10 WA
6th Annual Water Rights Transfers Seminar, Seattle. City University Downtown. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

October 10-11 UT
Utah Water Law Conference, Salt Lake City. Marriott. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

October 10-11 TX
NGWA Conference on Groundwater & Food Production, Dallas. DoubleTree by Hilton - Market Center. Presented by National Ground Water Ass'n. For info: www.ngwa.org/Events-Education/conferences/Pages/5022oct13.aspx

October 10-11 NV
Tribal Rights, Sovereignty & Economic Development Conference, Las Vegas. Bailey's Hotel & Casino. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

October 11 OR
Environmental Law: Year in Review, Portland. McMenamins Edgefield Manor. Presented by OSB Environmental & Natural Resources Section. For info: Dustin Till, 503/ 241-2641 or dtill@martenlaw.com

October 11 NM
Hydraulic Fracturing Conference, Santa Fe. La Posada de Santa Fe Resort. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

October 12-19 CO
Interdisciplinary Climate Change Research Symposium, Colorado Springs. La Foret Conference & Retreat Ctr. For info: http://disccrs.org/disccrsposter.pdf

October 14-17 Kenya
International Water Ass'n Development Congress & Exhibition, Nairobi. For info: www.iwahq.org/

October 14-18 NC
2013 Water & Health Conference: Where Science Meets Policy, Chapel Hill. William & Ida Friday Ctr. Sponsored by The Water Institute (UNC). For info: http://whconference.unc.edu/program/

October 15 NE
Changes: Climate, Water & Life on the Great Plains Conference, Lincoln. Cornhusker Hotel. For info: Lorrie Benson, NE Water Center, 402/ 472-7372, lbenson2@unl.edu or http://watercenter.unl.edu/WaterLawConf2013/index.asp

October 15-17 CO
Interstate Council on Water Policy Annual Meeting, Denver. Renaissance Hotel. For info: Peter Evans, Executive Director, phe@riverswork.com or icwp.org

October 15-17 MT
2013 Watershed Symposium, Missoula. Sponsored by Montana Watershed Coordination Council. For info: Kathryn Watson, 406/ 570-4261 or www.mtwatersheds.org/

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CALENDAR

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October 15-17 CA
Ass'n of Clean Water Administrators CAFO Roundtable 2013, Sacramento. Cal/EPA Headquarters, 1001 I Street. For info: www.acwa-us.org/#!meetings

October 16 NE
Nebraska Water Law Conference 2013, Lincoln. Cornhusker Hotel. For info: Lorrie Benson, NE Water Center, 402/ 472-7372, lbenson2@unl.edu or http://watercenter.unl.edu/WaterLawConf2013/index.asp

October 16-18 CA
Northern California Tour (Field Trip), Sacramento Valley. Presented by Water Education Foundation. For info: www.watereducation.org

October 18 AZ
Colorado River Conference, Phoenix. Arizona Biltmore. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

October 20 CO
IMPACT: A Summit on Climate Change, Boulder. University of Colorado, UMC Rm. 235. For info: platform@bouldercountydems.org

October 21 CO
Colorado River Conference, Denver. Grand Hyatt. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

October 22-23 OK
Oklahoma Governor's Water Conference, Midwest City. Sheraton Midwest City Hotel & Reed Conference Center. For info: www.owrb.ok.gov/news/waterconference.php

October 24 OR
OWRC 2013 Water Law Seminar, Redmond. Eagle Crest Resort. Presented by Oregon Water Resources Congress. For info: April Snell, OWRC, 503/ 363-0121, aprils@owrc.org or www.owrc.org/calendaritem.php?i=50

October 24 CA
Southern California Water Committee Annual Meeting & Dinner, City of Industry. Pacific Palms Hotel. For info: Kym Belzer, 818/ 760-2121, kbelzer@socalwater.org or www.as-dzine.com/client_proofs/fha/SCWC/SCWC_Annual_Meeting-13.pdf

October 28-29 CA
California Water Law Conference, San Francisco. Hotel Nikko. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

October 28-30 OH
Nonpoint Source Monitoring Conference & Workshop, Cleveland. Wyndham Cleveland. For info: npsmonitoring.tetratech-ffx.com/?

October 31 CA
Groundwater Law & Hydrology (CA) Course, Sacramento. Sutter Square Galleria, 2901 K Street. For info: UC Davis Extension, http://extension.ucdavis.edu/

October 31 OR
Oregon Toxics & Risk Assessment Conference, Portland. World Trade Ctr. Two, 25 S.W. Salmon. For info: Holly Duncan, 503/ 282-5220 or www.elecenter.com

November 1 CA
Stormwater Seminar, Santa Monica. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

November 2-10 Cuba
International Wetlands Research Program & Symposium, Cienaga de Zapata, Matanzas & Havana. Presented by Eco Cuba Network. For info: www.ecocubanetwork.net/wetlands/

November 4 CO
Energy & Environment Conference, Denver. Ritz-Carlton. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

November 4-7 OR
AWRA Annual Conference, Portland. Red Lion Jantzen Beach. Sponsored by the American Water Resources Ass'n. For info: www.awra.org

November 5-6 DC
2013 American Water Summit, Washington. Presented by Global Water Intelligence. For info: www.globalwaterintel.com

November 7-8 OR
22nd Annual Oregon Water Law Seminar, Portland. World Forestry Ctr., 4033 SW Canyon Road. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net