Integrated Water Resources Science and Services
Russian River Basin Partner Meeting Report
October 6, 2014

Executive Summary

On April 2, 2014, the NOAA National Weather Service (NWS), in cooperation with the Sonoma County Water Agency (SCWA), convened a one-day meeting in Santa Rosa, California, involving 41 representatives from national, regional, state, and local organizations. This meeting was part of a national initiative called Integrated Water Resources Science and Services (IWRSS). The IWRSS Federal partner agencies include NOAA, the U.S. Geological Survey (USGS), and the U.S. Army Corps of Engineers (USACE). Because SCWA have actively engaged stakeholders in the Russian River Watershed on water resources management issues over the past several years, it was decided that, in order to avoid "stakeholder burnout," this meeting would be limited to governmental agencies. Since so much work has already been done or is underway, the meeting was designed to scope out possible demonstration projects that could build upon existing or planned initiatives in the Russian River Basin. The timing and location of this meeting were particularly relevant given the drought emergency in Sonoma County and across the state, with 2013 being the driest year on record in the area.

A preliminary meeting was held in December 2013 to identify current water resources initiatives and the highest priority issues for the Russian River Basin. Additionally, participants were asked to provide reports and other information related to priority issues and needs. Based on this information, the IWRSS team drafted an issues paper for the basin, and identified forecasting, hydrologic modeling, data management, and data collection and monitoring as the priority needs to address.

At the stakeholder meeting, participants were divided into breakout groups reflecting these priority needs, with monitoring and data collection treated as a crosscutting issue across the other three topics. Each breakout group proposed one or two pilot projects to demonstrate how the key information gaps could be filled to address priority issues. The groups were tasked with focusing on achievable goals, building upon existing efforts, and utilizing IWRSS. The pilot projects are summarized below:

1. Forecasting: Modernization of water management strategy for Lake Mendocino to achieve increased reliability and resiliency.

2. Hydrologic modeling #1: Creation of hydrologic model inventory and organization of a symposium to identify gaps in modeling based on inventory.

3. Hydrologic modeling #2: Informing placement of new stream gages to enhance monitoring capability.

4. Data management: Central data repository for active data streams to allow for common data access.

Breakout groups discussed and identified IWRSS agency roles for each project (along with identifying additional agencies or organizations) and existing efforts that could be leveraged to move the proposed pilot project forward. The meeting concluded with a discussion of next steps, including general timelines and agency leads for each project.

List of Acronyms

ARs	Atmospheric rivers
CA DWR	California Department of Water Resources
CDEC	California Water Data Exchange Center
CNRFC	California-Nevada River Forecast Center
CWMS	Corps Water Management System
DHM	Diffusion Hydrodynamic Model
EFREP	Enhanced flood response and emergency preparedness
ESA	Endangered Species Act
FBO	Forecast based operations
FIRO	Forecast-informed reservoir operations
HEC	Hydrologic Engineering Center
HEFS	Hydrologic Ensemble Forecast System
HMT	Hydro-Meteorological Testbed
IWRSS	Integrated Water Resource Science and Services
NGO	Non-governmental organization
NIDIS	National Integrated Drought Information System
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service (NOAA)
OAR	Office of Oceanic and Atmospheric Research (NOAA)
RCD	Resource Conservation District
RRFC	Mendocino County Russian River Flood Control and Water Conservation Improvement District
SCWA	Sonoma County Water Agency
UCCE	University of California Cooperative Extension
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WFOs	Weather Forecast Offices (NOAA NWS)

Purpose of the Meeting

On April 2, 2014 the NOAA National Weather Service (NWS), in cooperation with the Sonoma County Water Agency (SCWA) and in coordination with the IWRSS Federal partner agencies, convened a one-day meeting in Santa Rosa, California, involving 41 representatives from national, regional, state and local organizations. IWRSS Federal partner agencies include the U.S. Geological Survey (USGS), U.S. Army Corps of Engineers (USACE), and NOAA NWS. During the meeting, participants engaged in full-group discussions and breakout group sessions to achieve the following objectives:

- Verify key gaps that IWRSS might fill to inform water resources decision making;
- Identify pilot projects that could demonstrate IWRSS capability and build on existing efforts;
- Identify functional components of pilot projects, assign lead roles, timeframes, and approximate costs;
- Discuss benefits and map out next steps.

Following is a summary of the discussion and recommendations from the meeting.

Priority Water Resources Issues in the Russian River Basin

The Russian River Basin faces numerous water resource management challenges related to flow levels, as evidenced by the current drought conditions and statewide drought emergency declaration for the entire state of California. Calendar year 2013 was the driest year on record in Sonoma County. Although storms in the late winter and early spring slightly

mitigated the emergency conditions, rainfall during 2013 through March 2014 was only one-third of the long-term average. As of September 15, 2014, Lake Mendocino water levels were at 27.6 percent of capacity.

In December 2013, a stakeholder engagement kickoff meeting was held between the IWRSS team and local groups, including Sonoma County Water Agency (SCWA) and Mendocino County Russian River Flood Control and Water Conservation Improvement District (RRFC). This meeting served as a forum to discuss previous stakeholder engagement initiatives and current/planned activities in the Russian River Basin. Based on input received during this meeting and a subsequent review and summary of recommended reference materials (see Appendix B), the team developed the following list of priority water resource issues in the Russian River watershed

- *Providing flows to protect, maintain and restore fisheries and aquatic habitat, especially for endangered species, as well as human uses*. Provisions of flows to protect, maintain, and restore aquatic habitat, especially for endangered species, including Coho salmon, is the main focus of integrated water management efforts in the basin. The Russian River Biological Opinion published in 2008 by the Fisheries Service mandates the creation of pools, backwaters, and side channels and maintaining flow velocities conducive for young fish. Additionally, the Russian River serves multiple human needs including domestic and agricultural uses, as well as recreational uses (see third bullet below).

Juvenile Coho Salmon

Related to this priority area, NOAA's Habitat Blueprint initiative is currently providing funding to several projects in the Russian River Basin for habitat protection and restoration for salmonid stocks; improving frost, rainfall, and river forecasts through improved data collection and modeling; and increasing community and ecosystem resiliency to flooding and drought through improved planning and water management strategies. In addition, SCWA has a plan in place to restore endangered fisheries (Russian River Instream Flow and Restoration Plan).

- *Predicting, managing, and responding to extremes (floods and droughts).* Significant flooding occurs in the Russian River Basin approximately every four years. For the most part, this flooding is attributed to occurrence of atmospheric rivers. These extreme precipitation events can contribute to coastal flooding and mudslides, which can cause significant damage to buildings and infrastructure. In addition, drought conditions require well-informed management responses to successfully navigate multiple competing uses.

Related to this priority area, NOAA's Hydro-Meteorological Testbed (HMT) conducts research on precipitation and weather conditions and accelerates the infusion of new science and technology into daily forecasting. The HMT maintains a coastal atmospheric river observatory in the southern part of the Russian River Basin. NOAA's National Integrated Drought Information System (NIDIS) is working to implement an integrated drought monitoring and forecasting system at federal, state, and local levels. The Russian River Basin was selected as a pilot project as part of NIDIS to explore design and implementation of early warning systems.

- *Managing water for competing uses, closely linked to reservoir storage, releases for fisheries, and groundwater withdrawals for crop frost protection*. The challenges of managing water resources during extreme weather periods is compounded by growing demands of an increasing population in the Russian River Basin, paired with a lack of surface storage and finite local groundwater supplies. Grapes are an increasingly dominant agricultural crop in the basin and vineyard tourism has grown in popularity, incentivizing conversion of land into vineyards, which require water withdrawals for irrigation and frost protection.

Currently, the NWS California-Nevada River Forecast Center provides reservoir inflow information and river flow forecasts. River flow information is also provided by the California Department of Water Resources, Division of Flood Management, and USGS California Water Science Center. The California Water Data Exchange Center (CDEC) disseminates various water-related information and data.

- *Predicting and managing the effect of climate change on both air and water temperature and on the intensity and frequency of extreme events.* According to the U.S. Global Change Research Program (USGCRP), extreme events, such as flooding and droughts, are predicted to increase in severity and intensity in California. Climatic fluctuations may cause further stress on salmonid populations in the Russian River.

- *Ensuring water quality through prevention, management, and remediation of point and non-point source pollution.* The Russian River mainstem and many of the major tributaries of the Russian River are listed as impaired under Section 303(d) of the Clean Water Act. Nonpoint sources of pollution in the Russian River Basin include agriculture, construction-related runoff from buildings and roads, stormwater runoff from impervious surfaces, and septic systems.

Russian River Basin Gaps & Needs

In connection with the priority water resource issues, the IWRSS team also identified information needs and gaps that contribute to water resource challenges in the region. These needs were described in a brief summary paper distributed to participants prior to the forum and updated by the group during the morning plenary session:

1. **Improved forecasting for water management** (including forecast-based operations), to address gaps related to river flows, reservoir releases, water use, groundwater dynamics, atmospheric rivers, seasonal variations, and extreme temperatures.

2. **Improved hydrologic modeling** to address gaps related to surface-groundwater interactions, understanding of gain and loss of reaches on tributaries, water quality parameters including sediment, temperature, and dissolved oxygen, flood inundation mapping, and characterization of managed and natural flows.

3. **Improved data management** to address gaps in cross-agency coordination, data interoperability, measurements and models, accessibility, and dissemination of data to stakeholders.

4. **Improved monitoring and data collection** to address gaps in water quantity information including precipitation, spatial distribution and interaction of surface water and groundwater, soil moisture, and unregulated or illegal diversions; water quality information including water temperature and fisheries/habitat; and real-time finer-scale atmospheric data.

The fourth need, improved monitoring and data collection, was identified by the IWRSS team as a crosscutting topic that could be addressed as part of the first three needs. During the opening plenary session, participants agreed to integrate this need into the three breakout group discussions.

Partners Meeting

Opening Plenary Session

Mary Mullusky (Acting Chief, NWS Hydrologic Services Division) laid the groundwork for the day by providing an overview of IWRSS objectives and ongoing activities. Natalie Cosentino-Manning (NOAA Fisheries Restoration Center) presented on the NOAA Habitat Blueprint and the selection of the Russian River Basin as the first Habitat Focus Area for this initiative. Participants asked questions after each presentation related to coordination of projects across the agencies involved in the IWRSS and Habitat Blueprint, future expansion of agency participation, and agency budget coordination.

In preparation for the first breakout group session, the four Russian River Basin needs (outlined above) were presented to participants, who briefly discussed each gap and added their input.

Morning and Afternoon Breakout Sessions

Following is a summary of the breakout group discussions. Participants were divided into issue-based groups reflecting the three priority gaps and needs. During the morning breakout session, each group was asked to identify one or two pilot projects to demonstrate how their need/gap could be met by IWRSS. The groups were asked to describe at least one project (or part of a longer-term project) that could be completed in the near term (within one to two years). Participants were instructed to brainstorm pilot projects that would inform event-driven, high impact or important decisions or questions that "keep you up at night." For the afternoon breakout session, each group was asked to further develop their pilot project ideas by identifying the major functional components of each pilot project, assigning lead agency roles, and noting potential economic benefits. Worksheets were used to help structure the break out discussions. Participants (by breakout group) are listed below (the full participant list can be found in Appendix A).

Forecasting	Hydrologic Modeling	Data Management
Marchia Bond	Rich Niswonger	Jerad Bales
Lynn Johnson	Tracy Nishikawa	Don Seymour
Jay Jasperse	Dawn Taffler	Craig Lichty
Rob Hartman	Bill Charley	Mark Strudley
Bill Jacoby	Reginald Kennedy	Rob Cifelli
Jack Hogan	Michael Schaffner	Natalie Cosentino-Manning
Zachary Hamill	Brittany Heck	Alan Haynes
Marty Ralph	Alan Flint	Stu Townsley
Michael Anderson	Mary Mullusky	Art Hinojosa
Ann DuBay	Mike Dillabough	Donna Page
Sean White	Chris Delaney	
Dick Butler	Josh Fuller	
Patrick Rutten	Grant Davis	
Lorrie Flint		
Micah Effron		
David Manning		

Results from the Forecasting Breakout Group

Lake Mendocino: Aerial view and plane view (courtesy SCWA)

Pilot Project Identification

Proposed Pilot Project:

- Modernize the Lake Mendocino water management strategy to achieve increased reliability and resiliency. This project would improve water management methods and strategies and would include the following elements:
    - Element 1: Quantify forecast attributes that would improve decision-making, identify forecasts needed, and determine what level of certainty is appropriate.
    - Element 2: Total water forecasting.
    - Element 3: Water quality forecasting.
    - Element 4: Institutional change (updated policies; risk management).

What decision(s) would this pilot project inform?

- Optimizing reservoir operations.

What foundation would it build upon?

Existing Effort/Foundation	Organization(s)
Increased instrumentation (hydromet, soil probes)	SCWA/HMT
Enhanced flood response and emergency preparedness (EFREP) (a state program to improve forecast and warning capabilities)	CA DWR/NOAA/Scripps
Hydrologic ensemble forecast system (HEFS), integration into CWMS (could be used to test forecast scenarios/hindcasting)	NOAA NWS, USACE
Basin characterization model, diffusion hydrodynamic model (DHM), SCWA models, HEC models	USGS, NOAA, SCWA, USACE HEC

Long-term feasibility study for modification of dam at Lake Mendocino (long-term), short-term study	USACE
Cal Water 2: Climate change impact study: future of atmospheric rivers (ARs), aerosols and impact on clouds and precipitation	Scripps Center for Western Weather and Water Extremes, and others
Habitat Blueprint	NOAA, SCWA
NIDIS atmospheric rivers and drought project	USGS, Scripps

Define Success: This project would be successful if:

- A prospectus development workshop is held to develop scope and create a roadmap for the project.
- An interagency collaborative process is established to identify projects that would improve reservoir operations.
- Ways to reduce forecast uncertainty are identified and quantified.
- Forecast uncertainty is reduced.
- Storage in Lake Mendocino is more effectively managed for multiple purposes.
- Science is used to demonstrate improved water management.
- This process is documented so other organizations can benefit (lessons learned).
- Barriers (i.e., institutional) to forecast-based operations are documented (lessons learned).

<u>What can be done shorter term (with little/no additional resources)? What can be done longer term (with additional resources)?</u>

- Short Term (within 6 months)
    - Hold a 2-day prospectus development workshop at Scripps to outline a multi-year effort to improve reservoir operations (within 3 months).
    - Create a roadmap with longer-term goals (within 6 months).
- Medium Term (within 2 years):
    - Define forecast baseline (streamflow, AR, seasonal forecast e.g. El Niño).
    - Set up monitoring locations (early in process).
    - Identify requirements for forecast-informed reservoir operations (FIRO). Quantify predictability of ARs, precipitation and streamflow and pathways for their improvement (both wet events and dry periods).
    - Define conditions that create worst-case scenarios (too much and too little) and develop conceptual scenarios for FIRO for flood and drought. Challenge: how to handle truly extreme/rare events with few examples to draw from. Develop conceptual reservoir alternative, test with historic extreme flood and droughts. Challenge: how to handle extreme events with dearth of examples.
    - Quantify potential economic benefits of FIRO drought and flood scenarios (not just for flood control).

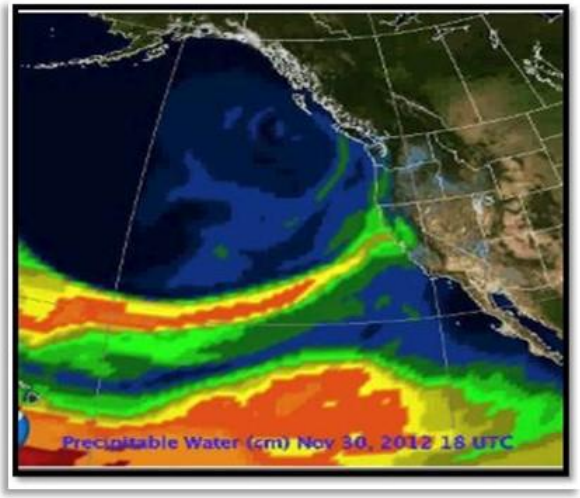
- Longer Term (> two years):
    - Improve forecast skill gaps identified in the FIRO requirements analysis.
    - Conduct retrospective "what-if" analyses using FIRO scenarios.
    - Design a real-time demonstration of FIRO for 2 winters (no actual changes in releases).
    - Carry out real-time demonstration project.
    - Evaluate results (positive and negative).

Pilot Project Functional Component Analysis

Pilot Project #1: Modernize Water Management Strategy for Lake Mendocino to Achieve Increased Reliability and Resiliency

Subcomponent descriptions:

- Identify requirements to enable FIRO:
    - Improved forecasting of atmospheric river events, rain event intensity, and duration.



Water vapor image showing atmospheric river

    - Establish forecast timescale requirements (may be different for different uses). For example, seasonal flood control during the spring needs a forecast of a different timescale as compared to forecast needs for frost and water supply concerns. There are also short-term evacuation timing considerations that must be taken into account.
    - Forecast needs upstream of the reservoir (capture for fisheries), and also downstream to account for releases.
    - Improved understanding of the runoff ratio and quantification of "losses" to soil moisture.
    - Determine what forecasts are needed and help determine what level of certainty is appropriate (best possible forecast scenario).

- Define forecast baseline:
    - Define the capability of current forecasts for streamflow, atmospheric rivers, and seasonal events like El Niño.
- Total upstream water balance forecasting (this is a tool for validation):
    - For reservoir re-operations.
    - Monitoring and modeling.
- Water quality forecasting:
    - A goal would be to reduce turbidity of discharge by better timing releases after precipitation events.
    - Require water of sufficient quality/quantity for fisheries (e.g., temperature).
    - Balance between release and retention to minimize turbidity (e.g., socioeconomic impacts; recreational fisheries impacts).

IWRSS roles:

- NOAA (CNRFC, OAR/HMT, and NMFS)
    - Provide information on current capabilities (e.g. hindcasting).
    - Habitat Blueprint: ecological, flood avoidance, commodity water value quantification.
    - Uncertainty in streamflow, atmospheric river (AR) occurrence.
    - NOAA NWS (Rob Hartman) to review list of developed forecast baselines.
- USACE
    - If possible, identify risk thresholds.
- USGS
    - Determine uncertainty in streamflow observations.

Other agency roles:

- RRFC and other groups: act as representative for locally affected stakeholders

Pilot Project Leadership:

Scripps Center for Western Weather and Water Extremes: Marty Ralph (co-lead)

USGS/Scripps: Mike Dettinger (co-lead)

NOAA: Pat Rutten

USACE: Mike Dillabough

SCWA: Jay Jasperse

CA DWR: Mike Anderson

Timeline:

- April/May 2014: Planning group gathers to plan workshop, establish monthly call schedule.
- July 2014: Workshop to create roadmap, list of possible forecast baselines.
- October 2014: Report out in form of written prospectus for FIRO demonstration.
- Winter 2015: Regroup to discuss lessons learned, future work/transferable projects, quantify benefits.
- See longer term actions and timeline above

Results from the Hydrologic Modeling Breakout Group

Pilot Project Identification

Proposed Pilot Project:

- Brainstorming: Pilot projects for runoff modeling, small basin modeling, low-flow modeling, and groundwater modeling. Soil moisture, stream temperatures, precipitation, and streamflow monitoring were identified as data necessary to support modeling. A need for a unified model platform led to the identification of the first pilot project.

- Pilot project #1: Model inventory and local forum/symposium. The model inventory would identify when a model could be used and what decisions could be made using the model. A local forum would be a follow up activity once the inventory was complete to present the findings of the project to watershed stakeholders.

- Pilot project #2: Consultation for NOAA NMFS gage siting (enhanced monitoring to inform gaps in modeling).

What decision(s) would this pilot project inform?

- Pilot project #1:
    - Forecasting drought/floods
    - Irrigation management
    - Fisheries management (flow expectations)
    - Improved decision-making credibility by using accepted/vetted models
    - Identifying monitoring needs and supporting gage placement (see project #2).
- Project #2:

- Modeling and providing baseline data.

What foundation would it build upon?

Project #1:

Existing Effort/Foundation	Organization(s)
HydroTech Meeting/Workshop	NOAA OAR
Russian River Watershed Independent Science Review Panel	SCWA
Tributary gaging project (see Project #2)	NOAA Restoration Center
Recently awarded SCWA consultant work	Kennedy/Jenks Consultants

Project #2:

Existing Effort/Foundation	Organization(s)
Existing gages in the basin	USGS, RCDs, UCCE

Define Success: This project would be successful if:

- Project #1:
  - A web-page inventory for users is developed.
  - Outstanding science gaps are identified.
  - Scenario planning is addressed.
  - Appropriate implementation of models occurred.
  - The inventory supported identification of monitoring needs and supported the gage placement in Project #2.
- Project #2:
  - A geo-database of federal and local monitoring efforts was created.

What can be done shorter term (with little/no additional resources)? What can be done longer term (with additional resources)?

- Project #1:
  - Short Term (within 7 months)
    - Symposium
  - Longer term
    - On-line inventory, webpage

        - More pilot projects to address key priorities
- Project #2:
    - NOAA gages sited by Spring 2015.

Pilot Project Functional Component Analysis

Pilot Project #1: Model inventory and local forum/symposium

Subcomponent descriptions:

- Hydrologic modeling inventory: The inventory will focus on existing models (both codes and programs) and contain information on the purpose of the model, accuracy, spatial and temporal resolution, known strengths and weaknesses, where it can be accessed, and examples of applications. The types of models to be reviewed by the group will include surface-water and groundwater interaction models to support basin water supply planning, and also hydrologic models which could be used to support project #1, the forecast informed reservoir operations (FIRO) project. A working group will be formed to agree on criteria to evaluate each model and then evaluate the strengths and weaknesses of each based on the criteria.
- Modeling symposium: After the working group has reviewed the inventory, a symposium will be convened with working group participants and model users in the watershed. It is anticipated that the symposium will cover three general topics:

    1. Inventory of model platforms:

        - Potential modeling platforms (H&H, watershed, integrated surface and groundwater, etc.) completed by IWRSS Federal agencies

        - Geospatial database tool of existing Russian River watershed models (prototype to be developed by SCWA).

    2. Evaluation of integrated surface water and groundwater model for the Alexander Valley. SCWA and consultant Kennedy/Jenks will present results of analysis and recommendations for the Alexander Valley integrated model. Input received during the symposium will be incorporated into the final report of the model scoping study conducted as part of a grant from the California Water Foundation.

    3. Hydrologic Working Group to present on potential high flow modeling platforms, which could be used to support a future implementation of FIRO for Lake Mendocino.

IWRSS agency roles: NOAA, USACE, and USGS will identify subject matter experts within their agencies and create a working group to develop criteria and evaluate each model.

Other agency roles:

- SCWA will coordinate the working group
- Kennedy/Jenks (SCWA contractor) will work on an inventory of surface water-groundwater models that can serve as framework for organizing the IWRSS inventory.

Pilot Project Leadership:

SCWA: Chris Delaney (lead)

NOAA: Lynn Johnson

USACE: Bill Charley

USGS: Tracy Nishikawa

Timeline:

- April/May 2014: SCWA and IWRSS agency leads will schedule some scoping discussions and determine a more detailed project schedule.
- June 2014: Each agency will compile their model inventory. NOAA Blueprint projects would be greatly enhanced by credible, vetted models, but this would require the modeling symposium to be held within the next 6 months (October 2014).
- August/September 2014: Evaluation criteria determined and inventory completed.
- October 2014: Modeling symposium held.
- Winter 2015: Regroup to discuss lessons learned, future work/transferable projects, quantify benefits.

Pilot Project #2: NOAA stream gage and weather station placement

Subcomponent descriptions:

- Geospatial database: Create an inventory of existing monitoring gages across all agencies.
- Coordinated instrumentation placement: Funding could be available for 12 gages and 20 weather stations. Subject matter experts from IWRSS agencies could convene to identify priorities for gages and identification of tributaries for installation. Place one or two gages as pilot project test-bed in particularly sensitive basins (depending on landowner cooperation).

IWRSS agency roles: NOAA, USACE, and USGS will identify monitoring gages, with USGS taking the lead. This coordinated instrumentation activity will leverage some of the early information that comes out of the Data Management Pilot Project.

Other agency roles: Landowners, resource conservation districts, Mendocino Farm Bureau, SCWA, Mendocino Flood, other non-regulatory agencies and groups.

Pilot Project Leadership:

USGS: TBD

NOAA: Mark Strudley, WFO Monterey

USACE: Holly Costa, Regulatory Division San Francisco District, USACE

Timeline:

- Spring 2015: Gages installed

Results from the Data Management Breakout Group

Pilot Project Identification

Proposed Pilot Project:

- Pilot Project #1: Central repository for data sharing/exchange. Develop a platform for the storage and use of raw data, processed data, and QA/QC'd data to improve coordination and water resource management in the basin. This effort will first require defining processes to allow for common data access (fully integrated, discoverable). Secondly, the pilot project will need to define the specific use data needs. The target audience would be management agencies and the public.

What decision(s) would this pilot project inform?

- Fully integrated and accessible date would support data-informed management decisions, which would help the agricultural sector make informed decisions on when/how much water to pump. Currently, operations are poorly coordinated due to lack of information.

What foundation would it build upon?

Existing Effort/Foundation	Organization(s)
California Data Exchange Center (CDEC)	CA DWR
Environmental Response Management Application	NOAA
Hobbes Project	UC-Davis

Define Success: This project would be successful if:

- There was a commitment from all agencies to provide a consistent and reliable data stream to CDEC, which is a robust and well-maintained central repository for relevant agencies to upload their respective water-related data for the Russian River Basin.

What can be done shorter term (with little/no additional resources)?

- Participating agencies migrate data streams to a single location
- Testing by IWRSS partner group.

What can be done longer term (with additional resources)?

- Receive feedback from testers, incorporate additional data from other organizations (e.g. NGOs).

Pilot Project Functional Component Analysis

Pilot Project: Central data repository

Subcomponent descriptions:

- Initial inventory: CDEC to provide list of all the data for the Russian River that they currently receive. Each agency will also provide types of data they could make available for the repository in native format and provide schema. Team will organize webinar to roll our project and gather suggestions.
- Needs assessment: Evaluate what users need (e.g. precipitation estimates, reservoir outflows, water quality, soil moisture, reservoir release data). Additionally, a second tier of data collection from non-governmental organizations (NGOs) could be included.
- Server deployment: Deployment of all collected data.

IWRSS agency roles:

NOAA, USACE, and USGS will gather data for submittal as well as identify other data sources to create comprehensive data inventory.

Other agency roles:

- SCWA: Coordinator
- CDEC: Inventory data currently in CDEC from federal agencies and will provide staff to work with IWRSS team.
- NGOs: After data gathered from federal and state agencies, NGO data will be inventoried and incorporated into the repository.

Pilot Project Leadership:

SCWA: Don Seymour (lead)

CDEC: Arthur Hinojosa or designate

NOAA:

- NMFS: Natalie Cosentino-Manning or designate
- NWS: Mark Strudley and Alan Haynes
- OAR: Allen White or designate

USACE: Christy Jones

USGS: TBD

Timeline:

- Summer 2014: Team will hold calls to refine schedule and plan kick-off webinar.
- October 2014: Participating agencies complete migration of data streams to a single location, which will go live for testing by IWRSS partner group.
- Later: Wider rollout for testing beyond IWRSS partner group.
- Winter 2015: Regroup to discuss lessons learned, future work/transferable projects, quantify benefits.

Next Steps

- IWRSS Executive Committee will coordinate and track each group's progress through quarterly meetings. The Executive Committee will be composed of IWRSS agency representatives, as well as pilot project coordinators and SCWA representatives:
    - Rob Hartman, NOAA (co-lead)
    - Pat Rutten, NOAA (co-lead)
    - Stu Townsley, USACE
    - USGS: TBD
    - Jay Jasperse, SCWA
    - Data Group Coordinator: Don Seymour, SCWA
    - Modeling Group 1 Coordinator: Chris Delaney, SCWA
    - Modeling Group 2 Coordinator: USGS (lead TBD)
    - Forecast Group Coordinator: Marty Ralph, Scripps, and Mike Dettinger, USGS/Scripps
- Schedule next Russian River Basin IWRSS Meeting for December 2014. The Executive Committee, pilot project group leadership, and participants in the April 2 partner meeting will reconvene to discuss lessons learned, future work and project transferability, and quantify benefits of pilot projects.

Appendix A

Integrated Water Resources Science and Services (IWRSS):
A Forum to Discuss this New Federal Initiative

Russian River Basin

April 2, 2014

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Appendix B

Russian River Basin – Water Resources Issues and Gaps
An Issues Paper Prepared for IWRSS Forum
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The Russian River Basin faces many water resources challenges. It has also been the site of various plans and projects to take steps towards solving these challenges, including early conceptual planning for IWRSS activities. A stakeholder engagement kickoff meeting with IWRSS federal partners and local groups including Sonoma County Water Agency (SCWA) and Mendocino County Russian River Flood Control and Water Conservation Improvement District (RRFC) was held in December 2013 and served as a forum to discuss previous stakeholder engagement and planned activities. Additionally, the participants highlighted overarching issues and gaps that confront their agencies and stakeholders. To provide a background on past work, current planning, and future projects, kick-off meeting participants offered reference materials from previous or ongoing activities. The December meeting and review of existing efforts helped ensure that future IWRSS activities in the Russian River Basin would not be redundant and that stakeholders would not be burdened by participation in duplicative projects or excessive outreach. This document summarizes some of the priority issues identified by previous work in the Russian River Basin and prevailing information gaps that should be addressed in order to ensure the success of the IWRSS moving forward.

Since the December meeting, a drought emergency has been called statewide and in Sonoma County, with calendar year 2013 being the driest year on record locally. While storms in February and March have somewhat mitigated the extreme conditions, water year 2013-14 is still less than one-third of average rainfall and Lake Mendocino levels are at 44 percent. This latest weather pattern highlights the need to address the region's most pressing water issues.

Stakeholders identified a several key issues that underlie water resources challenges in the basin:

- An overarching concern was expressed for provision of flows to protect, maintain, and restore fisheries and aquatic habitat,[1] especially for endangered species[2] including Coho Salmon.[3]
- Another important issue included prediction, management, and response to hydrologic extremes (floods and droughts), to manage water availability and use, especially in terms of quantity and reliability.
- The effect of climate change on the intensity and frequency of extreme events, along with temperature, and the resulting effect on water management planning.[4]
- Management of water for competing uses (e.g. agriculture, ecological flows, and other uses) was also identified as a key issue in additional documents, closely linked to reservoir storage and releases for fisheries[5] and withdrawals from groundwater for agricultural frost protection.[6,7]
- Water quality was also identified as an issue, especially prevention, management, and remediation of point and non-point source pollution.[8]

Documents provided by partners outlined key issues in detail. A concept paper[9] developed for early IWRSS activities outlined major issues facing the Russian River Basin. These issues include:

- Extreme wintertime precipitation due to atmospheric rivers, which can cause coastal flooding and mudslide events;
- Competing uses for domestic and agricultural water supply;
- Maintenance of stream flows for endangered fisheries habitat based on the Russian River Biological Opinion;
- Demands for water-based recreation;

- Hydrologic extremes from floods to droughts;
- Balancing water allocations for multiple uses;
- Ongoing groundwater storage depletion; and
- Concerns with climate change and the long-term impacts on the weather and the water budget in the basin.

In interviews conducted by the Mendocino County Resource Conservation District,[10] a majority of stakeholders identified "the presence of un-regulated and often illegal stream diversions from tributaries and the mainstem" as "the biggest problem affecting natural hydrologic and ecologic function of the Russian River." Other issues included:

- Effect of instream flow management in tributaries and the suppression of natural processes;
- Human-induced habitat loss including agriculture, urban expansion, road systems, and gravel mining; impacts to river hydrology and geomorphology due to reduced riparian habitat, urban development, dams, pumps, diversions, wells, and changes to flow regime; hydrologic disconnection from the floodplain, physical limits to meander, and gravel harvest with limited gravel re-nourishment;
- Lack of surface storage;
- Increasing human population;
- Water quality, specifically high turbidity;
- Salmonid passage;
- Frost protection;
- Groundwater management;
- Forest fuel management; and
- Watershed education.

Important data gaps and needs must be filled before IWRSS can move forward and provide new or additional products and services that would create regulatory certainty and clarity for stakeholders in the watershed. The stakeholder engagement kickoff meeting and previous stakeholder engagement activities identified the following gaps:

1. Need for monitoring and data collection

Why? Monitoring and data collection when fully integrated with modeling and forecasting can address a diverse array of water quantity and water quality concerns (scaled climate change modeling, [11] *fisheries-habitat relationships, runoff predictions, etc.).*

This could address some of the following gaps:

- Water quantity information: including precipitation data;[12,13] surface-groundwater distributions; soil moisture monitoring;[14] quantification of unregulated or illegal diversions.[15,16]
- Water quality information: including temperature data; fisheries/habitat data.
- Real-time & finer-scale atmospheric monitoring data.[17]

2. Need for improved forecasting and water management

Why? Improved forecasting of extreme weather events and river levels can improve flooding and drought predictions, which will allow for more effective management decisions regarding supply, flood control, and storage.

This could address some of the following gaps:

- Forecasting river flows, taking into account reservoir releases and water use.
- Enhanced atmospheric river forecasting (help anticipate extreme flooding and adjust releases accordingly).
- Forecast based operations (FBOs). [18]

3. Need for improved hydrologic modeling

Why? Improved hydrologic modeling will increase understanding of flow regimes (for salmon and human use), storage capacity, and paired with improved meteorological forecasting, potential future hydrologic conditions.

This could address some of the following gaps:

- Surface water-groundwater interactions.[19]
- Understanding of gain and loss of reaches on tributaries under various levels of impairment and future conditions.[20]
- Sediment transport impacts on flooding and biota.

4. Need for improved data management

Why? Improved data management can mean better coordination (and reduction in redundant dataset collection or production), standardization of data (improves interoperability of models). A better sense of existing data and models means easier prioritization of future data collection efforts and model building. This could address:

- The need for more coordination between agencies.
- Improved data interoperability to inform water availability for competing needs.

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[1] Improve Precipitation and River Flow Forecasting to Maximize Water Capture for Fisheries, 2013.
[2] Russian River Kickoff Meeting discussion, December 17, 2013.
[3] Russian River CCC Coho Salmon Recovery Plan, 2012.
[4] Russian River Kickoff Meeting discussion, December 17, 2013.
[5] Case Study – California: Russian River Watershed, 2013.
[6] Improving Frost Forecasts for the Russian River Basin, 2013.
[7] California's Russian River: A Conservation Partnership, 2013.
[8] Russian River Kickoff Meeting discussion, December 17, 2013.
[9] Concept Paper: Russian River, California Pilot Study for Integrated Water Resources Science and Services, 2010.
[10] Russian River Integrated Coastal Watershed Management Plan, 2012.
[11] Biological Opinion for Water Supply, Flood Control Operations, and Channel Maintenance, 2008.
[12] An Overview of the NOAA Habitat Blueprint and a Description of the Russian River Habitat Focus Area, 2013.
[13] Russian River Tributaries Water Budget High Resolution Characterization of Historical, Current and Future Conditions, 2013.
[14] Russian River Kickoff Meeting discussion, December 17, 2013.
[15] Russian River Integrated Coastal Watershed Management Plan, 2012.
[16] Russian River Integrated Coastal Watershed Management Plan, 2012.
[17] Improving Frost Forecasts for the Russian River Basin, 2013.
[18] Improve Precipitation and River Flow Forecasting to Maximize Water Capture for Fisheries, 2013.
[19] Case Study – California: Russian River Watershed, 2013.
[20] Russian River Tributaries Water Budget High Resolution Characterization of Historical, Current and Future Conditions, 2013.