

State Water Resources Control Board
Dry Year Program Report
January 2015

The Division of Water Rights

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INTRODUCTION

The 2014 water year, which officially ended on September 30, 2014, was the third driest in 119 years of record. The State Water Resources Control Board (State Water Board or Board), along with many other State agencies, responded to these conditions with a series of actions as envisioned by Governor Edmund G. Brown in his January 17 and April 25, 2014 declarations.

The State Water Board took action in six (6) general areas to address the drought emergency in 2014. The first was considering Temporary Urgency Change Petitions to water rights holders' permits and licenses to address drought conditions. In most cases, the requested changes were to conserve water for use later in the season. The second was curtailing certain classes of water rights in various watersheds when demand began exceeding supply or to implement emergency minimum fish flows. The third was ensuring that communities with at-risk drinking water supplies received the technical and financial support they needed to secure alternate water supplies and protect health and safety. Fourth, the State and Regional Water Boards took a number of actions to accelerate the use of recycled water as an additional source of supply that involved both financial incentives and permit streamlining. Fifth, in response to the Governor's April 25, 2014 Executive Order, which shortened the transfer processing timeframe by 15 days, the State Water Board, together with Department of Water Resources, held a multi-agency public listening session to solicit ideas and recommendations on streamlining the water transfer process. This was part of a larger streamlining effort to facilitate water transfers. Finally, recognizing the severity of the drought statewide, the Board focused on water conservation, adopting an emergency regulation that required action by almost all water agencies and individuals across the State in July 2014.

In order to take the necessary actions envisioned in the Governor's declarations and counter the destructive effects of the drought, the State Water Board adopted a series of emergency regulations pursuant to the authorities described in the Governor's declarations and the drought emergency legislation enacted in March 2014. Three emergency rulemaking packages were ultimately adopted by the State Water Board and approved by the Office of Administrative Law. The first rulemaking package responded to a request from State and federal fish agencies to establish emergency minimum flows on three priority Sacramento River tributaries to protect fish. The second pertained to the process of curtailing more junior water right holders to protect senior water right holders. The final regulation established conservation requirements for water suppliers and individuals statewide.

In its July 2, 2014 [resolution](#) adopting the rulemaking package relating to curtailing junior water right diversions to protect senior water right holders, the State Water Board described its intent to engage stakeholders in a general assessment of the information used to make water availability and water right priority determinations and to solicit suggestions for improvements.

On September 10, 2014, the Board followed up on this direction and asked for stakeholder comment on improvements that it should make to its implementation of the water rights priority system for future dry years. The Board also asked the public to provide recommendations related to other areas of interest to the Board. The Board received 36 letters in response to the solicitation and Division of Water Rights (Division) staff met with various stakeholder groups to discuss their recommendations. This

report describes how the Division approached curtailments in 2014, improvements that are currently underway, or are proposed for near-term implementation, as well as several longer-term improvements that are necessary.

Due to the uncertainty of predicting future climate patterns, precipitation events, and their effects on the State's water supply, this report focuses specifically on suggested near-term changes to the administration of the water rights priority system to improve its effectiveness if dry conditions persist into 2015.

The Board received comments and recommendations on a number of related topics such as temporary urgency change petitions, conservation and recycling, public trust, health and safety, and water transfers. Several sets of comments were also targeted to specific situations in specific watersheds. While these topics are outside the scope of this report, they are being evaluated and may be implemented at a future date.

1.0 January 1978 “Dry Year Program”

The Division began the assessment of its 2014 approach by reviewing the recommendations contained in a similar report prepared in January 1978 titled “Dry Year Program-Drought 77” (1978 Report), which reviewed the actions taken during the 1976-77 drought. The 1978 Report, similar to the 2014 assessment, discussed the Division's approach to provide information on water conservation and shortages to diverters in drought impacted areas; ensure that the limited water supply available was used in accordance with established rights; and enforce violations of permit and license conditions, illegal diversions, and the waste or unreasonable use of water.

The 1978 Report included recommendations for near-term, ongoing Division drought-related activities as well as future actions. While many of the recommended actions in the 1978 Report have been implemented in some form, an opportunity to improve and learn from past experience is worthwhile.

The following are general recommendations from the 1978 Report that are still relevant:

1.1 Legislative Changes to Improve the Administration of the Water Rights System

The Division encountered both legal and institutional constraints that hindered drought response in 1976-77. It found the public hearing process required in enforcing water rights law to be tremendously lengthy, and recommended the Board be granted authority to issue cease and desist orders against illegal diverters while the public hearing process is underway. Under the existing water rights process, the illegal diversion could continue to occur until the hearing process has concluded causing potential further harm to water right holders and public trust resources until the cease and desist order is issued. The 1978 Report also called for more frequent reporting of water diversion and use by pre-1914 and riparian water right diverters. More timely enforcement actions and accurate diversion information remain key issues today. Currently, riparian and pre-1914 water right diverters must file statements every three years. A water right system that relies on three-year old data is not responsive to current conditions,

especially during times of drought. At a minimum, statements should be filed on an annual basis and report diversion amounts by each separate claim of right. Underestimated water demand can negatively impact senior water right holders while overestimated demand can result in unnecessary curtailments. Resolving both of these issues would improve the administration of water rights especially in times of shortage. Section 2 discusses both of these issues in greater detail.

1.2 Standardize Methodology and Procedures for Determining Water Availability Relative to Water Rights Priority

While a standard methodology for determining water availability relative to water rights priority is currently in use and is similar to the process described in the 1978 Report, there is room for additional improvements as described in depth in section 2 of this Report

1.3 Provide Forecast Data to Water Diverters if a Shortage is Anticipated

The 1978 Report recommends increased communication, especially in regard to forecasting water shortages. The Division received similar comments this year. Although supply forecasts are not available in all watersheds, the Division provided water forecasting data on its web pages to help water diverters better plan. The Division continues to use its web pages and electronic email subscription service (lyris) to communicate forecasted shortages, potential curtailments, and the release of curtailments when stream flows increase.

1.4 Investigate and Implement New Technologies to Assist in Administering Water Rights

When the 1978 Report was issued, water right information was only available as physical paper copies. Since that time, the Board has implemented many new technologies such as the web-based Electronic Water Right Information Management System (eWRIMS) which contains information on water right permits and licenses issued by the State Water Board and other claimed water rights in California. The Division is continually expanding the types of information available through eWRIMS with more recent efforts focusing on electronic filing of data to improve both timely data availability and accuracy. The 1978 Report specifically recommended the use of aerial photography using U-2 planes. Since 1978, the availability of aerial imagery has improved and desk-top research has been greatly enhanced. The Division now has access to aerial photography services, which should assist water right diversion investigations. At the suggestion of many stakeholders, the Division is also investigating technologies such as satellite imagery and increased use of telemetered data as a more effective means of quantifying consumptive use, and deploying investigative and enforcement resources.

2.0 2014 Curtailment and Complaint Process

Curtailment Process

The Board relied essentially on two mechanisms to administer the water rights system when demand was projected to exceed supply in 2014. In many years, appropriative water rights holders in the Sacramento-San Joaquin Rivers and Delta (Bay-Delta watershed) that were granted permits and licenses after 1965 must comply with a special term that requires that they cease diversions when certain conditions exist. This term, Term 91, restricts the permit and license holder's right to divert water when the Central Valley Project (CVP) and State Water Project (SWP) (referred to collectively as the Projects) are releasing previously stored water to supplement stream flow to meet flow or water quality requirements in the Bay-Delta. The purpose of Term 91 is to prevent permit and license holders from taking previously stored water that they are not entitled to divert. The State Water Board has implemented Term 91 since the early 1980s and it affects approximately 118 water rights holders in July and August of most years.

The more widely used method of addressing insufficient overall supply was to conduct the analysis that led to the development of supply and demand curves for key river systems affected by the dry conditions. If there was insufficient supply available to meet the demand reported for a watershed, the State Water Board notified junior water rights holders of the need to curtail water diversions until senior water rights holders were satisfied. This method does not affect the use of water previously collected to storage.

In May 2014, Term 91 was triggered to protect CVP and SWP storage releases and Notices of Curtailment were issued for the entire Bay-Delta watershed based on analyses of supply and demand, similar to the approach used in the 1976-77 drought.

For each affected basin, the Division generated a hydrograph that plotted projected water demand against available supply over time. The projected demand was displayed cumulatively for each type of right. The hydrographs were posted on the Board's Drought Year Water Actions web page (Drought web page). This visual information helped junior water right holders to better understand when water supplies were expected to be unavailable to meet their priority of right. Basin boundaries for the supply and demand analyses were provided as additional information for the affected water right holders.

Projected Water Supply

Projected water supply was calculated using: (1) the California Data Exchange Center and Reservoir Storage Data (CDEC); (2) other information maintained by the Department of Water Resources (DWR); (3) National Oceanic and Atmospheric Administration's (NOAA) National Weather Service data, specifically information available on the California Nevada River Forecast Center webpage (CNRFC); (4) U.S. Geological Survey (USGS) National Water Information System Surface Water Data for California; (5) information from the USGS California Water Science Center; (6) information from the U.S. Bureau of Reclamation Mid Pacific Region Central Valley Operations Office; and (7) information from the U.S. Army Corps of Engineers Water Control Data System.

Demand Analysis

All water right holders are required to file reports documenting the amount of water diverted and used by month, under penalty of perjury, or to the best of their knowledge.¹ Post-1914 appropriative water right holders are required to file reports by July 1st of every year for the prior year's use. The demand analysis for these water right holders was based on this annual reported data for the years 2010 through 2012. 2012 Reports were the most current set of permit and license data available to the State Water Board.

Riparian and pre-1914 appropriative claimants do not submit annual reports. They are required to submit their reports (referred to as statements) triennially (once every three years) showing their past three years' monthly diversion and use. While all claimants report use, the statements are filed for one-third of the claimants each year on a rotating basis. As a result, the 2010 water year was the most current and complete set of diversion and use data for statements.

The Division corrected data for obvious errors such as incorrect units. Rights that supported direct diversion for power use only, which is non-consumptive (nearly all of the water returns to the stream relatively promptly), were removed from the demand totals. In addition, many individuals hold multiple water rights to divert water to a parcel of land. For instance, a person may have rights to two streams to irrigate the same parcel of land. The total quantity used is legally limited to reasonable beneficial use, but the water may be taken and reported under different rights year-to-year. Therefore, obvious duplications of diversion amounts across multiple water rights held by the same person for the same use was removed from the demand totals. For statements claiming both riparian and pre-1914 rights, the Division considered all of the reported diversion amount as diversions under the senior priority. After this quality control evaluation of the demand data was completed, the Division then sorted the demand into three groups: riparian, pre-1914, and post-1914 for curtailment analysis to reflect the varying priorities of the water rights. Key watershed groups worked closely with the Division to further improve the diversion and use data relied on to estimate demand.

The State Water Board currently has authority to approve or deny petitions for the transfer of water filed for permits and licenses. However, the State Water Board lacks authority to require petitions for transfers of water pursuant to pre-1914 appropriative rights. The DWR and the U.S. Bureau of Reclamation approve and monitor the transfers of water moving through their facilities and ensure that the transferred water would have been consumptively used or stored in the absence of the change, but they do not ensure the validity of the rights. Unfortunately, the State Water Board is not informed, through the required triennial reports of water diversion and use filed by pre-1914 water right diverters, of the amounts transferred.

¹ The quality of data submitted by the right holders is dependent on type of measuring equipment used, accuracy of measurement, and other factors outside the control of the State Water Board.

Supply and Demand Curves

The Division plotted the supply and demand data for each basin over time to create demand and supply curves for each type and priority of right. The Division used different methods of analysis for determining when demand exceeded supply depending on the available supply data for the watershed. During the curtailment period, the Division provided frequent updates of each watershed's curtailment analysis on the Drought web page.

The Division's curtailment analysis included a comparison of calculated daily DWR-supplied full natural flow data (Bay-Delta watershed) or USGS stream gages (Russian, Eel and Scott River watersheds) to monthly projected DWR or CNRFC full natural flows which were provided through the end of the water year.² In the Bay-Delta watershed, full natural flow projections were updated monthly using DWR's Bulletin 120 supply data while the other watersheds' monthly supply projections were updated periodically using CNRFC's data.³

Based on the intersections of the supply and demand curves, the Division projected when curtailment was necessary in each watershed, and to what level of water right seniority. The Division regularly revised the supply curves as rainfall events occurred. The Division also presented the curtailment analysis at Board Meetings' Drought Updates. For lifting curtailments, the monthly demand data was converted to an average daily rate of diversion and compared against either recent full natural flow supply data (Bay-Delta watershed) or USGS stream gages. Curtailments were lifted when recent supply or anticipated supply, in the event of an arriving storm, exceeded demand for different priorities of water rights. The Division used this daily comparison of supply to reported demand information to determine if curtailments should be lifted: (a) on a short-term basis associated with rainfall events, and (b) on a long-term basis based on improved streamflow conditions.

The water demand information that the Division relied upon to conduct this analysis generated the most discussion in 2014. As described above, the Division generally relied upon the most recent year for which a complete set of demand data, reported by water right holders, was available for the watershed. Changes in demand data have the greatest potential to alter the date of curtailment (or lifting of curtailment) and priority of rights affected by curtailment.

The watershed boundaries used to conduct the analysis also generated discussion. The more expansive the boundaries, the greater the number of water right holders that could potentially be subject to curtailment. The Division analyzed certain tributaries of the Bay-Delta watershed for potential curtailment on a tributary level. Precipitation events delayed such action to a later date when large-scale watershed curtailments were appropriate in May 2014.

² These projections are useful for planning purposes to account for snow and rainfall events when future supply is uncertain but are unnecessary in summer months when precipitation events no longer occur.

³ Bulletin 120 is a monthly update prepared by DWR, which provides, among other things, anticipated full natural flows for key locations using current snowpack conditions.

Field Inspections

The Division conducted approximately 947 field inspections to determine compliance with the curtailment notices. The Division was assisted in this activity by staff on loan from DWR and the Central Valley Regional Water Quality Control Board (Central Valley Water Board).

Gaining site access took significantly more time than originally anticipated. The delays were the result of diverters' failure to pick up certified letters, failure to respond to letters, unreturned phone calls to schedule inspections, and denial of access. When inspection warrants were needed, they took time to obtain. The tools needed to conduct the inspections (field vehicles, gps-enabled tablets, satellite phones) were also difficult to obtain because of procurement delays. Staff from other agencies had to be trained before going into the field. Computer-based field reporting forms and other documents were also needed to streamline report preparation for the drought inspections.

The field investigations identified previously-unreported claims of water rights, potential unauthorized diversions, and unapproved changes such as changes in the point of diversion or place of use that require additional follow-up activities.

Complaint Process

Persons with information about unauthorized diversions, diversions by junior water right holders that injure senior water right holders, diversions in violation of permit and license conditions, diversions that constitute waste and/or unreasonable use of water, and diversions that cause adverse impact to public trust resources (such as fish and wildlife) are encouraged to submit water rights complaints through the CalEPA Environmental Complaint website, or by contacting the Division directly by telephone, email, or letter. Complaints are public information; however, the identity of a complainant may be kept confidential upon request.

Complaints are prioritized based on significance and availability of resources. In general, the Division prioritizes allegations of unauthorized diversions of water in critical watersheds, or in watersheds that have resident endangered species.

In 2014, the Division received approximately 172 complaints between January and October as compared to 54 complaints for the same period in 2013. To accommodate the increase in complaints, additional Division staff was tasked with investigating complaints. The majority of complaints alleged unauthorized diversions or impacts to public trust resources. The Division completed or initiated investigations into most of the complaints received between January and October of 2014, however, some complaints are still pending investigation and final resolution.

For all complaints, the Division must determine what the alleged problem is, locate the affected parties, and investigate the activity. The problems with contacting parties that are the subject of complaint investigations are similar to the ones noted for curtailment inspections. However, obtaining site access to investigate complaints of illegal diversions can be even more complicated because there is no

acknowledged authority (such as is offered by the conditions of a water right permit or license) for these inspections.

The following are recommendations on how to improve the curtailment and complaint process:

2.1 Begin Yearly Water Planning Efforts as Early as Possible

Many commenters called for improved communication including advance notification of the possibility of curtailments in a watershed. In response, planning for a dry 2015 is underway and the Division is beginning to forecast supply and analyze demand data for key watersheds, which will be posted on the website by the end of January. While considerable resources were needed to develop the curtailment methodology and notification procedures in 2014, this effort is paying off in 2015 and will facilitate the early evaluation of supply and demand information in future dry/drought years. A 2015 notice of potential curtailment was already sent on January 23, 2015.

Using the procedures developed and equipment acquired in 2014, the Division will now be able to deploy staff for compliance inspections within a week of curtailment order/notice issuance. Contracts are also now in place to provide aerial imagery services in support of curtailment inspections and complaint investigations.

2.2 Improve Coordination with Other Agencies

The 2014 effort involved extensive coordination with DWR related to data, modeling, and inspection support. The Central Valley Water Board also provided staff resources to support inspections. Collaboration with the Department of Fish and Wildlife (CDFW) on critical minimum flows began early in the year and CDFW staff was instrumental in providing field support. A number of commenters recommended enhancing this coordination in 2015. The Division is now working to secure loaned or new resources in the event that dry conditions trigger curtailments and with DWR and the National Weather Service to improve the quality and timeliness of hydrology reporting. The Division will also work with USGS and DWR to ensure that existing flow gages used in the curtailment process are providing quality data to make appropriate curtailment decisions.

2.3 Improve Communication on Curtailments

Providing information earlier and consulting with diverters within affected watersheds was one of the themes in the comments received. The Board provided early notification about the developing drought situation and lack of water supply to roughly 9,000 diverters in late January 2014. As the 2014 water year progressed, public workshops were held to hear input and discuss proposed drought actions related to water conservation and curtailments as well as conservation, reuse, and recycling. Once it became clear that curtailments were needed, the Division continued to update the posted curtailment analysis for specific watersheds so that water right holders could better plan ahead.

With the procedures developed in 2014 now in place, the Division will be emphasizing continued coordination with water right holders to clean up demand data, so that decisions on curtailments are based on the most current and applicable information. The Division will also be posting/updating supply

and demand forecasts, by watershed, early and often. Where feasible, meetings will be scheduled locally in the specific watersheds where curtailment is anticipated to discuss current conditions and address questions and concerns. As part of these local meetings, the Division will reach out to local counties and other stakeholder representative groups to better communicate curtailment information. Key staff will be assigned to develop regional expertise and serve as the principal point of contact. However, with the potentially large number of water rights holders affected by continuing dry conditions, the Division will continue to rely heavily on electronic means of communications and will encourage anyone interested to sign up for the email notification service. All drought-related requests, actions, and other information will be available on the Drought web page.

2.4 Improve Communication Regarding Complaints

The Division has been taking steps to improve the complaint process. The Drought web page now links to information about complaints received and their disposition (where appropriate). Changes to the complaint portal are also under development to ensure that all of the required information is included in the complaint and to improve agency coordination in complaint response. The Division will work to increase public awareness about the complaint process by highlighting this information on the Board's web pages and in other materials.

2.5 Use the Most Applicable Data and Analysis in Curtailment Process

Throughout 2014, the Division and water right holders frequently evaluated the demand data to improve its accuracy. Section 3.0 discusses diversion data improvements in more detail. The Division is improving its curtailment analysis by augmenting reported demand data where it has identified errors such as non-consumptive demand or double-reporting, to better reflect actual demand. Given the delay in reporting of statements, the Division is exploring alternative approaches to quantify demand that is accurate and timely, such as averaging demand over multiple dry years (e.g averaging the 2010 to 2013 demand). If appropriate and feasible, the Division will also conduct curtailment evaluations on tributary reaches to determine if senior water right priorities are satisfied.

The field inspection program found that many persons who received curtailment notices for a post-1914 right claimed a riparian or pre-1914 right for continued diversions. In many instances, the Division was previously unaware of the claimed right. The Division will use informational orders, authorized under the emergency regulations, to obtain information on previously unclaimed rights, and to clarify the basis of known rights. If the emergency regulations are extended, the Division intends to use the informational order tool more extensively so that all water rights in key watershed are accounted for and included in the curtailment analyses.

2.6 Improve Inspection and Enforcement Process

Inspections and enforcement are critical to preventing unauthorized diversions and the wasteful and unreasonable use of water. The Division identified several problems with its compliance and enforcement efforts that prevented timely and effective enforcement of the water rights priority system. One issue was site access to conduct inspections. Although outright refusal to grant access for

Division inspections is uncommon, advance scheduling of inspections lessens the effectiveness of inspections in uncovering violations that may be occurring. The Division will explore possible changes to its inspection authority. Another problem is the inability to enforce water rights informational orders not issued pursuant to the emergency regulations. Informational orders are a tool to request basic documentation that can distinguish a legal from an illegal diversion. The tool must be enforceable in order to be effective and not ignored. The Division will also pursue options for improved long-term enforceability of information orders.

3.0 Data Quality in the Water Rights Database

In the past three years, the State Water Board has expanded the functionality of its water rights database, eWRIMS, so that it can now accept reported water diversion and use data through electronic submittals. As part of the package of legislation enacted in November 2009, the State Water Board and DWR were given the authority to require electronic data submittal. This same package of legislation also eliminated the reporting exemptions for certain water right holders and established penalties for failing to file these reports.

Even with these changes, there continue to be questions about the accuracy and timeliness of demand data and there are ongoing concerns about the ability to tie actual diversions to each specific water right. Ideally, both supply and demand data would be available on a real time basis, so that information describing the actual conditions of our waterbodies can be used to make the most informed and timely decisions. Until then, the Division has made, and will continue to make changes to increase both the amount and quality of data in the database.

The following are recommendations on how to improve the data quality in the water rights database:

3.1 Improve Water Demand Data Quality

As described previously, stakeholders in key watersheds worked closely with the Division in 2014 to help determine water uses and availability. The Division will continue to work with stakeholders to clarify information on water use and availability as well as to facilitate timely transmittal of data to DWR and the State Water Board so that water availability can be better determined on real-time and tributary-specific bases. On-line guidance documents are also proposed to better: 1) explain the information and terms used in the eWRIMS database, and 2) assist water right diverters with reporting their water diversion and use to the State Water Board. The Division will continue to provide year-round person-to-person assistance to diverters filing statements and reports.

3.2 Improve Reporting of Water Demand Data

Changing the Division's water diversion and use reporting forms is likely to improve the accuracy of water rights demand data. Water right holders who hold multiple water rights sometimes report their diversions cumulatively instead of broken out by each exercised right, making it difficult for the Division to attribute accurate diversion amounts to a particular exercised right. This can result in double counting where actual demand is less than calculated, which can in turn harm junior water right holders

whose diversions may be curtailed based on imperfect information. To improve demand data, separate reporting of diversion and use data for each point of diversion should be required. Additionally, diversion and use forms should be modified to require separate fields for the direct diversion or diversion to storage with identification of the bases of right being exercised. Currently, both direct diversions and diversions to storage are reported together. Finally, water diverted under water supply contracts or transfers should also be reported separately. The Division is exploring avenues to implement these changes. Requiring accurate accounting by each water right or water right claim would significantly benefit demand accuracy used in the Division's curtailment analyses.

3.3 Increase Demand Data Reporting Frequency

Riparian and pre-1914 water right diverters should be required to file statements annually, consistent with the frequency of reporting by post-1914 water right holders. This has been a long-term problem. The 1978 Report recommended that reporting be accelerated for riparian and pre-1914 water right diverters, noting that having a complete set of data for the prior year would have greatly assisted their work. Where demand is anticipated to exceed supply, projected diversion estimates should also be provided to the Board on a more frequent basis in order to better determine if curtailment of some rights is needed. This would increase the accuracy of curtailment determinations. Projected use and/or more frequently reported demand data may not be necessary in all watersheds or by all diverters, but it may be an invaluable source of information in watersheds where shortages are severe.

3.4 Automate Initial Assessments of Demand Data

The Division has been working on upgrades to the eWRIMS Report Management System (RMS) to improve quality assurance and control. These improvements will be implemented by early February 2015. Initially, error checking will be limited to just a few fields such as a comparison of reported diversions to face value. Additional automated data assessment features that alert water right holders and staff to potential errors in the reported data are also under development.

3.5 Require Measuring Devices and Define Exception Criteria

Currently, riparian and pre-1914 water right diverters are required to use "best professional practices" (BPP) and "best available technology" (BAT) to measure their diversions, unless the filer documents that implementation of those practices are not locally cost effective. Permit and license holders do not have the same requirement. The measuring requirements for BPP and BAT should include all water right diverters. In addition, approximately 68 percent of the statements received in 2012 and 2013 relied on the "not locally cost effective" exception and reported diversions that were estimated, not measured. Consideration should therefore also be given to further defining "not locally cost effective" by either establishing a threshold diversion amount or other criteria that would result in more diversions that are actually measured. For diversions that are claimed to be not locally cost effective, an accurate but less costly best professional practice or technology should be established.

4.0 Opportunities to Expand and Improve Data and Database Capabilities

Many federal, State and local agencies rely on water supply information for planning and decision-making. Geographic Information Systems and remote sensing technologies are making this information more readily available and in a more usable format. Information on river flows and water diversions, however, is very limited and not readily accessible in many cases. This lack of real-time information on flows and diversions makes it very challenging to determine if sufficient supply exists to support both the projected demand and in-stream needs. Because of the cost of state-of-the-art gages, many small streams are not gaged or the gages are unable or inadequately maintained to provide real-time, reliable information. However, these small streams often provide as much, if not more, valuable habitat and support important uses such as irrigation and drinking water.

Increased number of gages and additional modeling would improve certainty regarding water available for appropriation and make significant steps towards providing real time flow data. However, gage installation, gage maintenance, and model development are resource intensive.

The following are recommendations to on how to expand and improve data and database capabilities:

4.1 Improve Water Availability Analysis through Modeling

The Division has been working with the Center for Watershed Sciences at U.C. Davis to develop a prototype model for the Eel River watershed that could be used to make much more precise decisions on curtailments, both in terms of their imposition and withdrawal. The Eel River was selected as a pilot for its small size and simplicity with respect to the number of water rights and water right priorities. The model uses supply forecasts for select gage locations, distributes that flow to sub-watersheds, and then allocates the sub-watersheds' supply to known water rights in those areas based on priority of the rights and reported use. The unimpaired supply forecasts are provided by third parties such as CNRFC and DWR. The Eel River model has been completed and tested. Based on the outcome of the initial testing, the Division is pursuing expansion of the model to include additional watersheds such as the much larger Russian, Sacramento, and San Joaquin River watersheds. Additional testing and refinement of the model is now planned. The additional testing that is now underway will determine whether or not the model becomes the primary tool in the curtailment analyses or is used as a verification tool.

4.2 Improve Water Availability Analysis through Increased Telemetered Gages

As noted above, with the exception of large streams or large tributaries of major streams, most water sources in the state are not gaged. When smaller streams are gaged, individual organizations, landowners, or groups generally maintain the records independently. For the larger streams and tributaries, USGS runs and maintains a high quality streamflow gaging network. The gages in this network can cost as much as \$20,000 to install and most commonly measure river stage (depth of water) which is then correlated to flow data and must account for changing channel shape and size. It can cost as much as \$25,000 per year to maintain an individual gage and validate the stage-flow relationship, making consistent availability of this data a challenge. The Division will develop a work

plan, with pertinent agencies and stakeholders, to evaluate the existing network of federal, state, local, and privately held gaging stations and determine whether any of these stations can be enhanced to improve water availability analysis. The work plan will also identify potential sources of funding and strategic key locations where increases in the number of telemetered stream gages, precipitation gages and other watershed climate monitoring tools would provide for additional and more timely flow information, serving multiple purposes including determining whether flow is natural or foreign in time or source.

5.0 Conclusion

Many comments were submitted on the approach to curtailments taken in 2014 as well as suggestions related to other drought related actions. With drought conditions now continuing into 2015, this report primarily describes the short-term recommendations that either are, or can be implemented now. There are also a few recommendations included in the report that will take more time because they require legislative action or additional funding.

Drought conditions stress the water right prioritization system and expose issues or problems that may otherwise have gone unnoticed or untested for years. As weather patterns change, it is likely that this system will see more and more use. Based on the Division's analysis of its 2014 curtailment related actions, curtailment actions pursued during the 1976-77 and other droughts, as well as experience with frequent implementation of Term 91, elements of the water rights system would benefit from modernization as many states have already done.

While there may be some argument about the details, the ideal system for administering water rights would include three elements:

1. Adjudications or other actions which account for all rights, including riparian and pre-1914, and extinguishes prior unexercised rights for all streams,
2. Minimum in-stream flow requirements for all streams,
3. Real-time management of flows and diversions that accurately tracks water availability and the need for curtailment based on the accounting of water rights, hydrology, and by ensuring that minimum in-stream flow levels are met.

With the technology that exists today, the system should be capable of providing current, accurate data on water supply and demand so that decisions reflect the most up-to-date conditions. Investing in technologies to do this will significantly correct the problems with the reporting systems and data quality in the long run and will save resources over time.