

RECLAMATION

Managing Water in the West

Environmental Assessment 16-10-MP

Agreement for the Reimbursement of Groundwater Pumping Costs for the Gray Lodge Wildlife Area Between the United States and the State of California (2016-2031)

Refuge Water Supply Program
Bureau of Reclamation, Mid-Pacific Region
Sacramento, California



U.S. Department of the Interior
Bureau of Reclamation

August 2016

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Section 1 Introduction

The Bureau of Reclamation (Reclamation) proposes entering into the “*Agreement for the Reimbursement of Groundwater Pumping Costs for the Gray Lodge Wildlife Area between the United States and the State of California*” (Reimbursement Agreement) with the State of California Department of Fish and Wildlife (CDFW) in order to reimbursement CDFW for costs associated with pumping groundwater as part of Level 4 supplies for the Gray Lodge Wildlife Area (WA) (Proposed Action). The term of the Reimbursement Agreement would be effective in Water Year (WY) 2016 and cover WY 2016 through WY 2030, approximately 15 years.

The Proposed Action, located in Butte and Sutter counties of California (see **Figure 1**), would allow for the pumping of up to 16,159 acre-feet (AF) of groundwater per year. Such groundwater would be utilized to meet part of Gray Lodge WA’s Level 4 (L4) supplies.

1.1 Background

Section 3406(d) of the Central Valley Project Improvement Act (CVPIA), Public Law 102-575, Title 34 (1992), authorizes and directs the Secretary of the Interior, through Reclamation, to deliver firm water supplies of suitable quality to 19 federal, state and private wetland habitats, wildlife areas and wildlife refuges (collectively referred to as Refuges) located in the Central Valley, including the Gray Lodge Wildlife Area (WA; Refuge). CVPIA identifies two refuge water types, Level 2 (L2) and Level 4 (L4) for delivery to the Refuges.

Section 3406(d)(1) of the Act directs the Secretary, through Reclamation, to provide water supplies to the Refuges in accordance with Level 2 of the “Dependable Water Supply Needs” table for those habitat areas as set forth in the *Report on Refuge Water Supply Investigations* (Reclamation, 1989) (Refuge Water Supply Report). This report describes water needs and delivery requirements for each identified wetland habitat area to accomplish the stated refuge management objectives. In the Refuge Water Supply Report, L2 represents the average annual historical water supplies received by these refuges between approximately 1975 through 1984, and L4 identifies the water supplies needed for full development of the Refuges for optimal habitat benefits. L2 water is provided primarily from the Central Valley Project (CVP) supplies.

Section 3406 (d)(2) directs the Secretary, through Reclamation, to supplement those quantities of water (L2 water supplies) provided under Section 3406 (d)(1) to full L4 quantities of the “Dependable Water Supply Needs” table for those habitat areas as set forth in the *Report on Refuge Water Supply Investigations*. The quantities of water required to supplement the L2 supplies represent the difference between the L2 allocation and L4 allocation, and must be acquired

through voluntary measures, including water conservation, purchase and conjunctive use, which do not require involuntary reallocations of CVP yield. The difference between L2 and full L4 water quantities is referred to as Incremental Level 4 (IL4).

Under CVPIA, Reclamation is responsible to provide 44,000 AF of Level 4 water to Gray Lodge WA. This annual allocation is comprised of 35,400 AF of L2 and 8,600 AF of IL4 water supplies.

Most of the surface water supplies used on Gray Lodge WA is conveyed through the Biggs-West Gridley Water District's (BWGWD; District) facilities to 3 points of delivery on the northern Gray Lodge WA boundary. Reclamation entered into a long-term conveyance agreement with BWGWD in September 2003 for the conveyance of CVPIA water supplies to the Refuge. This agreement also has a facilities construction component for the purpose of improving District conveyance facilities to increase capacity to provide CVPIA surface water deliveries meeting the scheduled needs of Gray Lodge WA of the full CVPIA Level 4 allocation. Presently, due to capacity constraints, the District can only deliver reduced amounts of L2 water, and no IL4 water, until the facilities improvement project is completed. However, the District annually shuts down its conveyance system for approximately 3 months for maintenance and repairs, usually occurring from mid-January through mid-April. Historically, groundwater has been the only water supply source for Gray Lodge WA during the District's operational shutdown period.

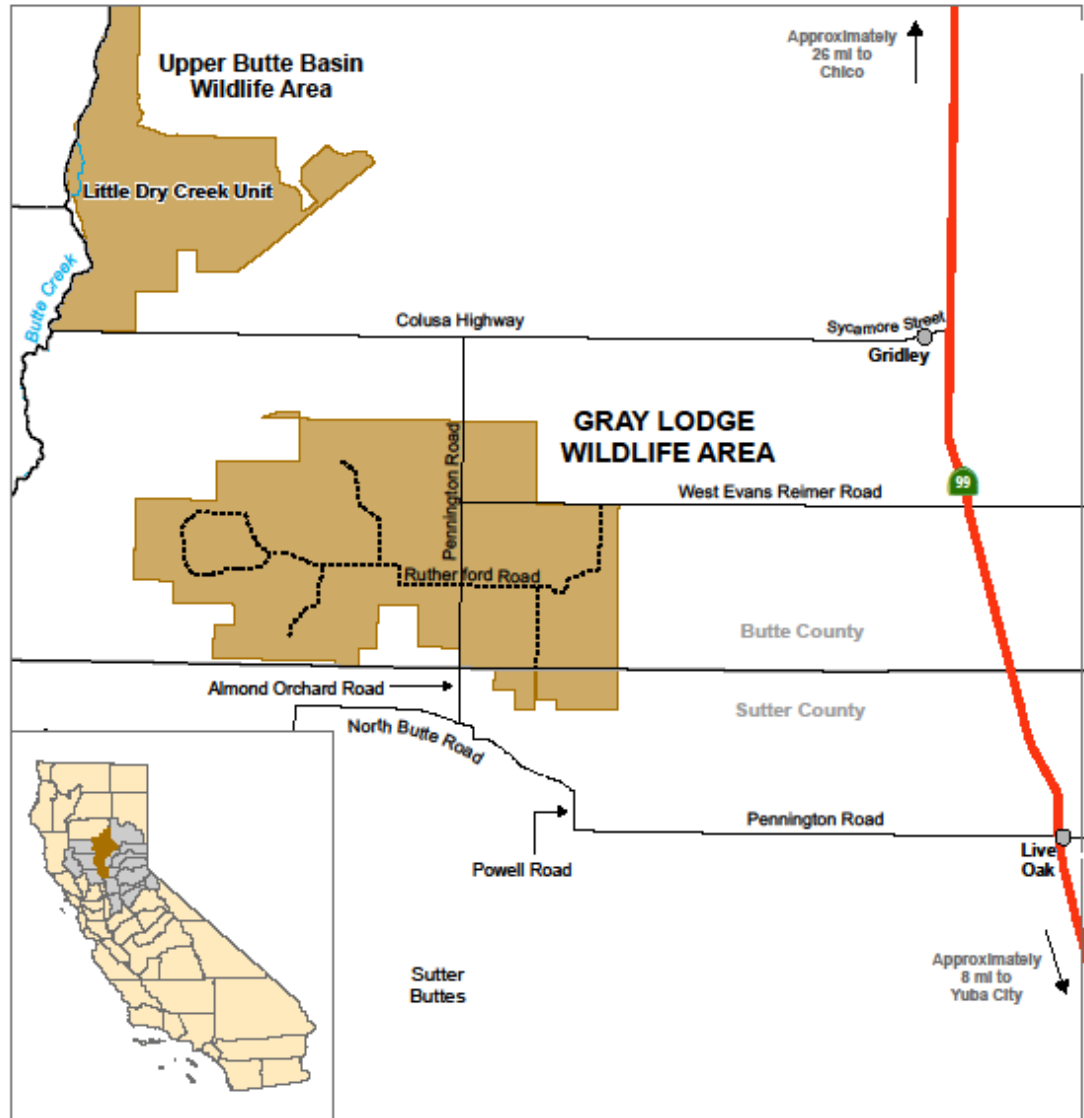
Currently, there are 23 groundwater wells located on the Gray Lodge WA. All groundwater wells discharge into the Refuge's internal distribution system.

Reclamation has reimbursed CDFW for costs for groundwater pumping contributing to Gray Lodge WA's CVPIA L2 water supplies as far back as 1995.

1.2 Need for the Proposal

The need for the Proposed Action is to continue to provide reliable full L2 water supplies to Gray Lodge WA and to augment reduced L2 and L4 water supplies when needed. Under the Proposed Action, Reclamation would reimburse CDFW for costs associated with deep well pumping to provide groundwater supplies to Gray Lodge WA.

California Department of Fish and Wildlife
North Central Region
GRAY LODGE WILDLIFE AREA
Butte, Sutter County



- Wildlife Area
- Public Vehicle Access
- State Highway
- Local Road



0 2 Miles

Disclaimer: Boundaries are approximate.
Maps are intended for general purposes only.

February 2016 - WLB

Figure 1. Location Map

Section 2 Proposed Action and Alternatives

2.1 No Action Alternative

The No Action Alternative would consist of Reclamation not entering into an agreement with the CDFW to fund the pumping of groundwater supplies to help meet Gray Lodge WA's L2 demand or IL4 water allocation. The pumping of the wells for purposes defined in this EA would not occur and this groundwater would not be developed and utilized within Gray Lodge WA to help meet L2 or IL4 refuge water needs. The volume of groundwater pumped would likely decrease. Gray Lodge WA would not receive full L2 supplies annually, resulting in impacts to CDFW's ability to effectively manage habitat through less than full L2 or L4 water supplies.

2.2 Proposed Action Alternative

Reclamation proposes to reimburse CDFW through the Reimbursement Agreement for the costs associated with operation and maintenance of CDFW's groundwater wells for groundwater utilized as part of Gray Lodge WA's CVPIA allocation. CDFW is willing to continue pumping groundwater to meet part of Gray Lodge WA's L4 supplies, to benefit one or more of the following: 1) meet scheduled water needs during the District's shutdown season; 2) supplement limited quantities of L2 surface supplies up to the full L2 allocation; 3) meet some or all of the Refuge's IL4 allocation; and, 4) augment reduced L2 surface supplies in critically dry years when the Refuge's L2 allocation is reduced below 100%. The term of the Reimbursement Agreement would be effective in Water Year (WY) 2016 and cover WY 2016 through WY 2030, approximately 15 years. (Note: "Water Year" means the period from and including March 1 of each calendar year through the last day of February of the following calendar year.)

Groundwater pumping would be limited to 16,159 AF annually, the amount supported in previous environmental compliance documents covering earlier groundwater pumping reimbursement agreements between Reclamation and CDFW for Gray Lodge WA. The 16,159 AF is also acknowledged by Butte County's Department of Water & Resource Conservation as the Gray Lodge WA's historic use and meeting the safe-yield criteria of their Groundwater Management Plan.

A water quality monitoring plan (WQMP) will be developed covering CVPIA groundwater supplies under the long-term Reimbursement Agreement. Implementation of the WQMP would ensure that pumping of these developed water supplies would not impact water quality of existing water supplies.

Under the Proposed Action, CDFW would monitor groundwater levels from all inactive and active wells, along with collecting groundwater pumping volumes from these wells, on a monthly basis at Gray Lodge WA, and provide this data to Reclamation. Since approximately 1991, CDFW has consistently monitored groundwater levels from all inactive and active wells on a monthly basis, along with collecting monthly groundwater pumping volumes at Gray Lodge WA. CDFW has provided Reclamation with this data since 2003.

Section 3 Affected Environment and Environmental Consequences

This section discusses the affected environment and environmental consequences of the Proposed Action and the No Action Alternative, in addition to environmental trends and conditions that currently exist.

Potential impacts to the following resources were considered and found to be minor. Brief explanations for the impacts are provided below:

- **Indian Trust Assets (ITA):** ITAs are legal interests in assets that are held in trust by the United States for federally recognized Indian tribes or individuals. The closest ITA to the Proposed Action activity is Colusa Rancheria about 8 miles to the west/southwest. No ITAs occur within Gray Lodge WA. The Proposed Action does not have the potential to affect ITAs.
- **Indian Sacred Sites:** The Proposed Action would not affect and/or prohibit access to and ceremonial use of Indian sacred sites.
- **Cultural Resources:** Reclamation has determined that the proposed action is the type of undertaking that does not have the potential to cause effects on historic properties, should such properties be present, pursuant to 36 CFR § 800.3(a)(1). As such, Reclamation has no further obligations under 54 U.S.C. § 306108, commonly known as Section 106 of the National Historic Preservation Act (NHPA).
- **Environmental Justice:** Executive Order 12898 requires each Federal agency to identify and address disproportionately high and adverse human health or environmental effects, including social and economic effects of its program, policies, and activities on minority populations and low-income populations. No significant changes in Refuge management or in agricultural communities or practices would result from the Proposed Action, other than potential production of groundwater. These changes are not likely to have effects to any individuals or populations within the action area. Accordingly, the Proposed Action would not have disproportionately negative impacts on low-income or minority populations within the study area.

The overall study area includes specific analysis for each resource that may be directly or indirectly affected by groundwater pumping and the use of groundwater for habitat management purposes within Gray Lodge WA. The Gray Lodge WA is located in the central part of the Sacramento Valley near the Sutter Buttes, in Butte and Sutter counties (**Figure 1**). The study area region is

characterized by flat valley lowland wetlands and agricultural lands, with a climate that is cool and moist in the winter and hot and dry in the summer.

Gray Lodge WA's diversity and location along the Pacific Flyway make it a haven for both migratory and resident wildlife. Surrounded by miles of rich agricultural lands, the approximately 9,200-acre area is managed for the wildlife that call Gray Lodge WA home for all or part of the year. Reflective ponds, grassy fields and wooded riparian areas provide food, water and shelter for more than 300 species of migrant and resident birds and mammals.

3.1 Surface Water Resources

3.1.1 Affected Environment

Gray Lodge Wildlife Area

Before passage of the CVPIA, Gray Lodge WA received water from a combination of surface water and groundwater sources, just as it does now. As a landholder within the Biggs-West Gridley Water District, Gray Lodge WA has both primary and secondary surface water rights. Gray Lodge WA receives 8,000 AF of dependable water from BWGWD and Reclamation Districts (R.D.) 833 and 2054. Approximately 3,700 acres of the Refuge are within the BWGWD Primary & Secondary Service area. The BWGWD has allocated 12,000 AF of water per year to the Gray Lodge WA as a District member, but approximately 8,000 AF (USBR 1989 Refuge Water Supply Investigations) are available during the irrigation season, from April to November. The Refuge turnouts from the BWGWD facilities are located at the end of the District system and cannot receive water when the BWGWD canals are dewatered, typically from mid-January through mid-April.

The Refuge is bisected by R.D. 833's Drain and R.D. 2054's Drain. While these canals convey agricultural return flows and rain water, and are part of the Valley's flood control project, over the years these drains have been incorporated into the internal delivery and recovery system for the various waters used on the Refuge. The return flows are only available during the summer and early fall when the rice fields are drained. The R.D.s do not use or claim the agricultural return flows, which are diverted by the Refuge under appropriative rights (Reclamation, 1989). Water may not be available in R.D. 833's Drain after rice fields are drained in the fall. Water is available from R.D. 2054's Drain from April to November (Reclamation, 1989). The amount of water available in these drains during the normal irrigation season has been decreasing as area farms improve irrigation efficiency and implement tailwater recycling programs. This is not considered a firm water supply for Gray Lodge WA. Gray Lodge WA receives 8,000 AF of dependable water through BWGWD as a District member. These 8,000 AF are considered a firm reliable water supply.

3.1.2 Environmental Consequences

No Action

The No Action Alternative would consist of Reclamation not entering into an agreement for the funding of operations and maintenance of the wells for groundwater supplies to help meet the demand for water in the Gray Lodge WA, and the pumping of the wells for purposes defined in this EA would not occur. The volume of groundwater pumping within the Gray Lodge WA would likely decrease. Groundwater is used to augment limited surface water supplies. Surface water supplies quantities are not expected to increase in the near future; thus, a reduction in groundwater supplies equates to a reduction of overall water supplies. Under the No Action Alternative, there would be potential impacts to existing conditions and current trends of the affected environment. During periods of reduced water availability, limited CDFW funding or a lack of CDFW funding would result in Gray Lodge WA having a limited ability to provide habitat for flora and fauna that depend on the Gray Lodge WA. The reduction of dependable water supplies would result in the degradation of habitats and the reduction in CDFW's ability to produce essential food resources for migratory birds and meet the goals and objectives of the Gray Lodge WA, CDFW, and CVPIA.

Proposed Action

The Proposed Action would not impact surface water supplies because a net increase or decrease in CVPIA surface water supplies being delivered would likely not occur, with exception in a critically dry year. The total amount of CVPIA surface water delivered would remain relatively the same. With this proposed action, pumped groundwater would continue to be used to supplement Gray Lodge WA's surface water deliveries. Surface water and pumped groundwater would continue to be comingled for reasonable and beneficial uses within Gray Lodge WA, to meet habitat goals and objectives for flora and fauna that depend on the Gray Lodge WA.

Cumulative Impacts

No adverse impacts to surface water resources would result from implementation of the Proposed Action, therefore, the Proposed Action would not contribute to cumulative impacts to surface water resources.

3.2 Groundwater and Geologic Resources

3.2.1 Affected Environment

Gray Lodge WA is located in the Butte Sink sub-inventory unit (SIU), which is the lowest point in elevation in all of Butte County. Depth to groundwater averages between 6 to 150 feet in the Gray Lodge WA, depending on hydrology and time of year. Gray Lodge WA falls within the Sacramento Valley Groundwater Basin, East Butte Subbasin.

Historically, groundwater has been used to supply a portion of the annual demand on the Gray Lodge WA. There are 23 deep groundwater wells used onsite, as necessary, to supplement surface-water deliveries and to supply water to portions of the Gray Lodge WA that cannot be reached by gravity flow of surface supplies or is impractical to supply surface water supplies during portions of the year.

In the portion of the subbasin located within the southern part of Butte County, groundwater level fluctuations for composite wells average about 4 feet during normal years and up to 10 feet during drought years. The groundwater fluctuations for wells constructed in the confined and semiconfined aquifer system average 4 feet during normal years and up to 5 feet during drought years. (DWR, 2004) CDFW has collected monthly well depth data and groundwater pumping volume information at Gray Lodge WA since 1991. The baseline information data set is comprehensive.

3.2.2 Environmental Consequences

No Action

The No Action Alternative would consist of Reclamation not entering into an agreement for the funding of operations and maintenance of the wells for groundwater supplies to help meet the demand for water in the Gray Lodge WA, and the pumping of the wells for purposes defined in this EA would not occur. The volume of groundwater pumping within the Gray Lodge WA would likely decrease. The overall quantity and quality of habitat within the Gray Lodge WA would also decrease due to an inability to flood some of the wetlands during critical times of the year to meet goals and objectives.

Proposed Action

Groundwater would be produced from multiple CDFW owned wells for use within Gray Lodge WA. Groundwater would be pumped in an amount up to 16,159 AF annually for Refuge water supplies. The actual amount of groundwater produced in a given water year would be dependent on the productivity of the wells and other factors, such as water quality, surface water availability and Refuge demand. Groundwater produced by the production wells would be discharged into the Gray Lodge WA conveyance system and mixed with the various surface waters for dilution (when available). All groundwater produced during the Proposed Action would be used for Refuge management purposes. Pumping would only occur if monitoring data indicates water quality is suitable for Refuge use and groundwater levels are projected to be sustainable during the life of the Proposed Action.

Reclamation's May 2009 Finding of No Significant Impact and Environmental Assessment analyzed the impacts of pumping the Gray Lodge WA wells on local groundwater and geologic resources including the cumulative effects associated with other local wells (e.g., Stony Creek Fan project wells). This groundwater level and aquifer impact analysis is included on pages 8-9 of Reclamation's NEPA Environmental Assessment for the *Agreement for the Reimbursement of*

Deep Well Pumping Costs on the Gray Lodge Wildlife Area between the United States and the State of California, May 2009 (Reclamation 2009) (2009 EA). This analysis on pages 8-9 of the 2009 EA is incorporated by reference. An evaluation shows that there are no new circumstances or changes in the action or its impacts that would result in significantly different environmental effects.

Cumulative Impacts

When added to past, present, and future foreseeable action, the Proposed Action would contribute a minor change in groundwater production in the general vicinity. Private and publically owned wells in and near the study area would continue to be utilized for groundwater development during the Proposed Action. Continued pumping within the safe yield during the period of the Proposed Action would not substantially impact the aquifer system.

3.3 Water Quality

3.3.1 Affected Environment

Groundwater Quality

Groundwater of the Sacramento Valley can be divided into six hydrochemical facies having distinctive chemical compositions (Hull, 1984). Gray Lodge WA well water is extracted from the Butte Basin hydrochemical facies which coincides with the Butte flood basin. The Butte Basin extends from Chico in the north to Sutter Buttes in the south. The western boundary of the basin is the Sacramento River, and the Feather River delineates the eastern boundary. Butte Creek and the Butte Sink are major surface hydrologic features in the basin.

The recharge areas for this basin are the Tuscan volcanic rock facies and the Victor Plain to the north and east of the basin, and the alluvial deposits flanking Sutter Buttes. The Tuscan formation contains andesitic sands, extensive tuft deposits, and volcanic glass. Silica concentrations throughout Butte Basin groundwater are high due to solution of volcanic glass from the Tuscan volcanics and Sutter Buttes (Hull, 1984).

The groundwater elevation under Gray Lodge WA is 50 to 60 feet below mean sea level. The regional groundwater flow is south - southwesterly towards the Sacramento River. Butte Basin groundwater is dominated by calcium-magnesium bicarbonate or magnesium calcium bicarbonate ions (Fogelman, 1977).

Surface Water Quality

Gray Lodge WA diverts unused and unclaimed Refuge and agricultural drain water from R.D. 833 and R.D. 2054. These flood control and agricultural drains flow from the northeast to the south-west, through Gray Lodge WA to adjacent lands. The R.D. drains carry water that has been recycled onto fields as many as three times. The quality of this water may be affected by the amount of re-use,

and the compostings and quantities of amendments that were applied to the crops (CRWQCB, 1989). Agricultural return flows are typically available to the Gray Lodge WA during the summer and early fall when local rice fields are drained.

3.3.2 Environmental Consequences

No Action

The No Action Alternative would consist of Reclamation not entering into an agreement with CDFW to fund groundwater pumping supplies. Water quality in the Gray Lodge WA would not be adversely impacted under the no action alternative.

Proposed Action

The potential for poor-quality water to be extracted under the Proposed Action exists, however, based on the results of groundwater and surface water quality monitoring over the last several years ((*Gray Lodge Wildlife Area Water Quality Assessment Water Years 2003-2013* (Reclamation, 2016)), it is unlikely to occur. The Proposed Action would implement a water quality monitoring plan (see **Appendix A**) which includes a Gray Lodge WA site map with locations of all groundwater wells. If water quality monitoring indicates unsuitable water quality, pumping operations would be modified or curtailed as necessary. Further detail is provided in the WQMP under the Adaptive Management section included in **Appendix A**. The WQMP would help to ensure that no adverse impacts occur to surface water supplies during the Proposed Action.

Cumulative Impacts

Under the Proposed Action, impacts to water quality would not be significant and continued monitoring would occur along with any follow-on actions required under the WQMP. Therefore, the Proposed Action would not contribute to cumulative impacts to water quality.

3.4 Biological Resources

Reclamation's 2009 EA included a description of the affected environment and analyzed the impacts of pumping the Gray Lodge WA wells on biological resources including the cumulative effects. This biological resources affected environment information and impact analysis is included on pages 10-12 of Reclamation's 2009 EA. The analysis on pages 11 and 12 of this 2009 EA is incorporated by reference. An evaluation shows that there are no new circumstances or changes in the action or its impacts that would result in significantly different environmental effects.

Section 4 Consultation and Coordination

4.1 Public Review

Public reviews were conducted for the 2009 EA and subsequent EAs associated with past reimbursement agreements. No comments were received.

Section 5 References

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APPENDIX A: WATER QUALITY MONITORING PLAN

RECLAMATION

Managing Water in the West

Gray Lodge Wildlife Area Water Quality Monitoring Plan



U.S. Department of the Interior
Bureau of Reclamation

August 2016

Mission Statements

The mission of the Department of the Interior is to protect and manage the Nation's natural resources and cultural heritage; provide scientific and other information about those resources; and honor its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

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RECLAMATION

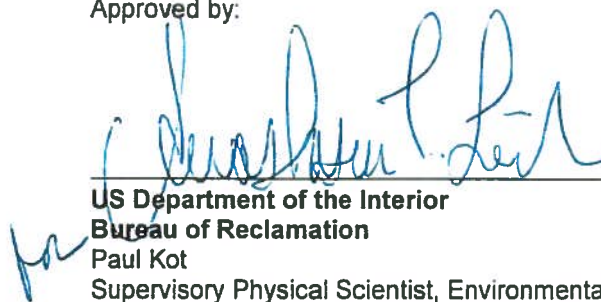
Managing Water in the West

Gray Lodge Wildlife Area Water Quality Monitoring Plan

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8/22/2016
Date

The Water Quality Project for the Gray Lodge Wildlife Area is managed and conducted by the US Bureau of Reclamation (Reclamation) Environmental Monitoring Branch. This Water Quality Project is implemented in support of Reclamation's obligation under the Central Valley Project Improvement Act to provide reliable water supplies to the Gray Lodge Wildlife Area.

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Introduction

The Gray Lodge Wildlife Area (Gray Lodge; GLWA; Wildlife Area) is operated and managed by the State of California Department of Fish and Wildlife (CDFW). The GLWA is one of 19 Central Valley wetlands and wildlife areas identified in the Central Valley Project Improvement Act (CVPIA), Public Law 102-575, Title 34, Section 3406(d). Pursuant to CVPIA, Reclamation is obligated to provide Gray Lodge with firm water supplies of “suitable quality” to maintain and improve wetland habitat.

The GLWA (Figure 1) requires water deliveries to maintain permanent and seasonal wetlands, and their associated uplands, to meet the needs of migratory and resident species that depend on these habitats, on an annual basis. The Wildlife Area receives water from a combination of surface water and ground water sources. Historically, these sources have been unreliable because water quantities were insufficient, or because the water could not be delivered during periods when it was most needed (Reclamation, 2016).

The primary intent of the Gray Lodge Wildlife Area Water Quality Monitoring Plan (WQMP; Plan) is to ensure that ground water provided to the GLWA through CVPIA is of suitable quality to protect the beneficial uses of Wildlife Area waters. Reclamation has reimbursed CDFW for costs associated with ground water production in support of Reclamation’s CVPIA obligation to annually provide Gray Lodge full Level 4 water supplies¹, as far back as 1995.

Reclamation proposes entering into a new long-term (15 years) “*Agreement for the Reimbursement of Groundwater Pumping Costs for the Gray Lodge Wildlife Area Between the United States and the State of California*” (Proposed Action) for the purpose of reimbursing CDFW for costs associated with ground water pumping. One of Reclamation’s responsibilities under the Proposed Action is to monitor ground water quality.

Goals and Objectives

The principal intent of the WQMP is to ensure that ground water provided to the Wildlife Area through CVPIA is of suitable quality to protect the beneficial uses of Wildlife Area waters.

Previous Reclamation study results indicate that overall, the ground water provided as a portion of GLWA’s CVPIA Level 4 water supplies is of suitable quality to meet Wildlife Area goals and objectives. Under the Proposed Action,

¹ Level 4 water supply encompasses Level 2 plus Incremental Level 4 water supply allocations.

continued monitoring will ensure that Reclamation continues to provide suitable quality ground water to the Wildlife Area.

Background

Reclamation has been monitoring the quality of ground water inputs to Gray Lodge since 2003. These water quality monitoring activities were implemented in support of the “*Agreement for the Reimbursement of Deep Well Pumping Costs on the Gray Lodge Wildlife Area between the United States and the State of California*”, which is now expired. In 2006, the WQMP purpose was expanded to include monitoring of the primary surface water inputs to the GLWA in order to evaluate the potential influence of ground water supply on the overall quality of Wildlife Area waters. Specifically, monitoring was expanded to include: surface water inputs delivered via the Biggs-West Gridley Water District (District) facilities agricultural drainage appropriated from Reclamation Districts (RD) 2054 and 833 canals, water residing within the Wildlife Area, and GLWA drainage water.

The typical (baseline) character of GLWA ground water and surface water was determined using monitoring data collected 2003 – 2015. Monitoring consisted of tracking of physical water quality indicators (physicals: pH, dissolved oxygen, electrical conductivity, temperature, and turbidity) and chemical analytes including common nutrients, trace metals, and common pesticides and herbicides. The majority of the constituents analyzed were present at concentrations considered fully protective of Wildlife Area water uses and overall, GLWA ground water was determined to be of suitable quality to meet Wildlife Area goals and objectives (Reclamation, 2016).

Previous study results indicate that continued monitoring of aluminum, arsenic, iron and manganese may be merited (Reclamation, 2016). In some GLWA water, these elements are present at concentrations that exceed one or more water quality standards for the protection of Wildlife Area beneficial use(s). Aluminum and iron are commonly present at levels that could have negative impacts to GLWA fresh water aquatic life; manganese concentrations commonly exceed water quality standards for the protection of agricultural uses. In addition, arsenic and manganese are at times present in GLWA waters at levels that are higher than concentrations that are known to be fully protective of humans who eat fish grown in Wildlife Area waterways.

CDFW Responsibilities – Water Level Monitoring

CDFW has monitored ground water levels on a consistent monthly basis in both active and inactive GLWA deep wells since approximately 1991 (Figure

2). Additionally, CDFW has recorded monthly pumped groundwater quantities for all of the deep wells since 1991. This information is maintained in CDFW's records (Data). CDFW has provided Reclamation's Refuge Water Conveyance Program with this ground water Data since 2003. Under the Proposed Action, CDFW will continue these monitoring activities and will continue to provide the Data to Reclamation on a monthly schedule. The Data will be provided to Reclamation's Refuge Water Conveyance Project Manager by the 10th of the month following the month of collection using CDFW's "GLWA Monthly Report" format.

Reclamation Responsibilities – Water Quality Monitoring

Monitoring Sites

Monitoring will occur at three ground water and two surface water sites (Table 1; Figure 3). Ground water sampling locations were chosen based on their geographical distribution within the GLWA; water from the selected wells can be used throughout the Wildlife Area. Surface water sites were selected to be representative of surface water entering the Wildlife Area via District conveyance (Rising River) and water used within, and/or draining from, the Wildlife Area (Main Drain).

Well 7 Ground water from Well 7 can be used to supply the northwest corner of the Wildlife Area which cannot be reached by other GLWA wells.

New Well 19 (Well ARRA-GL3-09) Ground water from this well can be used on the majority of the Wildlife Area.

Well 24 (Well ARRA-GL-2-09) Ground water from this well can be used on the western portions of the Wildlife Area.

Alternate Well Sites: (Well 10 and Well 28) These wells (Figure 2) will be monitored at the discretion of CDFW if any of the primary wells are non-operational on the day of scheduled water quality sampling.

Rising River Water collected at surface water site Rising River represents the quality of surface water as delivered by the Biggs-West Gridley Water District (BWGWD) via three points of delivery (POD) on GLWA's northern boundary at Schwinn, Cassady and Rising River (Figure 2). Located on the Traynor Lateral, Rising River is the POD for the greatest volume of water delivered by BWGWD. Water collected at this site has not yet interacted with other Wildlife Area water supplies or the Wildlife Area wetlands.

Main Drain Monitoring at site Main Drain, which is located immediately upstream of the Main Drain check structure, represents the quality of water mixed

throughout the Wildlife Area from all sources flowing onto and through the Wildlife Area. Approximately 80% of the drainage that leaves the Wildlife Area is an accumulation of this mixture.

In typical water years, samples collected in the fall and spring are representative of water used on the Wildlife Area, and/or draining from the Wildlife Area; water samples collected during the winter commonly reflect the quality of GLWA on-site water, not water draining from the Wildlife Area. This is because, on September 1 of each year, the Main Drain is boarded-up to a level that facilitates flooding of the GLWA (Reclamation, 2016). In typical years, boards are left at this level until March 15th when the boards are removed to facilitate wetland management for diverse moist-soil plants.

Water collected at site Main Drain may also be representative of GLWA on-site water (not water draining from the Wildlife Area) in the late summer/early fall of years when precipitation is low and water supplies to the GLWA are reduced. During these periods, water typically remains ponded behind the Main Drain check structure.

Target Analytes

Based on results of previous Gray Lodge Wildlife Area water quality monitoring, target analytes will be as follows: total aluminum, total and dissolved arsenic, manganese, and iron; and common physical water quality indicators - pH, dissolved oxygen, electrical conductivity, temperature, and turbidity (Table 2).

Field Methods and Materials

Water Quality Sample Collection

Schedule

In order to ensure safe implementation of monitoring activities, Reclamation staff will coordinate with Wildlife Area staff before visiting the Wildlife Area between September 1 and September 25. The dove hunting season runs from September 1-15 and deer season is from Sept 17-25. During these periods, the Wildlife Area is open for hunting every day and site access may be limited. From October 22 through the first weekend in February, site visits will not occur on a Wednesday, Saturday or Sunday as these days are also reserved for hunting.

In order to allow time for quality assurance activities and for shipped samples to arrive at the analytical laboratory on a weekday, samples will not be collected on a Thursday, Friday or Saturday.

Water quality samples will be collected three times each water year². The first sampling event is to occur after District deliveries have fully recharged the internal GLWA water distribution system (typically April to early May). The second event will take place at the height of the irrigation season when District deliveries are at a maximum (typically August or September). The last event will occur after the main irrigation season has ended but before District deliveries are suspended for winter maintenance (typically December to late January).

Exact sampling dates will be coordinated with the Wildlife Area Manager and/or Reclamation's Refuge Water Conveyance Project Manager. To determine/confirm appropriate sampling dates, the Environmental Monitoring (MP-157) GLWA project lead will contact the Wildlife Area Manager or Refuge Water Conveyance Project Manager in late March, late July, and early December.

If Reclamation needs/requests CDFW to turn on ground water wells to facilitate sampling, MP-157 field staff will coordinate with CDFW staff in advance of the proposed testing, unless other arrangements are already in place.

If the primary Project wells (Well 7, New Well 19 or Well 24) are inoperable for any reason, MP-157 staff will contact the Wildlife Area Manager and follow recommendations either to postpone sampling, or to sample one of the alternate wells identified in this plan (Well 10 or Well 26).

Procedures

All sample collection, sample transportation, and record keeping procedures will be performed in accordance with MP-157 standard operating procedures (Reclamation, 2012). At all times, care will be taken to ensure collection of environmental samples that are representative of the water as it exists in the environment. Nitrile gloves will be worn for all sample collection activities, only pre-cleaned equipment and bottles will be used, and samples will be preserved appropriately to ensure that sample chemical characteristics are not altered after collection.

Surface and ground water grab samples will be collected using an HDPE sample churn splitter and then transferred to appropriate sample bottles (Table 2). At the time of sample collection, physical characteristics of water quality samples will be measured *in situ* using a pre-calibrated YSI 600 XL or YSI EXO multi-parameter Sonde.

Surface water grab samples will be collected from the center of the Rising River channel, and near the center of the Main Drain structure where water is well mixed. Ground water samples will be collected at the well head; samples will be collected only after wells have been purged for at least three full minutes – or

² The water year begins the first day of March and ends on the last day of February the following calendar year.

until pumped water appears clear and free of sediment for at least one full minute – whichever occurs later.

Sonde Data Collection and Instrument Maintenance

Schedule

At sites Rising River and Main Drain, physical water quality characteristics will be recorded once per hour by a Yellow Springs Instrument (YSI) 6000 Series unattended water quality instrument (sonde).

Every two weeks, YSI 6000 sondes will be calibrated and maintained, and data files will be uploaded to a YSI 650 data logger. Immediately before an unattended sonde is retrieved for calibration, physicals will be measured using a secondary YSI 600 XL or YSI EXO (hand held) sonde to verify accuracy of unattended readings. The secondary sonde will be calibrated within 4 hours of taking verification measurements.

Prior to the next site visit, data files will be reviewed in order to identify whether sensors are likely to need replacement or maintenance.

Procedures

Sonde calibration, maintenance and data uploading procedures will be performed in accordance with manufacturer's recommended procedures as summarized in MP-157 standard operating procedures documents (Reclamation, 2012).

During site visits, MP-157 personnel will evaluate water levels in order to determine whether sensors are sufficiently covered to record valid measurements. If sensors appear to be covered by less than six inches of water, the unattended sondes will be removed and physicals monitoring will be suspended. Sites will continue to be visited every two weeks and water levels reevaluated so that sondes can be redeployed when water levels are sufficiently high.

Analytical Methods

Chemical analyses will be performed by private analytical laboratories following standard analytical methods (Table 2). Specific analytical procedures are described in analytical methods documents which are available on-line and by request from Reclamation's Quality Assurance (QA) and Data Management Branch (MP-156) personnel.

Analytical methods were selected to have reporting limits (RLs) below the lowest applicable water quality limit (Table 3). Note that due to matrix effects and other sample-specific analytical complexities, achieved RLs will not always match method RLs.

Quality Assurance Methods

Field practices, laboratory practices, and analytical results are evaluated by Reclamation quality assurance personnel in order to ensure that monitoring data and results are of the highest possible quality. For an in-depth description of the quality assurance procedures associated with this project, see the *Quality Assurance Project Plan for Water Quality Monitoring for the Gray Lodge Wildlife Area* (Reclamation, 2016) and the *MP-156 Standard Operating Procedures Manual for Quality Assurance* (Reclamation, 2014).

Data Assessment Methods

Water quality will be assessed by comparing constituent concentrations with water quality standards for the protection of the beneficial uses identified in the Wildlife Area in Reclamation's "Gray Lodge Wildlife Area Water Quality Assessment Report" (2016).

Reporting and Other Actions

For any water quality data results of concern, MP-157 will immediately notify Reclamation's Refuge Water Conveyance Project Manager and CDFW.

Data for each water year will be assessed on a yearly basis and reports submitted to the Refuge Water Conveyance Program, Program Management Branch (MP-410) for review by June 1st of the following water year.

WQMP Revision Process

An annual review of the WQMP and associated Quality Assurance Project Plan will identify and document any procedural changes necessary to the monitoring plan. WQMP and Quality Assurance Project Plan revisions will reflect potential changes in contracted analytical laboratories, contact information, water quality standards, changes mandated through the adaptive management process, and any other circumstances affecting the monitoring effort.

Adaptive Management

An adaptive management plan will be developed between CDFW and Reclamation, as needed to address concerns or issues that may arise with CVPIA ground water deliveries. In the event that an adaptive management plan is needed, the plan will be developed within 60 days of identifying the concern or issue that needs to be addressed. In order to meet GLWA water quality and water delivery goals and objectives, CDFW and Reclamation will coordinate to develop and agree upon measures to address the concerns. Adaptive management measures may include curtailing or modifying Wildlife Area water operations, amending sampling schedules, or updating water quality thresholds to match

current standards. Measures will ensure that the CVPIA water supply developed during the Proposed Action will not adversely affect GLWA water quality.

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References

- Reclamation, 2012, Standard Operating Procedures for Environmental Monitoring, United States Bureau of Reclamation, Mid Pacific Region, Environmental Monitoring and Hazardous Materials Branch, April, 133p.
- Reclamation, 2014, Standard Operating Procedures for Quality Assurance, United States Bureau of Reclamation, Mid Pacific Region, Environmental Monitoring and Hazmat Branch. Print.
- Reclamation, 2015. Quality Assurance Project Plan for Water Quality Monitoring for the Gray Lodge Wildlife Area: United States Bureau of Reclamation, Mid Pacific Region, Environmental Monitoring and Hazmat Branch, Version 7. Print.
- Reclamation, 2016, Gray Lodge Wildlife Area Water Quality Assessment, Water Years 2003-2013, United States Bureau of Reclamation, Mid Pacific Region, Environmental Monitoring and Hazmat Branch, June, 55p plus figures and appendices.

Figures

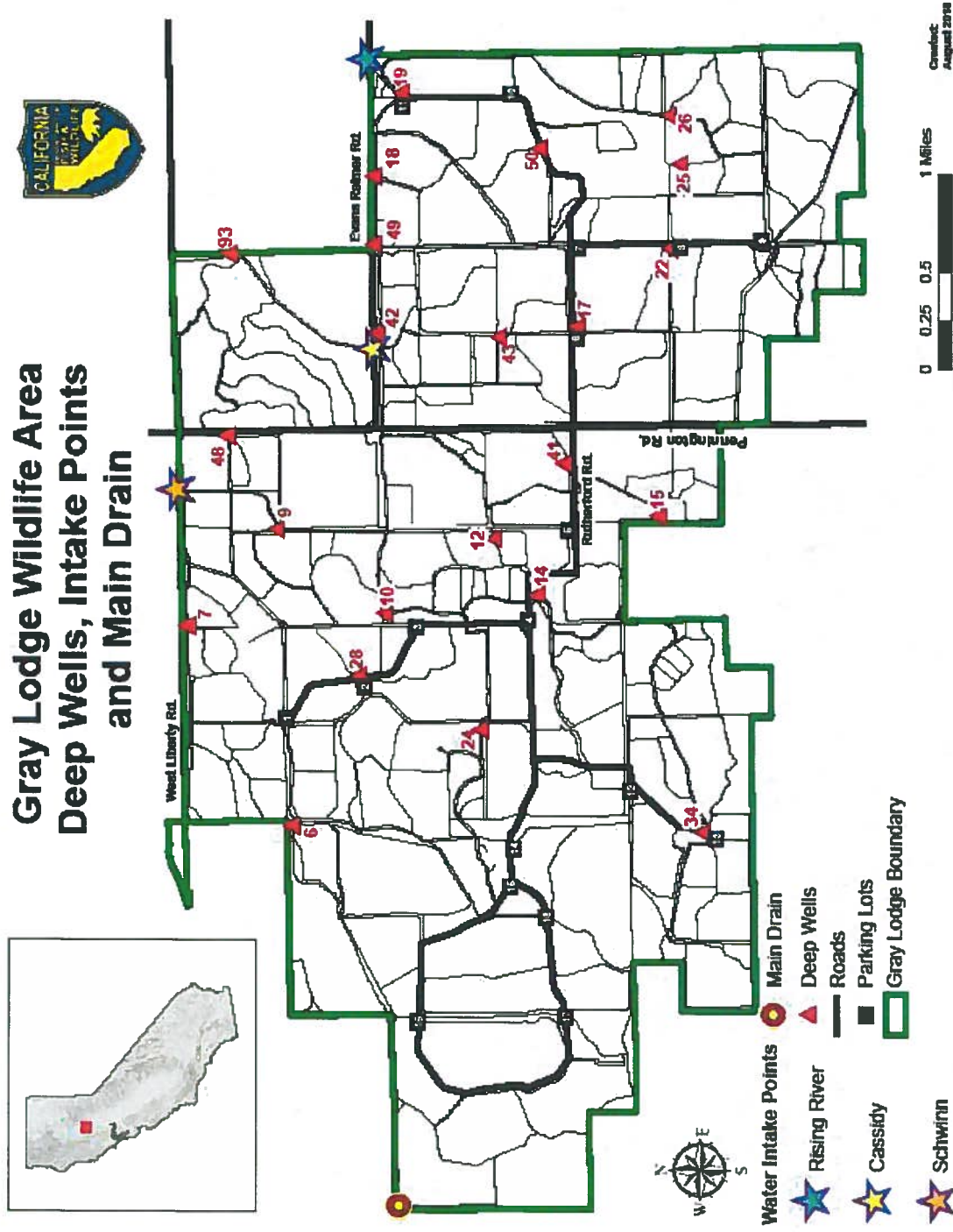


Figure 2. Map of Gray Lodge Wildlife Area showing locations of deep wells, points of deliveries (water intake points), and the primary Wildlife Area drainage point (Main Drain).

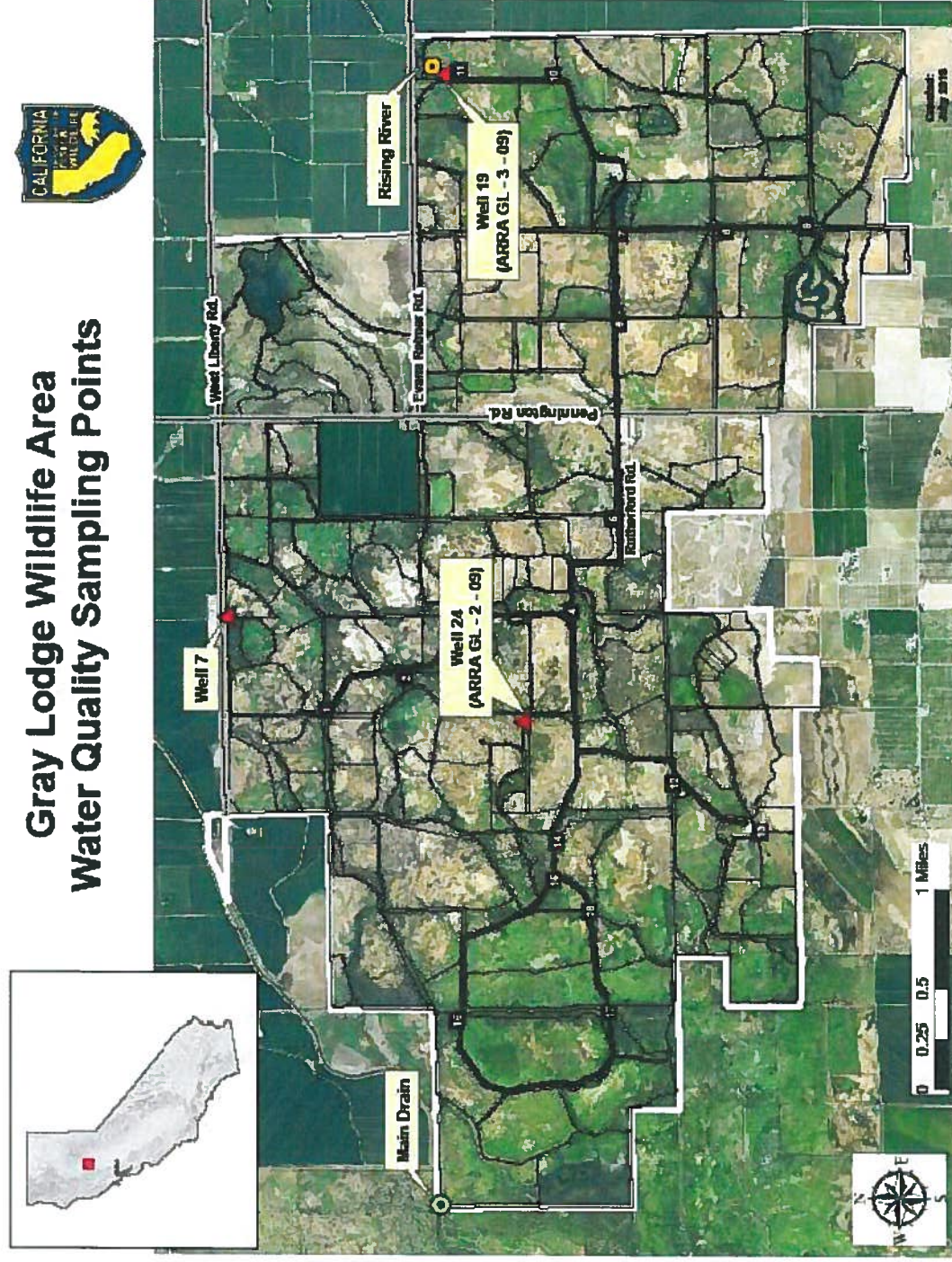


Figure 3. Satellite image showing locations of the three primary ground water sample sites (Well 7, New Well 19, Well 24) and the two surface water collection sites (Rising River, Main Drain). Thick black lines designate access roads; white polygon indicates the Wildlife Area boundary.

Tables

Table 1 Site Names and Locations

Site Name	Water Type	Latitude (N)	Longitude (W)
Rising River	Surface Water	39° 19' 55.11"	-121° 45' 55.94"
Main Drain	Surface Water	39° 19' 55.63"	-121° 52' 22.70"
Well 07	Ground Water	39° 20' 50.16"	-121° 49' 02.04"
Well 10	Ground Water	39° 19' 57.77"	-121° 48' 58.17"
New Well 19/ARRA GL-4-09	Ground Water	39° 19' 51.82"	-121° 45' 59.83"
Well 24/ARRA GL-2-09	Ground Water	39° 19' 31.76"	-121° 49' 36.88"
Well 28	Ground Water	39° 20' 04.78"	-121° 49' 19.60"

Table 2 Analytes, Analytical Methods, QA Samples and Bottle Requirements

Analyte	Analytical Method	Lab	QA Type ¹	Container		Chemical Preservative	Bottle Label
				Type	Size		
Total Fe	EPA 200.7	APPL	R,D,S,B	HDPE	500 ml	HNO ₃	Total Metals 200.7/200.8
Total Al, As, Mn	EPA 200.8						
Dissolved Fe	EPA 200.7						Dissolved Metals 200.7/200.8
Dissolved As, Mn	EPA 200.8						

1. R and D are duplicate samples, S is a sample triplicate with a known concentration of reference standard added (matrix spike), and B is a sample blank composed of de-ionized water

Table 3 Analytical Methods and Desired Reporting Limits

Analyte	Lowest Applicable WQ Standard		Desired RL (µg/L)	Method RL (µg/L)
	Objective	Limit (µg/L)		
Aluminum (total)	FWAL - CC	87	≤ 20	≤ 20
Arsenic (total)	IR	100	≤ 20	≤ 0.5
Arsenic (dissolved)	BP	10	≤ 2	≤ 0.5
Iron (total)	FWAL - CC	1000	≤ 200	≤ 25
Iron (dissolved)	BP	300	≤ 60	≤ 100
Manganese (total)	IR	200	≤ 40	≤ 0.5
Manganese (dissolved)	BP	50	≤ 10	≤ 0.5
Temperature	BP	< 5 ° F above receiving temp	Not Applicable	
Conductivity	BP	240 µS/cm		
pH	BP	6.5-8.5 units		
Dissolved Oxygen	BP	≥7.0 mg/L		
Turbidity	Not Applicable	Not Applicable		

FWAL-CC: protection of chronically exposed fresh water aquatic life

BP: Basin Plan protections

IR: protection of agricultural uses (irrigation suitability).