RECLAMATION

Managing Water in the West

River Garden Farms and Zone 7 Water Agency Water Transfer

Environmental Assessment

18-27-MP

U.S. Department of the Interior
Bureau of Reclamation

June 2018

Mission Statements

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated 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.

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Chapter 1
Introduction

This Environmental Assessment (EA) analyzes the environmental impacts of a proposed transfer of water made available through a groundwater substitution action in contract year 2018[1]from River Garden Farms (RGF) to Zone 7 of the Alameda County Flood Control and Water Conservation District (Zone 7 Water Agency). This EA was prepared in compliance with the National Environmental Policy Act (NEPA) (42 United States Code [USC] §4231 et seq.), the Council of Environmental Quality implementing regulations (40 Code of Federal Regulations [CFR] §1500-1508), and the Department of the Interior's NEPA regulations (43 CFR Part 46). RGF received approval for this transfer from the State Water Resources Control Board (State Water Board) by Order dated May 7, 2018; this transfer is exempt from the California Environmental Quality Act (CEQA) pursuant to California Water Code Section 1729. The State Water Board will issue a Notice of Exemption for this project and no additional CEQA documentation is necessary.

This EA describes the potential direct, indirect, and cumulative effects of transferring water from the seller, RGF, to the buyer, Zone 7 Water Agency. RGF holds a Sacramento River Settlement Contract (SRSC), Contract Number 14-06-200-878A-R-1, with the United States for Base Supply[2] and Central Valley Project [CVP] Water[3] ["Project Water"]. This EA also identifies measures that have been incorporated to minimize or avoid project-related impacts.

1.1 Need for the Proposal

The State Water Project (SWP) allocated 30 percent of "Table A" amounts to their contractors, including Zone 7 Water Agency. Under current allocations, Zone 7 Water Agency would not receive adequate supplies to meet water demand for this year and is considering water transfers to address this shortage. River Garden Farms proposes to transfer up to 5,748 acre-feet (AF) of Base

[1] Water Service Contract Year is March 1, 2018 through February 28, 2019. Sacramento River Settlement Contract Year is April 1, 2018 through October 31, 2018.

[2] Article 1(b) of the Sacramento River Settlement Contract defines Base Supply as the quantity of Surface Water established in Articles 3 and 5 which may be diverted by the Contractor from its Source of Supply each month during the period April through October of each Year without payment to the United States for such quantities diverted.

[3] Article 1(n) of the Sacramento River Settlement Contract defines Project water as all Surface Water diverted or scheduled to be diverted each month during the period April through October of each Year by the Contractor from its Source of Supply which is in excess of the Base Supply.

Supply[4], made available through a groundwater substitution action, to Zone 7 Water Agency. Reclamation's need is to review and consent to the transfer of Base Supply, consistent with state and federal law, and the Sacramento River Settlement Contract.

[4] RGF's Base Supply is based on its underlying water right, License 1718.

Chapter 2
Alternatives

2.1 No Action

For the No Action Alternative, Zone 7 Water Agency would not purchase water, made available through a groundwater substitution action, from RGF. Zone 7 Water Agency, a municipal and industrial SWP contractor, could experience shortages in 2018. Zone 7 Water Agency may take alternative water supply actions in response to shortages, including increased conservation measures (reduction of landscape irrigation or water rationing), increased local groundwater pumping, reduced groundwater recharge, and/or recovery of additional water from groundwater banks in Kern County. It could also seek to transfer water from others, which may require additional NEPA or CEQA analysis.

2.2 Proposed Action

The Proposed Action is the transfer of surface water in contract year 2018 from the seller, RGF, to the buyer, Zone 7 Water Agency. RGF would transfer up to 5,748 AF of Base Supply, made available through a groundwater substitution action, to Zone 7 Water Agency. Reclamation has approval authority over potential transfers of Base Supply. The California Department of Water Resources (DWR) would convey the water through the Delta to Zone 7 Water Agency. Figure 2-1 shows the project locations.

When Reclamation receives transfer proposals, it evaluates each proposal individually, as it is received, to determine if it meets state law. Reclamation has followed this process in past years when approving transfers (such as when approving water transfers in 2013, 2014, and 2015). Reclamation may reoperate CVP facilities to change the pattern of water releases from storage to deliver transferred water to Zone 7 Water Agency, if possible. If this reoperation is possible, it would require a Warren Act contract to store water in CVP facilities. The petition filed for temporary changes in the place of use, purpose of use, and point of diversion under License 1718 for the transfer of up to 5,748 af of water would need to be approved by the State Water Resources Control Board and an agreement with DWR would needed in order for DWR to convey the water to Zone 7.

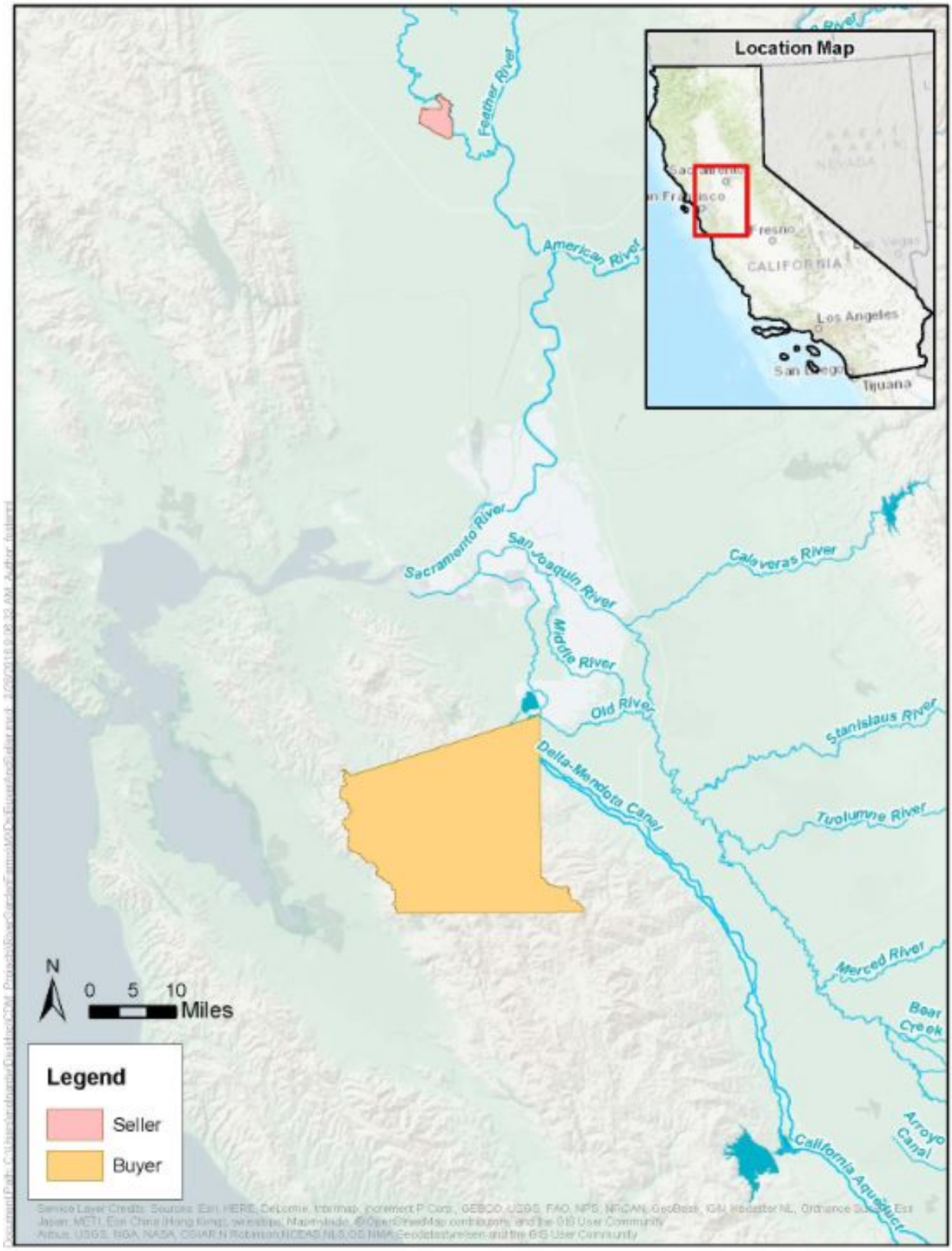

Figure 2-1. Project Location

2.2.1 River Garden Farms (Seller)

RGF was originally founded in 1912 with the primary intent of purchasing land. It has been family owned and operated farm since 1964 with the contractual right to divert up to 29,800 AF (29,300 AF Base Supply and 500 AF Project Water) from the Sacramento River pursuant to its SRSC. RGF has a farming operation with up to 15,000 acres of land in Yolo and Colusa counties.

The Proposed Action would transfer up to 5,748 AF of Base Supply, made available through a groundwater substitution action. A transfer of water made available through a groundwater substitution action occurs when the seller chooses to pump groundwater in lieu of diverting surface water supplies, thereby making the surface water available for transfer. Eight wells within the Yolo subbasin would be used for the groundwater substitution transfer. Production capacity of these wells range from 1,700 gallons per minute (GPM) to 3,000 GPM. All eight wells are perforated at depths between 170 to 680 feet below ground surface (bgs) and have screen lengths varying from 70 to 360 feet. Additionally, all eight wells are powered by electric pumps.

2.2.2 Zone 7 Water Agency (Buyer)

Zone 7 Water Agency is a SWP contractor. DWR is responsible for managing the SWP, which stores and delivers municipal and industrial (M&I) and irrigation water supplies to SWP water users. Zone 7 Water Agency relies on SWP supplies for approximately 80 percent of its total water supplies. The remaining 20 percent of its supplies are from local storage projects including Lake Del Valle and Livermore Valley Groundwater Basin.

Zone 7 Water Agency has developed an Urban Water Management Plan that identifies a Water Shortage Contingency Plan for years where supplies are not adequate to meet demands (Zone 7 Water Agency 2016). The Plan identifies voluntary and mandatory conservation based on the severity of the water shortage. Zone 7 Water Agency projects up to 20 percent demand reduction during minimal and moderate shortages, up to 30 percent in a severe shortage, and over 35 percent in a critical shortage (Zone 7 Water Agency 2016).

2.2.3 Potential Water Transfer Operations

Under the Proposed Action, RGF would transfer up to 5,748 AF of Base Supply, made available through a groundwater substitution action. Water could be made available for transfer during the irrigation season of April through October; however, conveyance of the water would be limited to the July through September window. RGF could make the transfer water available in June, if Reclamation could reoperate CVP facilities and store this water. If that operation is not possible, the full volume could instead become available in

July, August, and September. Table 2-1 below summarizes the transfer volumes available in July, August, and September under the Proposed Action.

Table 2-1. Monthly Transfer Volumes Available under the Proposed Action

	July	August	September
Transfer volume through groundwater substitution pumping (in AF)	2,190	2,190	1,368

The biological opinions on the Coordinated Operations of the CVP and SWP (U.S. Fish and Wildlife Service [USFWS] 2008; National Oceanic and Atmospheric Administration Fisheries Service [NOAA Fisheries] 2009) analyze transfers through the Delta from July to September that are up to 600,000 AF in critical years, and dry and critically dry years following dry or critical years. For all other year types, the maximum transfer amount is up to 360,000 AF. Through Delta transfers would be limited to the period when USFWS and NOAA Fisheries find transfers to be acceptable, typically July through September. DWR would export transfer water only during the July through September period when capacity is available at the Banks Pumping Plant (PP).

During June, Reclamation may choose to attempt to retain surface water made available through a groundwater substitution action in an upstream storage facility (Shasta Reservoir) until the Delta export pumps have the capacity available to convey water south, if the storage operation were possible. In general, to retain water made available for transfer in upstream facilities, Reclamation and DWR would have to declare the Delta is in a "balanced" water condition under the terms of the Coordinated Operating Agreement (COA). Reclamation and DWR would try to facilitate the conveyance of additional water made available for transfer through the export pumps during the summer months based on the availability of unused export capacity. The hydrologic risk of unused capacity not being available is borne by the transfer parties.

An objective in planning a transfer based on the substitution of groundwater is to ensure that groundwater levels recover to their seasonal high levels before the transfer begins. Because groundwater levels generally recover at the expense of streamflow, the wells used in a groundwater substitution transfer should be sited and pumped in such a manner that the streamflow losses resulting from pumping are primarily during the wet season, when losses to streamflow minimally affect other legal users of water. For the purposes of this EA, the streamflow loss that occurs because of pumping groundwater to make surface water available for transfer is estimated to be 13 percent. The quantity of surface water available for transfer at the transferor's surface supply point of diversion would be reduced by the estimated streamflow loss.

An additional requirement associated with a transfer is carriage water. Carriage water is the portion of the water made available for transfer that is not diverted

in the Delta and becomes Delta outflow, which would be used to maintain water quality in the Delta for through-Delta transfers. Carriage water calculations would also reflect conveyance losses as the water moves from its source, at the transferor's surface supply point of diversion, to the Delta export pumps, and is conveyed from the Delta to the buyer. Carriage water is represented as a percent of the transfer that does not reach the buyer, and this percent is calculated after the water made available for transfer is moved through the Delta, based on real-time monitoring information in the Delta. Historically, carriage water amounts range from 20 to 30 percent.

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Chapter 3
Affected Environment and Environmental Consequences

3.1 Resources Not Analyzed in Detail

Department of Interior Regulations, Executive Orders, and Reclamation guidelines require discussion of Indian Trust Assets (ITAs), Indian Sacred Sites, National Historic Preservation Act Section 106, and Environmental Justice when preparing environmental documentation. Impacts to these resources were considered and found to be minor or absent. A brief explanation supporting the minor or absent impacts is provided below:

3.1.1 Indian Trust Assets (ITAs)

ITAs are defined as legal interests in property held in trust by the U.S. government for Indian tribes or individuals, or property protected under U.S. law for federally recognized Indian tribes or individuals. ITAs can include land, minerals, federally-reserved hunting and fishing rights, federally-reserved water rights, and in-stream flows associated with a reservation or Rancheria. By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the U.S. Figure 3-1 shows that there are no ITAs within or adjacent to RGF, where potential drawdown impacts could occur.

Because water made available for transfer through a groundwater substitution action would not affect groundwater table elevations near the ITA sites, the Proposed Action would not affect ITAs.

3.1.2 Indian Sacred Sites

As defined by Executive Order 13007: Indian Sacred Sites, a sacred site "means any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site." The affected environment for the Proposed Action does not include Federal land; therefore, there is no potential for Indian Sacred Sites to be affected by the Proposed Action.

3.1.3 Cultural Resources

Reclamation determined that the proposed action is the type of activity that does not have the potential to cause effects on historic properties pursuant to 36 CFR § 800.3(a)(1). As such, Reclamation has no further obligations under Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108).

3.1.4 Environmental Justice

The 1994 Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires all Federal agencies to conduct "programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under, such programs, policies, and activities, because of their race, color, or national origin." Water made available for transfer through a groundwater substitution action would not have adverse effects on human health, the environment, or socioeconomic conditions for these groups in the seller's and buyer's areas.

Under the No Action Alternative, Zone 7 Water Agency may take alternative water supply actions in response to shortages, but these actions would generally follow the pattern of actions during previous dry periods under existing conditions. However, any reductions in water supply would affect all municipal and industrial users and would not be directed at minority or low-income populations. The water transfer under the Proposed Action would provide water to municipal and industrial users in the Zone 7 Water Agency's service area. Similar to the No Action Alternative, any benefits from increased water supplies would affect all municipal and industrial users and would not be directed at minority or low-income populations.

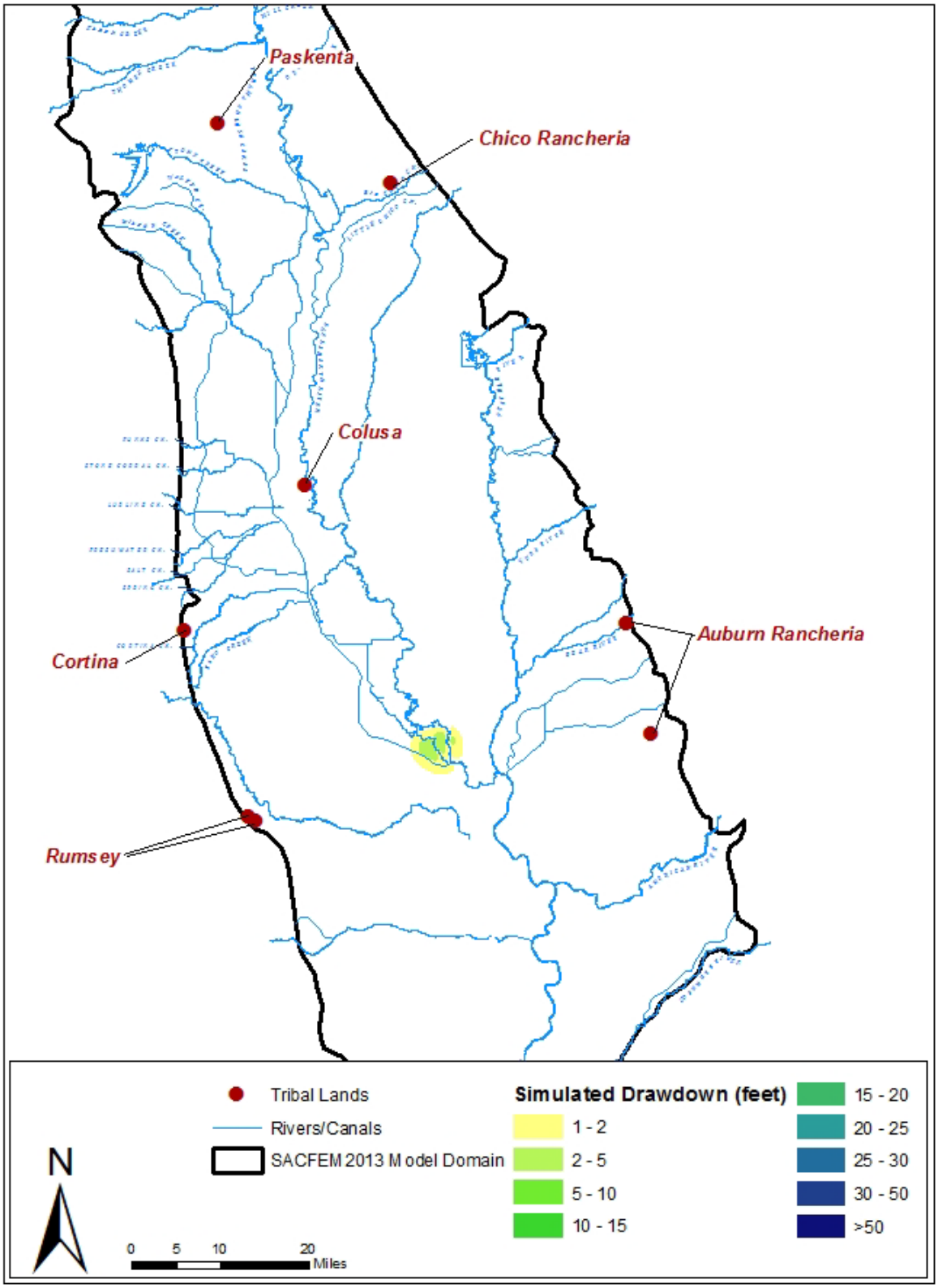


Figure 3-2. Groundwater Effects to ITAs in the Sacramento Valley Groundwater Basin

3.2 Air Quality

3.2.1 Affected Environment

Air quality in California is regulated by the U.S. Environmental Protection Agency (USEPA), the California Air Resources Board (CARB), and locally by Air Pollution Control Districts (APCDs) or Air Quality Management Districts (AQMDs). The following air districts regulate air quality within the project study area:

- Bay Area AQMD (Zone 7 Water Agency)
- Yolo/Solano AQMD (RGF)

In the Sacramento Valley and San Francisco Bay Air Basins, ozone (O_3), inhalable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$) are pollutants of concern because ambient concentrations of these pollutants exceed the California Ambient Air Quality Standards (CAAQS). Additionally, ambient O_3 and $PM_{2.5}$ concentrations exceed the National Ambient Air Quality Standards (NAAQS), while carbon monoxide (CO) concentrations recently attained the NAAQS and are designated maintenance. Table 3-1 summarizes the attainment status for the counties affected by the Proposed Action.

Most of the seller's service area supports agricultural land uses. Crop cycles, including land preparation and harvest, contribute to pollutant emissions, primarily particulate matter.

Table 3-1. State and Federal Attainment Status

County	O_3 CAAQS	$PM_{2.5}$ CAAQS	PM_{10} CAAQS	O_3 NAAQS[1]	$PM_{2.5}$ NAAQS	PM_{10} NAAQS	CO NAAQS
Alameda	N	N	N	N[2]	N	A	M
Yolo	N	U	N	N[3]	N	A	M

Source: 17 California Code of Regulations §60200-60210; 40 CFR 81; CARB 2017a; USEPA 2018a

Notes:

[1] 8-hour O3 NAAQS was modified in October 2015, but area designations are still pending; the area designations in the table are for the 2008 standard. States have one year after promulgation of a new NAAQS to submit to the USEPA a list of all areas in the state that should be designated as nonattainment. The USEPA subsequently has two years from the date of the standard revision to promulgate the new area designations (42 USC 7407(d)). In 2017, the EPA extended the deadline for the area designations (USEPA 2017).

[2] 8-hour O3 classification = marginal

[3] 8-hour O3 classification = severe

Key:

A = attainment (background air quality in the region is less than (has attained) the ambient air quality standards)

CO = carbon monoxide

M = maintenance (area formerly exceeded the ambient air quality standards (i.e., was designated nonattainment), but has since attained the standards)

N = nonattainment (background air quality exceeds the ambient air quality standards)

O3 = ozone

PM10 = inhalable particulate matter

PM2.5 = fine particulate matter

U = unclassified/attainment (area does not have enough monitors to determine the background concentrations; treated the same as attainment)

3.2.2 Environmental Consequences

The applicable air quality plans in Yolo County include the *Sacramento Regional 2008 NAAQS 8-Hour Ozone Attainment and Reasonable Further Progress Plan* (Sacramento Metropolitan AQMD 2017) and the *$PM_{2.5}$ Implementation/Maintenance Plan and Re-designation Request for Sacramento $PM_{2.5}$ Nonattainment Area* (Sacramento Metropolitan AQMD 2013). The regional air quality attainment plans (AQAPs) contain several control measures to attain and maintain air quality standards. These control measures were then promulgated in the rules and regulations at the Yolo/Solano AQMD and other air districts located in the nonattainment areas; therefore, if a Proposed Action is consistent with the air district's and State's regulations, then the project is in compliance with the AQAPs. Additionally, because the Proposed Action requires approval by Reclamation, a Federal action, the Proposed Action is subject to the general conformity regulations in 40 CFR 93, Subpart B. Groundwater substitution under the Proposed Action would use electric-driven groundwater pumps, and there would be no localized emissions of criteria air pollutants under the Proposed Action nor would the Proposed Action exceed the general conformity de minimis thresholds in 40 CFR 93.153.

3.3 Biological Resources

3.3.1 Affected Environment

The project area includes the Sacramento River watershed and the Delta area. Natural communities associated with these areas include valley/foothill riparian and natural seasonal wetland. Valley/foothill riparian natural communities generally occur along river and stream corridors on the east side of the Sacramento Valley. Trees typically associated with the valley/foothill riparian natural community include willows, Fremont cottonwood (*Populus fremontii*), valley oak (*Quercus lobata*), and western sycamore (*Platanus racemosa*). Many species of birds, mammals, reptiles, and amphibians depend on riparian habitats, such as woodpeckers, warblers, flycatchers, owls, and raptors. Other wildlife species that use riparian habitats include western fence lizard (*Sceloporus occidentalis*), Pacific tree frog (*Pseudacris regilla*), western toad (*Anaxyrus boreas*), bullfrog (*Rana catesbeiana*), western skink (*Eumeces skiltonianus*), western whiptail (*Cnemidophorus tigris*), southern alligator lizard (*Elgaria multicarinata*), racer (*Coluber constrictor*), gopher snake (*Pituophis catenifer*), king snake (*Lampropeltis* sp.), garter snake (*Thamnophis* sp.), northern Pacific rattlesnake (*Crotalus oreganus oreganus*), opossum (*Didelphis virginiana*), black-tailed jackrabbit (*Lepus californicus*), western gray squirrel (*Sciurus griseus*), ringtail (*Bassariscus astutus*), river otter (*Lontra canadensis*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), beaver (*Castor canadensis*), mule deer (*Odocoileus hemionus*), and a number of bat species. Wetland natural communities support many species of waterfowl, such as mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), American widgeon (*Anas americana*), and Canada goose (*Branta canadensis*), and a variety of wading birds and shorebirds.

Special-status wildlife species with potential to occur in the project area are listed in Appendix A. As described in the appendix, the species present would not be affected by the transfer of water made available through a groundwater substitution action.

Table 3-2 summarizes fish species of concern in the project area.

Table 3-2. Fish Species of Management Concern in the Project Area

Status	Species	Primary Management Consideration	Location
Special-Status	Chinook Salmon (*Oncorhynchus tshawytscha*) – Winter run	FE	Sacramento River
	Chinook Salmon – Spring-run	FT	Sacramento River
	Central Valley Steelhead (*Oncorhynchus mykiss*)	FT, Recreation	Sacramento River
	Green sturgeon (*Acipenser medirostris*)	FT	Sacramento River
	Delta smelt (*Hypomesus transpacificus)*	FT	Delta
	Longfin smelt *(Spirinchus thaleichthys)*	FC	Delta
Other	Striped bass (*Morone saxatilis*)	Recreation	Sacramento River
	American shad (*Alosa sapidissima*)	Recreation	Sacramento River
	White sturgeon (*Acipenser transmontanus*)	Commercial, Recreation	Sacramento River

Source: USFWS 2015; CDFW 2015a; CDFW 2015b; NMFS 2009; CDFW and University of California at Davis 2015
Key:
FE = Federal endangered
FT = Federal threatened
Recreation = non-listed commercially important species of management concern.
Commercial = non-listed recreationally important species of management concern.

Reclamation consulted with the U.S. Fish and Wildlife Service in 2008, and the National Marine Fisheries Service in 2009 on the coordinated operation of the CVP and SWP. RPA action 1.2.4 requires Reclamation to develop and implement an annual Temperature Management Plan by May 15 to manage the cold-water supply within Shasta Reservoir and make cold water releases from Shasta Reservoir and Spring Creek to provide suitable temperatures for listed species, and, when feasible, fall-run Chinook salmon. Reclamation prepared a temperature management plan for 2018 (Reclamation 2018) that protect these species and is currently implementing 2018 operations.

Natural Communities Commonly Associated with Groundwater (NCCAG) dataset identifies groundwater dependent ecosystems (i.e. plant and animal species that rely on groundwater to survive) in the Sacramento Valley (Klausmeyer et al. 2018). Figure 3-2 shows the groundwater dependent wetland habitat and riparian vegetation in the project area.

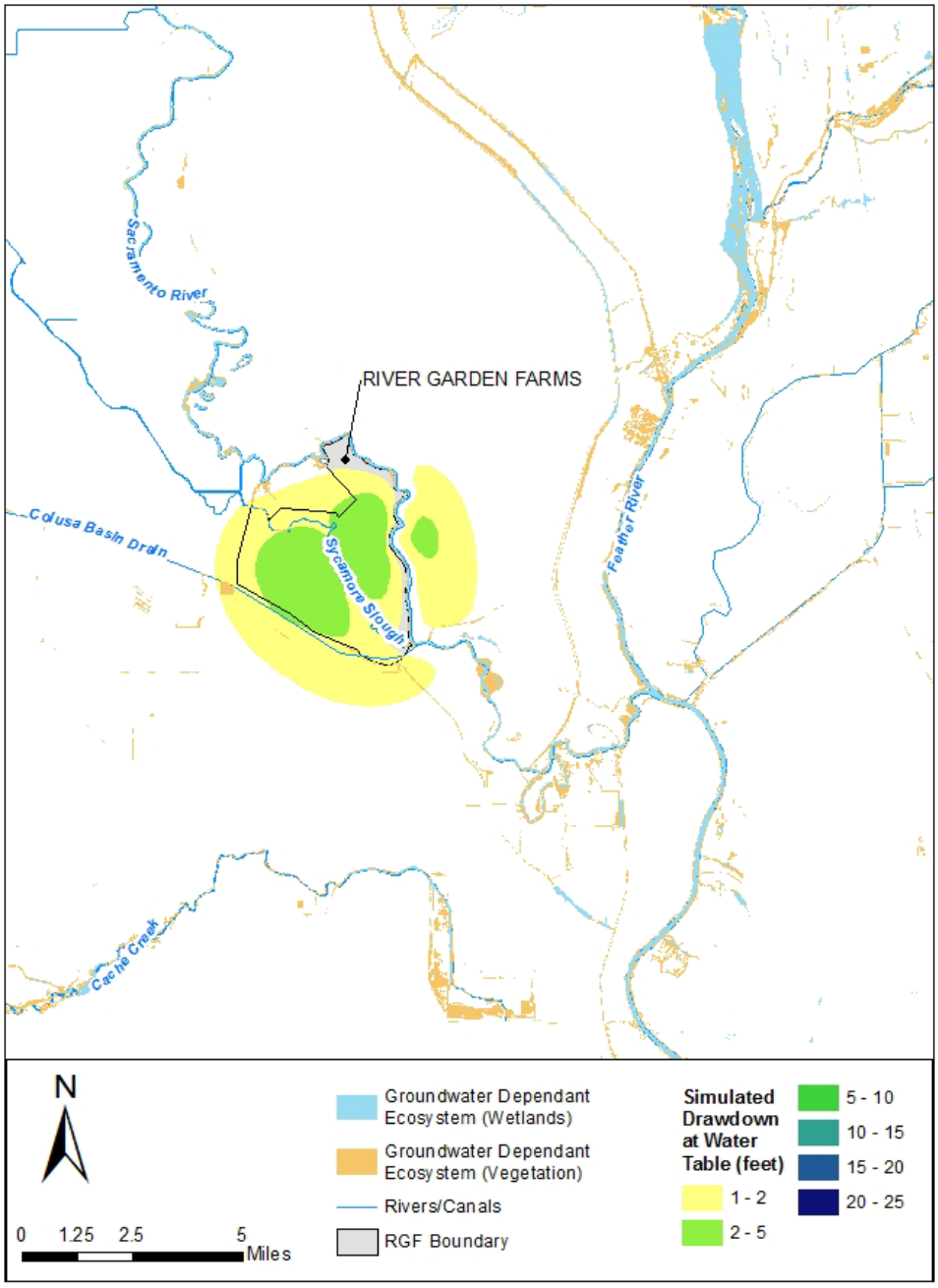


Figure 3-2. Groundwater Dependent Ecosystems in the project area (Source: NCCAG dataset, 2018)

3.3.2 Environmental Consequences

Fishery Resources

Under the Proposed Action, water would be made available for transfer through a groundwater substitution action. Surface water would be transferred, and groundwater would be pumped within RGF.

Sacramento River Under the Proposed Action, water made available for transfer through a groundwater substitution action would be delivered in July, August, and September, unless changes are requested to aid implementation of the Temperature Management Plan. During June, Reclamation may be able to store some water made available for transfer in Shasta Reservoir, pursuant to a Warren Act Contract, which would decrease flows from Shasta Reservoir to the seller's points of diversion pursuant to its SRSC. The largest reduction in flow could be approximately 96 cfs in June, if the buyer requests the transfer occur in June. For comparison, flows in the Sacramento River near Colusa averaged 6,315 cfs in June 2014, 4,314 cfs in June 2015, 5,135 cfs in June 2016, and 9,358 cfs in June 2017 (DWR 2017a). The water made available for transfer would not affect flows downstream of the point where RGF would have diverted water if the transfer did not occur; therefore, flows into the Delta would not decrease. Sacramento River flows could increase slightly in July, August, and September as the water made available for transfer flows to the Delta for export to the buyer.

The decrease of up to 96 cfs in Sacramento River flows in June (less than 2 percent of June 2016 flows and approximately 1 percent of June 2017 flows) would not be substantial enough to affect special status fish species. Adult migration by special status fish species, including, Chinook salmon, steelhead, and green sturgeon would not be affected by the slightly decreased flows. This magnitude of flow decrease would not reduce spawning habitat availability and incubation, increase dewatering or juvenile stranding, or reduce the suitability of habitat conditions during juvenile rearing of these species.

Local Streams and Water Bodies Water made available for transfer through a groundwater substitution action under the Proposed Action could reduce groundwater levels and potentially deplete surface water flows in rivers and creeks near the seller area (see 3.5 Hydrology and Water Quality). Surface water depletions in the Sacramento and Feather rivers as a result of making water available for transfer through a groundwater substitution action would not be substantial due to higher flow rates in these rivers. Depletions would also not be of sufficient magnitude to affect special status fish species. Reduced surface water flows in smaller creeks could affect special status fish species. Based on a review of field sampling data and reports, this analysis concluded that there is no evidence of the presence of special-status fish species in Sycamore Slough within the seller area. In the Colusa Basin Drain, streamflow reductions would range from zero to 0.1 percent of monthly historical flows from 1998 to 2018 and be less than ten percent of monthly average stream flows. These flow changes would be small, and the habitat for special status species in these waterbodies would not be substantially affected by the Proposed Action.

Terrestrial Resources

The Yolo Habitat Conservation Plan/ Natural Community Conservation Plan (Yolo HCP/ NCCP) is under development and applicable to the project area. The Yolo HCP/ NCCP is a countywide conservation plan providing strategy for

conserving species and habitats while still allowing for economic development. The Proposed Action would not conflict with the HCP and NCCP, nor have an effect on the natural communities that are covered in the Yolo HCP/NCCP because of the temporary nature of the transfer and the minimal changes in flows associated with the Proposed Action

3.4 Greenhouse Gas Emissions

3.4.1 Affected Environment

The greenhouse gas (GHG) analysis focuses on the following three pollutants: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The other two pollutant groups commonly evaluated in various GHG reporting protocols, hydrofluorocarbons and perfluorocarbons, are not expected to be emitted in large quantities as a result of the alternatives and are not discussed further in this document.

3.4.2 Environmental Consequences

GHG emissions would occur from operation of the groundwater pumps. This analysis estimates emissions using available emissions data and information on fuel type, engine size (hp), and the transfer amounts included in the proposed alternative. Existing emissions data used in the analysis includes:

- Electric utility CO_2 emission factors from TCR (2018)
- Emissions & Generation Resource Integrated Database (eGRID) CH_4 and N_2O emission factors from USEPA (USEPA 2018b)

Each GHG contributes to climate change differently, as expressed by its global warming potential (GWP). GHG emissions are discussed in terms of CO_2 equivalent (CO_2e) emissions, which express, for a given mixture of GHG, the amount of CO_2 that would have the same GWP over a specific timescale. CO_2e is determined by multiplying the mass of each GHG by its GWP. This analysis uses the GWP from the Intergovernmental Panel and Climate Change Fourth Assessment Report (Forster et al. 2007) for a 100-year time period to estimate CO_2e. This approach is consistent with the federal GHG Reporting Rule (40 CFR 98), as effective on January 1, 2014 (78 Federal Register 71904) and the 2017 Edition of California's GHG Emission Inventory (CARB 2017b). The GWPs used in this analysis are 25 for CH_4 and 298 for N_2O.

Groundwater substitution could increase GHG emissions in the seller area. Emissions from groundwater substitution would be 306 metric tons CO_2e per year (detailed calculations are provided in Appendix B, "Greenhouse Gas Emission Calculations"). Emissions would be less than the GHG Reporting Rule threshold of 25,000 metric tons CO_2e per year for stationary sources.

3.5 Hydrology and Water Quality

3.5.1 Affected Environment

Surface Water

The Sacramento River flows south for 447 miles through the northern Central Valley and enters the Delta from the north. The major tributaries to the Sacramento River are the Feather, Yuba, and American rivers. Reclamation owns and operates the CVP, which has major reservoirs on the Sacramento River (Shasta Reservoir) and American River (Folsom Reservoir). DWR owns and operates the SWP, which has a major reservoir on the Feather River (Oroville Reservoir).

Surface Water Quality

While surface water quality in the Sacramento River system is generally good, several water bodies within the area of analysis have been identified as impaired by certain constituents of concern and appear on the most recent 303(d) list of impaired waterways under the Clean Water Act (SWRCB 2012). Table 3-3 summarizes the 2012 303(d) listed water bodies within the areas of analysis.

Table 3-3. 303(d) Listed Water Bodies within the Area of Analysis and Associated Constituents of Concern

Water Body Name	Constituent	Estimated Area Affected [1]	Proposed TMDL Completion Year
Shasta Reservoir	Cadmium	20 acres	2020
	Copper	20 acres	2020
	Zinc	20 acres	2020
	Mercury	27,335 acres	2021
Sacramento River (Keswick Dam to Delta)	Chlordane	16 miles	2021
	DDT	98 miles	2021
	Dieldrin	98 miles	2021
	Mercury	16 miles	2021
	PCBs	98 miles	2021
	Unknown toxicity	129 miles	2019
Sacramento-San Joaquin Delta	Chlordane	41,736 acres	2013
	DDT	41,736 acres	2013
	Dieldrin	41,736 acres	2013
	Dioxin compounds	41,736 acres	2019
	Furan compounds	41,736 acres	2019
	Invasive species	41,736 acres	2019
	Mercury	41,736 acres	2008
	PCBs	41,736 acres	2008
	Selenium	41,736 acres	2010

Source: SWRCB 2012.

Key:

DDT =Dichlorodiphenyltrichloroethane

PCBs = Polychlorinated biphenyls

TMDL = Total maximum daily load

Notes:

[1] Estimated area affected is given as the surface area (acres) of lakes or estuaries or length (river miles) for river systems.

Groundwater

River Garden Farms is located within the Yolo Subbasin, which is within the Sacramento Valley Groundwater Basin. The Yolo Subbasin is located in the southern portion of the Sacramento Valley Groundwater Basin, within Yolo County. Historically, groundwater levels in the Subbasin are impacted by periods of drought due to increased groundwater pumping and reduced surface water recharge. These declines are usually followed by recovery in wet years (DWR 2004). DWR does not provide a groundwater pumping estimate for the Yolo Subbasin in Bulletin 118.

The Yolo Subbasin has an estimated total storage capacity of 6,455,940 acre-feet for depths between 20 and 420 feet (DWR 2004). Groundwater storage data for the Yolo Subbasin, from Spring 2005 to Spring 2010, indicates annual storage decreases in dry years and increases during wetter periods (DWR 2013). The data showed the same trend for average changes in groundwater elevation, decreasing in dry years and increasing in wetter years, during this period.

Groundwater levels in the Yolo Subbasin have declined over the past decade (2007 to 2017). These decreases have caused wells to go dry in parts of the Subbasin, particularly during the years of 2014 and 2015. As of August 11, 2015, five wells in Yolo County were reported dry in 2014 and 2015 (Data collected by University of California Davis). Persistent dry weather conditions since 2006 have been partially responsible for these steep declining trends. Water Year 2017 was classified as one of the wettest years on record since 1983. On average, spring 2017 groundwater levels across the state have recovered in comparison to spring 2016 levels but have not improved to pre-drought levels.

Appendix C, Groundwater Existing Conditions, includes groundwater well monitoring data for select wells near the seller's area that depicts typical groundwater level trends in the Yolo Subbasin. The data presented in the hydrographs indicate that groundwater levels in the area have generally recovered to spring 2016 levels in the last year. This trend is especially seen in the hydrographs of deeper wells, with depths greater than 570 feet that experienced greater declines in groundwater levels during the drought and, like the shallower wells, showed some recovery to or exceeded spring 2016 levels. In summary, groundwater levels in the Sacramento Valley Groundwater Basin, including the Yolo Subbasin, have recovered to better than spring 2016 levels but have not improved to pre-drought levels. Past groundwater trends are indicative of groundwater levels declining moderately during extended droughts and recovering to pre-drought levels after subsequent wet periods.

Land Subsidence DWR has prioritized the Yolo Subbasin as having a high potential for subsidence (DWR 2014a). Historically, land subsidence occurred

in the eastern portion of Yolo County because of groundwater extraction and subsequent consolidation of loose aquifer sediments. The area between Zamora, Knights Landing, and Woodland has been most affected (Yolo County 2012). This area is near extensometer 11N01E24Q008M, which has recorded approximately 1.1 feet of subsidence from 1992 to 2016 (DWR 2017b). Due to groundwater withdrawal over several decades, as much as four feet of land subsidence has occurred east of the town of Zamora.

Also, in Yolo County within Conaway Ranch, DWR observed land subsidence estimated at approximately 0.2 foot from 2012 to 2013 and an additional 0.6 foot from 2013 to 2014 (DWR 2017c). In comparison, slightly less than 0.1 foot of subsidence occurred over the previous 22 years (1991-2012). The rate of subsidence within Conaway Ranch has declined since 2014 with approximately 0.03 feet of subsidence being recorded since 2015 (DWR 2017c).

Groundwater Quality

Groundwater quality in the Sacramento Valley Groundwater Basin is generally good and of sufficient quality for municipal, agricultural, domestic, and industrial uses. Groundwater quality in the Yolo Subbasin is generally hard and high in salt content. Groundwater in the Yolo Subbasin is characterized as the sodium magnesium, calcium magnesium, or magnesium bicarbonate type (DWR 2003).

The California Department of Public Health (CDPH) and United States Environmental Protection Agency's secondary drinking water standard for total dissolved solids (TDS) is 500 milligrams per liter (mg/L), and the agricultural water quality goal for TDS is 450 mg/L. TDS concentrations as high as 1,500 mg/L have been recorded in wells west of the Sacramento River in the Yolo Subbasin, between Putah Creek and the confluence of the Sacramento and San Joaquin rivers (Bertoldi 1991).

3.5.2 Environmental Consequences

Surface Water

Under the Proposed Action, water made available for transfer through a groundwater substitution action would be delivered to Zone 7 Water Agency in July, August, and September. Reclamation could store water in Shasta Reservoir during June, pursuant to a Warren Act Contract, when it cannot be moved through the Delta to Zone 7 Water Agency. This stored water would be delivered in July, August, and September. Storing water would result in a small decrease in flows of approximately 96 cfs between Shasta Reservoir and RGF's diversion point in June. For comparison, flows in the Sacramento River near Colusa averaged 6,315 cfs in June 2014, 4,314 cfs in June 2015, 5,135 cfs in June 2016, and 9,358 cfs in June 2017 (DWR 2017a). The flow decreases would not extend downstream of the point where water would have been diverted if a transfer did not occur; therefore, flows into the Delta would not decrease in June.

Surface Water Quality

Under the Proposed Action, there could be small changes in flows in the Sacramento River. However, there would be no appreciable change in water source or flow that would affect water quality.

Groundwater

Groundwater pumped in lieu of diverting surface water could result in temporary declines of groundwater levels. Declining groundwater levels resulting from increased groundwater substitution pumping could cause: (1) increased groundwater pumping costs due to increased pumping depth; (2) decreased yield from groundwater wells due to reduction in the saturated thickness of the aquifer; (3) decrease of the groundwater table to a level below the vegetative root zone, which could result in environmental effects; and 4) third-party impacts to neighboring wells.

Groundwater Levels Past trends indicate groundwater levels in the Sacramento Valley decline moderately during extended droughts and recover to pre-drought levels after subsequent wet periods (see Appendix C). DWR and other monitoring entities, as defined by Assembly Bill 1152, extensively monitor groundwater levels in the basin.

Groundwater drawdown impacts associated with the groundwater substitution pumping from eight wells within RGF that would occur under the Proposed Action were evaluated using the SACFEM2013 groundwater model. The SACFEM2013 groundwater model simulates a total transfer volume of 11,496 AF. The simulated transfer volume is twice the volume of actual transfers as it considers transfers over the entire transfer period (April through September). Due to the lack of conveyance capacity between April through June, the Proposed Action only considers 5,748 AF of transfers between July through September. Impacts from the Proposed Action would be smaller than that discussed below. Table 3-4 below summarizes pumping and depth information for the RGF wells.

Table 3-4. Groundwater Substitution Well Information under the Proposed Action

Potential Seller	Number of Wells	Pumping Rate (gpm)	Range of Screened Interval (feet)
River Garden Farms	8	1,700 - 3,000	170 - 686

The locations and depths of the eight modeled wells are specified in the model based on data collected from RGF.

- Figures 3-3, 3-4, 3-5, and 3-6 show the simulated drawdown due to the Proposed Action under September 1977 hydrologic conditions. During

dry years, surface water resources are limited and users have historically increased groundwater pumping to address shortages.

- The proposed water transfer for 2018 was simulated in SACFEM2013 using September 1977 hydrologic conditions because 1977 represents the driest condition available during the SACFEM2013 simulation period (WY 1970 to WY 2003). Simulating a transfer during this period illustrates the potential to compound impacts from dry-year pumping as compared to the No Action Alternative.

- Figure 3-3 shows the simulated drawdown of the water table based on results from the top layer of the SACFEM2013 model. This layer has a depth of up to 35 feet bgs.

- Figure 3-4 shows simulated drawdown at approximately 200 to 300 feet bgs.

- Figure 3-5 presents the simulated drawdown at approximately 300 to 400 feet bgs.

- Figure 3-6 presents the simulated drawdown at approximately 700 to 900 feet bgs.

Simulated drawdown of the water table (Figure 3-3) represents the estimated decline in the groundwater surface within the shallow, unconfined portion of the aquifer (i.e., the height of water within a shallow groundwater well). The drawdown in the deeper portions of the aquifer (Figures 3-4 through 3-6) represents a change in hydraulic head (i.e., water pressure) in a well that is screened in this deeper portion of the aquifer.

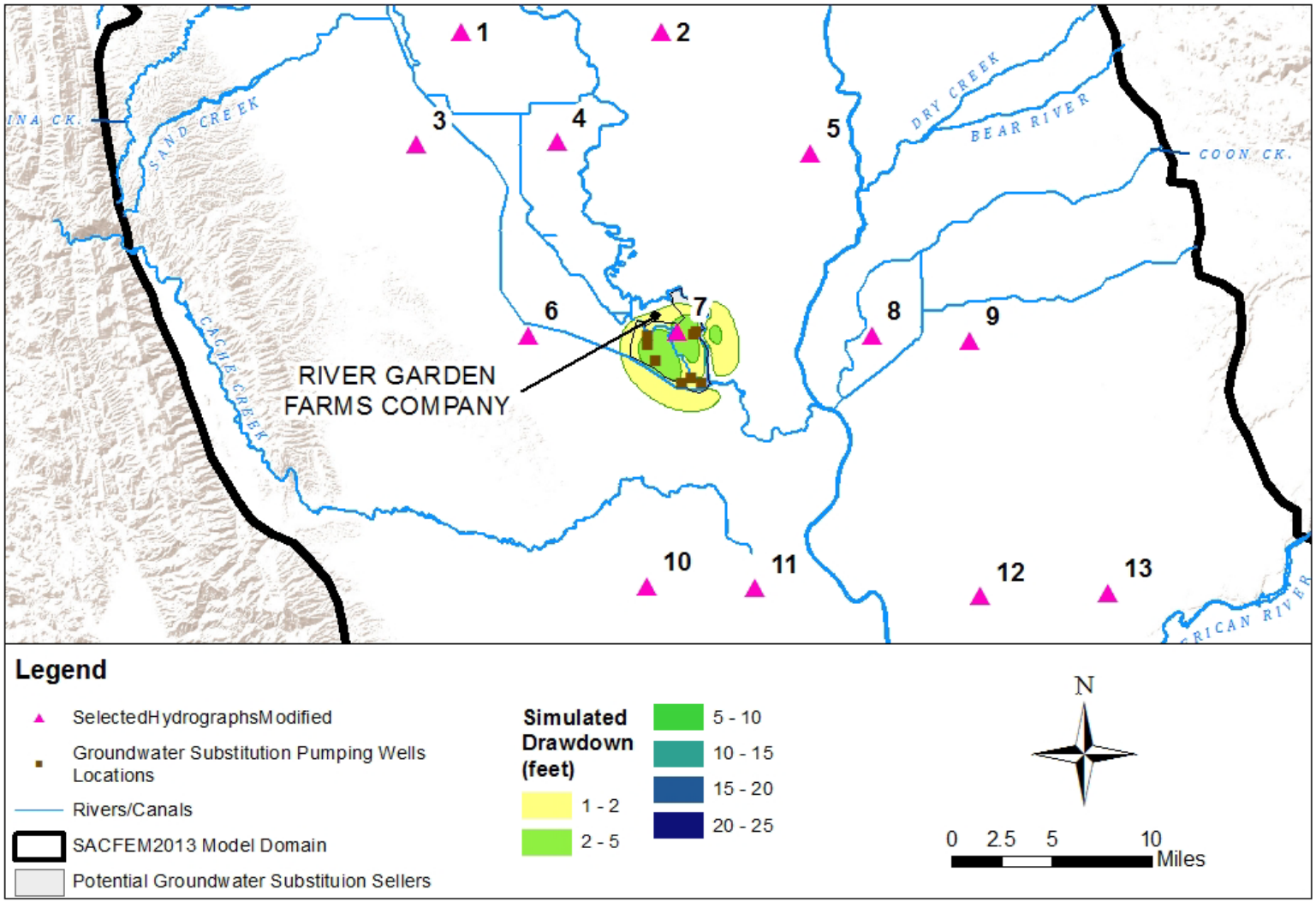


Figure 3-3. Simulated Drawdown at the Water Table (0 to approximately 35 feet bgs), based on September 1977 Hydrologic Conditions

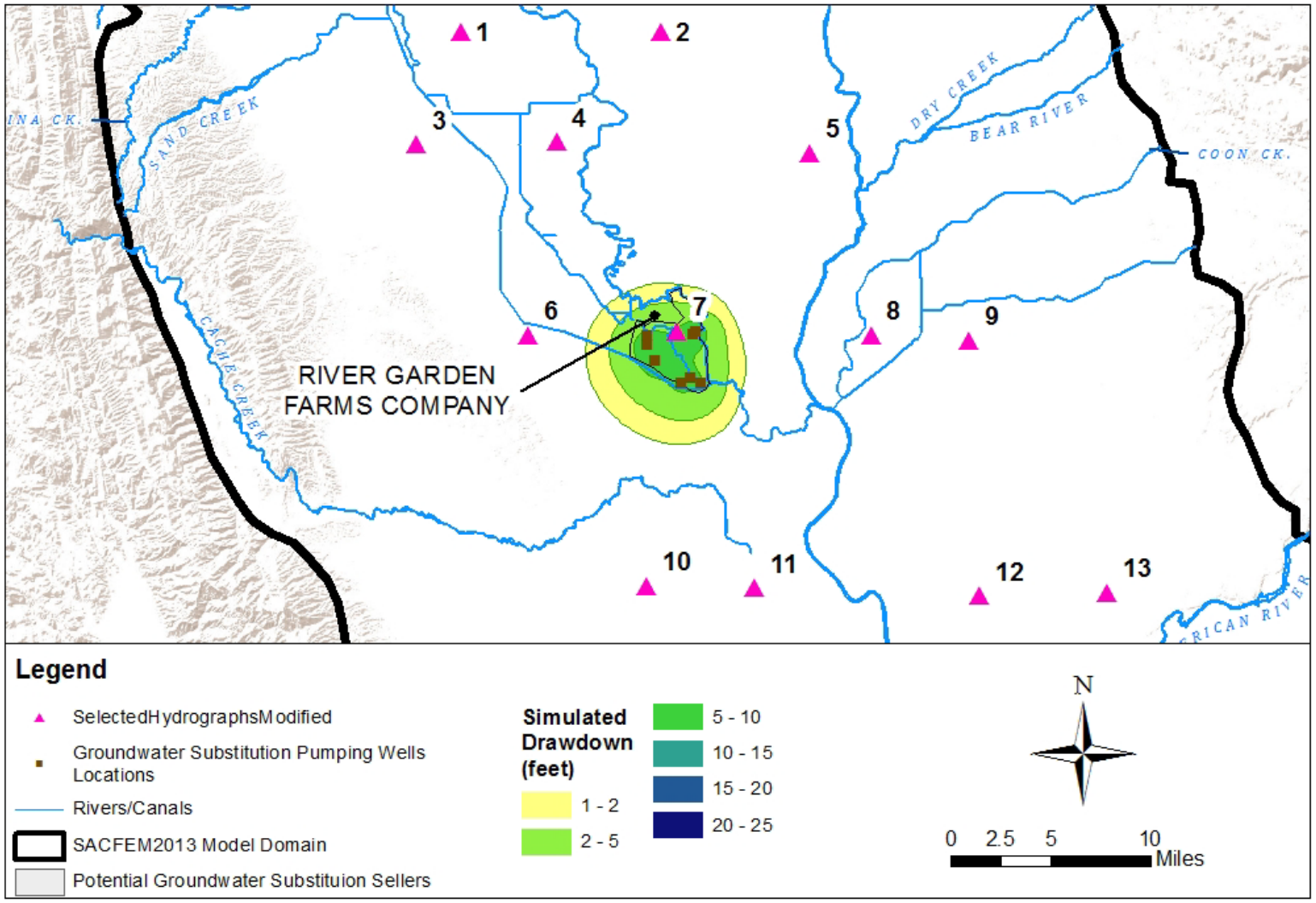


Figure 3-4. Simulated Drawdown (approximately 200 to 300 feet bgs), based on September 1977 Hydrologic Conditions

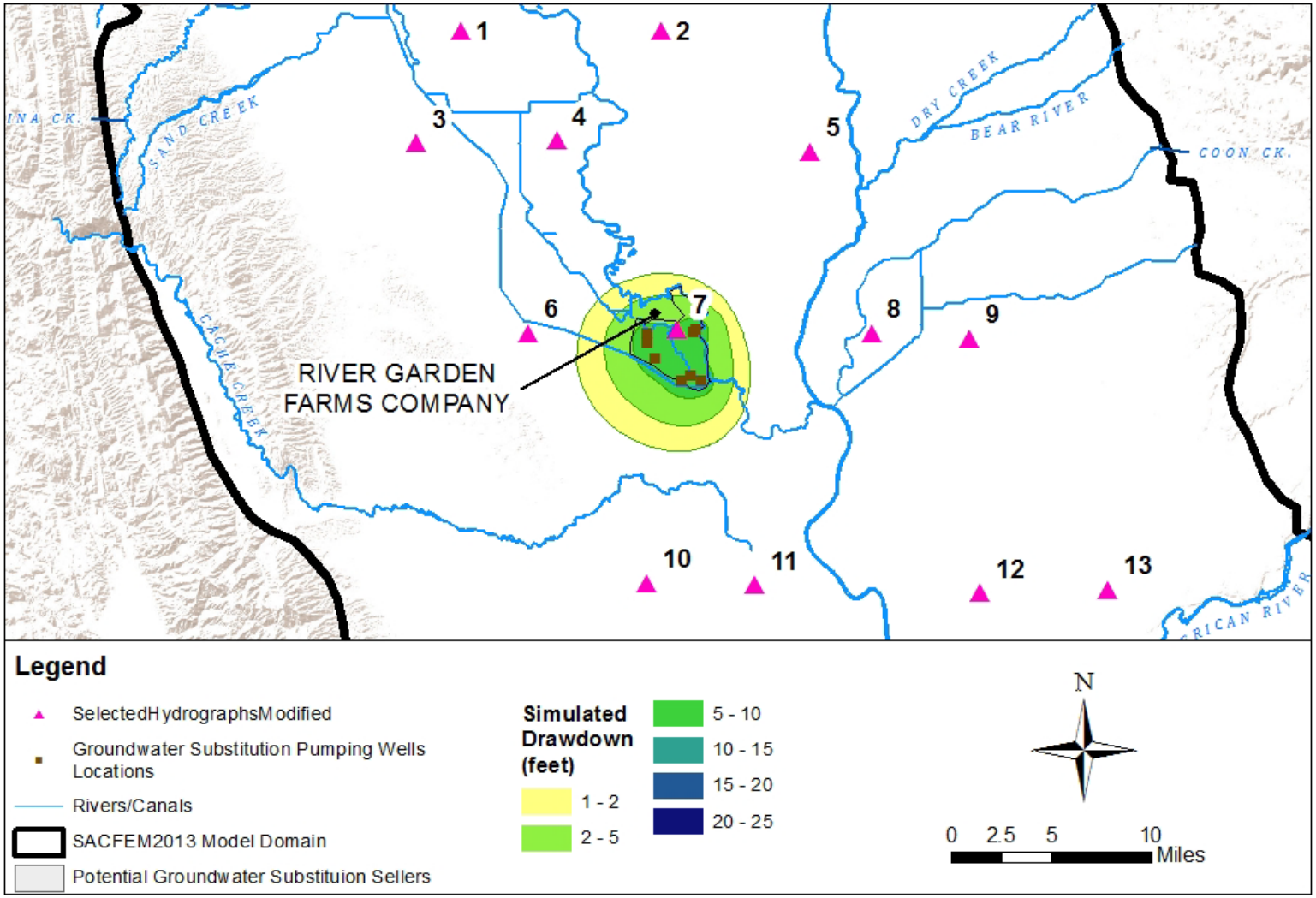


Figure 3-5. Simulated Drawdown (approximately 300 to 400 feet bgs), based on September 1977 Hydrologic Conditions

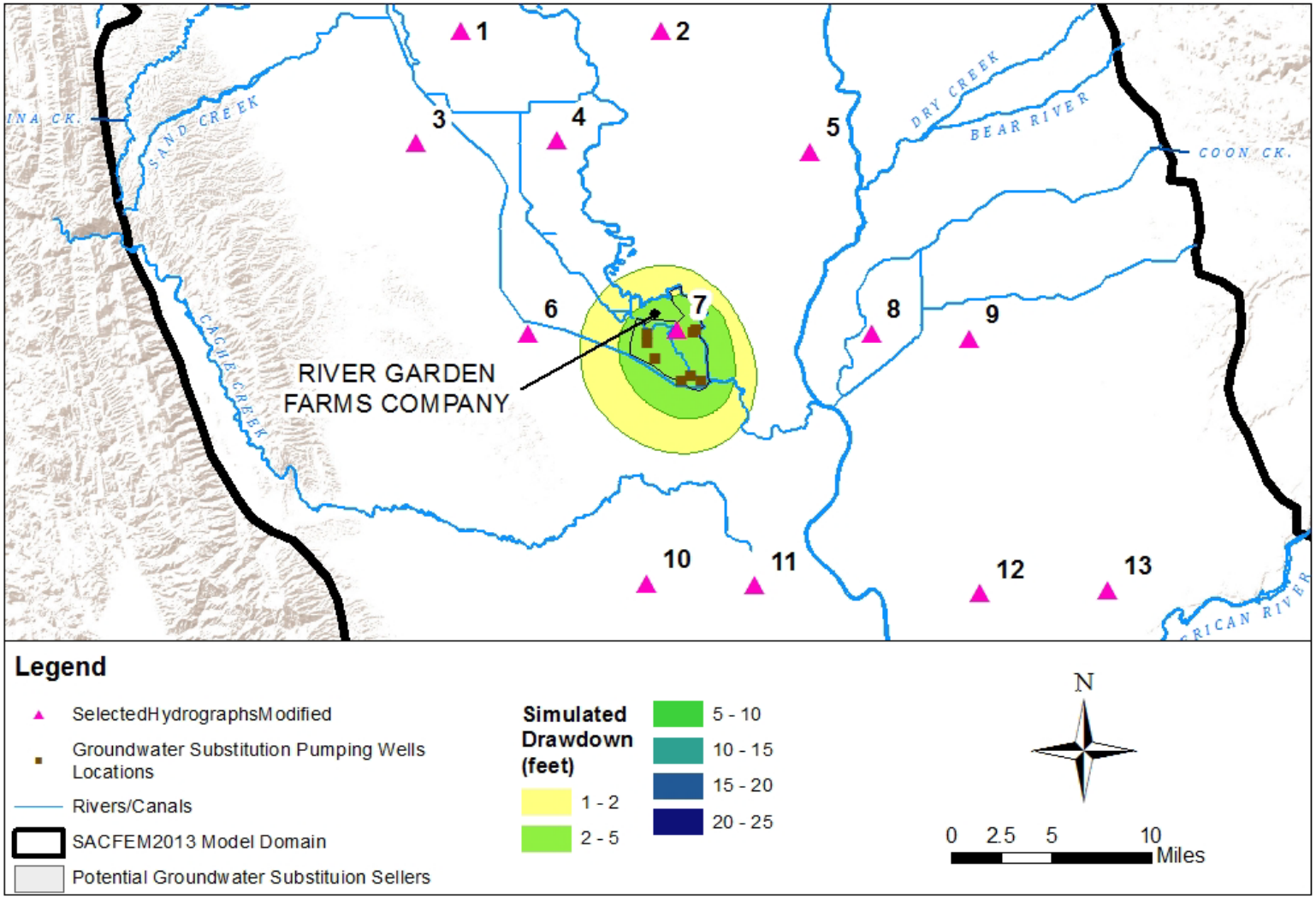


Figure 3-6. Simulated Drawdown (approximately 700 to 900 feet bgs), based on September 1977 Hydrologic Conditions

Figures 3-7 and 3-8 show simulated groundwater head hydrographs for Location 7 (see Figure 3-3 for location) for both the Baseline (No Action Alternative) and Proposed Action. Location 7 was highlighted in this discussion since this location has the highest drawdown under the Proposed Action. Figures 3-7 and 3-8 show that groundwater levels are generally only slightly lower under the Proposed Action (blue line) than under the No Action Alternative (red line). Figure 3-9 shows the change in groundwater head between the Baseline and the Proposed Action at each layer of the SACFEM2013 model (i.e., varying aquifer depths) in the seller area. Approximately 89 percent of the pumping in the seller area was concentrated in aquifer model layers 3 and 4 (approximately 230 to 560 feet bgs). The pumping in aquifer layers 3 and 4 resulted in approximately 7.5 feet of drawdown due to the Proposed Action, as compared to Baseline conditions. Most of the recovery near the pumping zone occurs in the year following the transfer event. Recovery at the water table was more gradual. Groundwater recovery is highly dependent on (1) hydrology of the years following the transfer; (2) proximity of a transfer well to surface water; (3) pumping in the year following the transfer; and (4) aquifer properties. Appendix D, Groundwater Modeling Results, includes simulated groundwater head hydrographs for multiple locations. These are shown in Figure 3-3.

Groundwater substitution under the Proposed Action could result in temporary drawdown that exceeds what would have occurred under the No Action Alternative. Model results show that increased groundwater pumping due to the Proposed Action could cause localized declines of groundwater levels, or cones of depression, that extend beyond the boundaries of the seller area (Figures 3-3 through 3-6). Water made available for transfer through a groundwater substitution action could result in groundwater declines in excess of seasonal variation and this could affect groundwater levels and consequently pumping capacities on the wells not part of the Proposed Action. To reduce these effects, the Mitigation Measure GW-1 (below) specifies that RGF establish a monitoring and mitigation program for the transfer of water made available through a groundwater substitution action. The requirements of GW-1 would require monitoring of groundwater levels within the local pumping area and if effects were reported or occurred, RGF would reduce pumping or compensate for effects until the groundwater basin recharges as specified in GW-1.

Groundwater/Surface Water Interaction

The implementation of groundwater substitution pumping can lower the groundwater table and may change the relative difference between the groundwater and surface water levels. This change could reduce the amount of surface water, as compared to pre-pumping conditions, due to two mechanisms. The mechanisms are:

- Induced leakage. Lowering the groundwater table causes a condition where the groundwater table is lower than the surface water level. This

condition causes leakage out of a surface water body and could also increase percolation rates on irrigated lands.

- Interception of groundwater. A well used as a substitute, to make surface water available for transfer, can intercept groundwater that would have discharged to the surface water absent the pumping.

Because these mechanisms may result in a depletion of streamflow, the volume of water actually transferred is not a like volume of groundwater pumped through a substitution action. The amount of water that can justifiably be considered to be made available for transfer is the volume of water pumped less the amount of induced leakage and the amount of intercepted groundwater flow. The Proposed Action includes measures that would reduce the amount of water that the Zone 7 Water Agency receives by an estimated 13 percent depletion factor to prevent any adverse impacts associated with groundwater/surface water interaction, as further described in Chapter 2. This would address potential stream depletion as a result of the Proposed Action. Additionally, the potential effects to fish and riparian vegetation from decreased streamflows are assessed in the Biological Resources section.

Land Subsidence

Excessive groundwater extraction from unconfined and confined aquifers could lower groundwater levels and decrease pore-water pressure in the aquifer. The reduction in pore-water pressure could result in a loss of structural support within clay and silt beds in the aquifer. The loss of structural support could cause the compression of clay and silt beds resulting in a lowering of the ground surface elevation (land subsidence). The compression of fine-grained deposits, such as clay and silt, is largely permanent. Infrastructure damage and alteration of drainage patterns are possible consequences of land subsidence.

In the Sacramento Valley Groundwater Basin, and more specifically in the Yolo Subbasin where RGF is located, portions of Colusa and Yolo counties have experienced subsidence. Historically, land subsidence occurred in the eastern portion of Yolo County and the southern portion of Colusa County because of groundwater pumping and the subsequent consolidation of loose aquifer sediments. The area between Zamora, Knights Landing, and Woodland has been most affected by subsidence in Yolo County (Yolo County 2012). DWR has categorized the Yolo Subbasin as having a high potential for land subsidence. The transfer of water made available through a groundwater substitution action in RGF's service area (within the Yolo Subbasin) could increase the potential for land subsidence when groundwater levels fall below historic low water levels. Impacts would be reduced with Mitigation Measure GW-1.

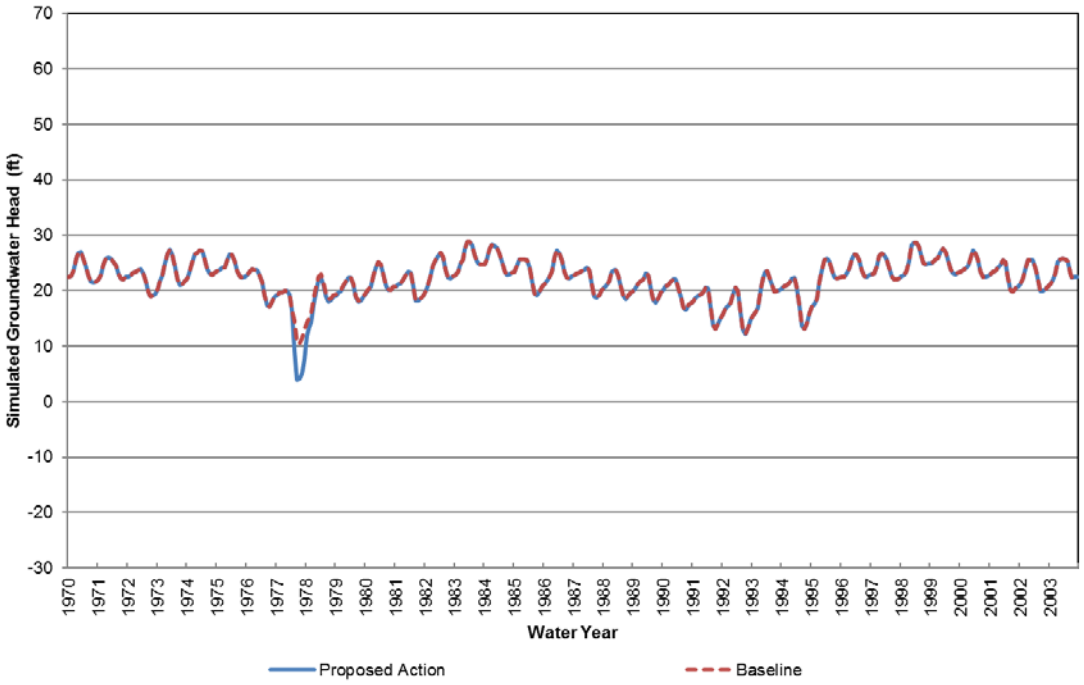


Figure 3-7. Simulated Groundwater Head (approximately 220 to 380 feet bgs) at Location 7 (See Figure 3-3 for Location)

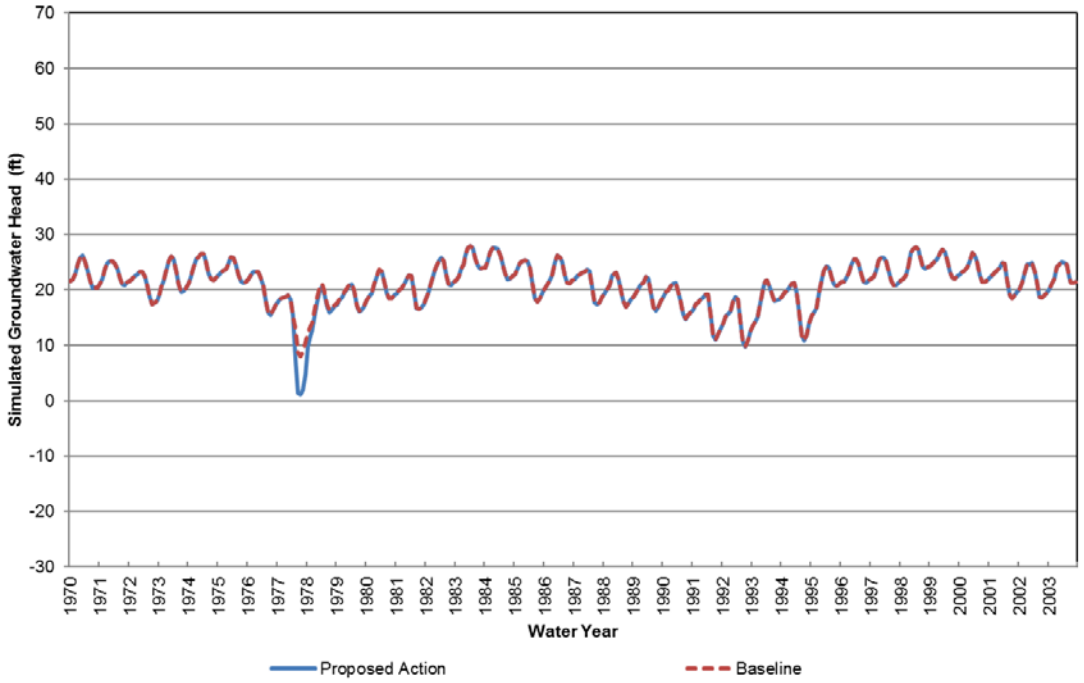


Figure 3-8. Simulated Groundwater Head (approximately 380 to 530 feet bgs) at Location 7 (See Figure 3-3 for Location)

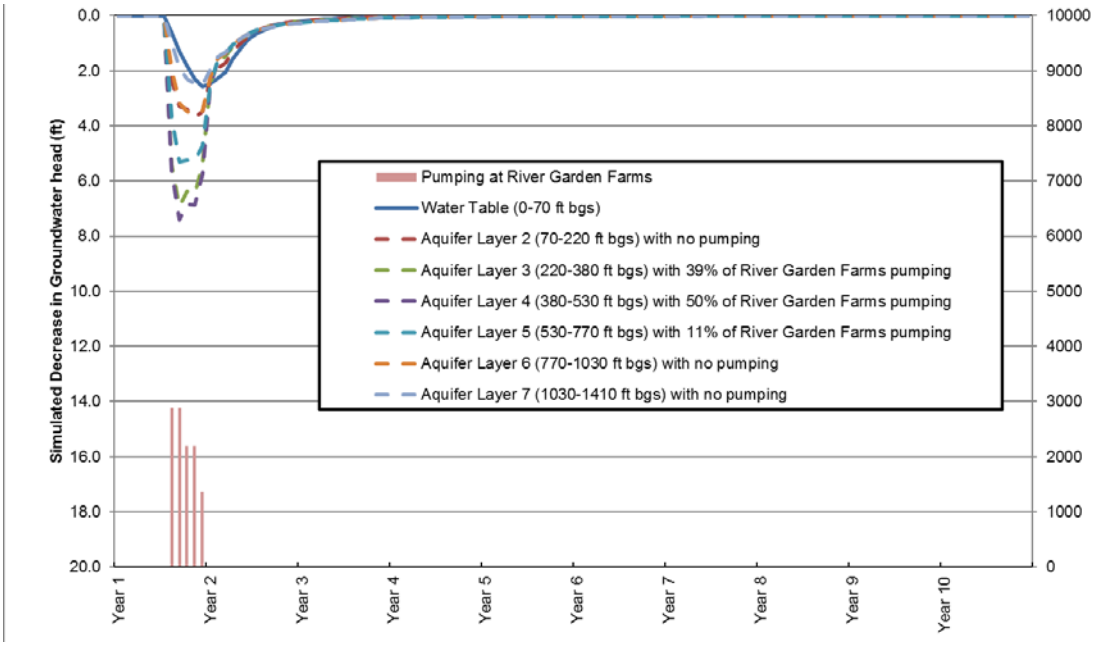


Figure 3-9. Simulated Change in Groundwater Head at Location 7 (See Figure 3-3 for Location) under the Proposed Action

Mitigation Measure GW-1: Monitoring Program and Mitigation Plan

The *DRAFT Technical Information for Preparing Water Transfer Proposals* (Reclamation and DWR 2015) provides guidance for the development of a groundwater substitution water transfer proposal. The technical information informs the development of the monitoring and mitigation program for the potential transfer activity evaluated in this EA.

The objective of Mitigation Measure GW-1 is to avoid adverse environmental effects and ensure prompt corrective action in the event unanticipated effects occur. The measure accomplishes this by monitoring groundwater or surface water levels during a transfer to avoid potential effects. The objectives of this process are to: (1) minimize potential effects to other legal users of water; (2) provide a process for review and response to reported effects by non-transferring parties; (3) assure that a local mitigation strategy is in place prior to the transfer; Reclamation will verify that RGF adopts and implements these mitigation measures to avoid adverse effects of transfer-related groundwater extraction. In addition, RGF must confirm that the proposed groundwater pumping will be compatible with state and local regulations and Groundwater Management Plans (GMPs). As Groundwater Sustainability Plans (GSPs) are developed by Groundwater Sustainability Agencies, potential sellers must confirm that the proposed pumping is compatible with applicable GSPs.

Well Review Process

RGF must submit well data for Reclamation and, where appropriate, DWR review, as part of the transfer approval process. Required information will be

detailed in the most current version of the *DRAFT Technical Information for Preparing Water Transfer Proposals.*

Monitoring Program

RGF must complete and implement a monitoring program subject to Reclamation's approval that shall, at a minimum, include the following components:

- *Monitoring Well Network*. The monitoring program shall incorporate a sufficient number of monitoring wells, as determined by Reclamation and RGF in relation to local conditions, to accurately characterize groundwater levels and response in the area before, during, and after transfer pumping takes place. Depending on local conditions, additional groundwater level monitoring may be required near ecological resource areas.

- *Groundwater Pumping Measurements*. All wells pumping to replace surface water designated for transfer shall be configured with a permanent instantaneous and totalizing flow meter capable of accurately measuring well discharge rates and volumes. Flow meter readings will be recorded just prior to initiation of pumping and at designated times, but no less than monthly and as close as practical to the last day of the month, throughout the duration of the transfer.

- *Groundwater Levels*. RGF will collect measurements of groundwater levels in both participating transfer wells and monitoring wells. Groundwater level monitoring will include measurements before, during and after transfer-related pumping. RGF will measure groundwater levels as follows:

  – Prior to transfer: Groundwater levels will be measured monthly from March in the year of the proposed transfer-related pumping until the start of the transfer (where possible).

  – Start of transfer: Groundwater levels will be measured on the same day that the transfer-related pumping begins, prior to the pump being turned on.

  – During transfer-related pumping: Groundwater levels will be measured weekly throughout the transfer-related pumping period, unless site specific information indicates a different interval should be used.

  – Post-transfer pumping: Groundwater levels will be measured weekly for one month after the end of transfer-related pumping, after which groundwater levels will be measured monthly through March of the year following the transfer.

Yolo and Colusa counties have established GMPs to provide guidance in managing the resource, but they do not have a quantitative target that identifies when transfer mitigation should begin. RGF must identify in their transfer proposal appropriate monitoring wells and the specific groundwater trigger for each well (established through the historic low groundwater level for that well). RGF will initiate the mitigation plan if groundwater levels fall below historic low groundwater levels.

Additionally, Reclamation, Zone 7 Water Agency, and RGF will coordinate closely with potentially impacted third parties to collect and monitor groundwater data. If a third party expects that it may be impacted by a proposed transfer, that party should contact Reclamation and RGF with its concern. The burden of collecting groundwater data will not be the responsibility of the third party. If warranted, groundwater level monitoring to address the third-party's concern may be incorporated in the monitoring and mitigation plans required by Mitigation Measure GW-1.

Additionally, to avoid adverse effects to vegetation RGF will monitor groundwater depth data to verify that adverse effects to deep-rooted vegetation are avoided. If monitoring data indicate that water levels have dropped below root zones (i.e., more than 10 feet) where groundwater was 10 to 25 feet below ground surface prior to starting the transfer), RGF must implement actions set forth in the mitigation plan. If historic data show that groundwater elevations in the area of transfer have typically varied by more than this amount annually during the proposed transfer period, then the transfer may be allowed to proceed. If there is no deep-rooted vegetation (i.e., oak trees and riparian trees that would have tap roots greater than 10 feet deep) within one-half mile of the transfer wells or the vegetation is located along waterways that will continue to have water during the transfer, the transfer may be allowed to proceed. If no existing monitoring points exist in the shallow aquifer, monitoring would be based on visual observations of the health of these areas of deep-rooted vegetation. If adverse impacts to deep-rooted vegetation (that is, loss of a substantial percentage of the deep-rooted vegetation as determined by Reclamation based on site-specific circumstances in consultation with a qualified biologist) occur as a result of the transfer despite the monitoring efforts and implementation of the mitigation plan, RGF will prepare a report documenting the result of the restoration activity to plant, maintain, and monitor restoration of vegetation for 5 years to replace the losses.

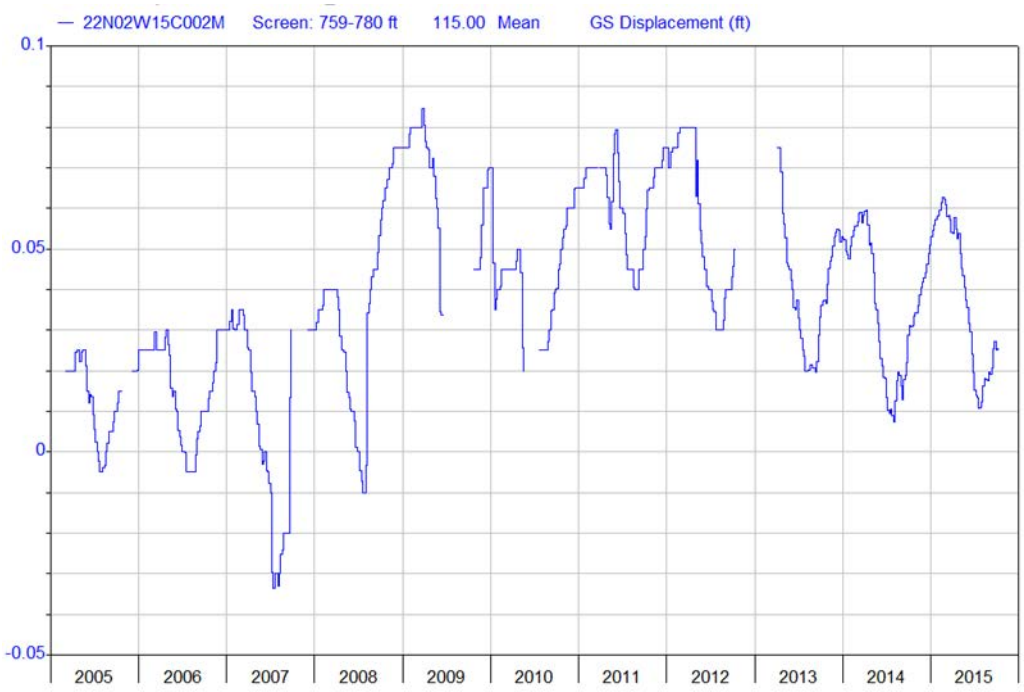
- *Groundwater Quality*. RGF shall measure specific conductance in samples from each participating production well. Samples shall be collected when RGF first initiates pumping, monthly during the transfer period, and at the termination of transfer pumping.

- *Land Subsidence.* Subsidence monitoring will be required if groundwater levels could decline below historic low levels during the proposed water transfer. Before a transfer, RGF will examine local groundwater conditions and groundwater level changes based on past pumping events or groundwater substitution transfers. This existing information will be the basis to estimate if groundwater levels are likely to decline below historic low levels, which would trigger land surface elevation measurements (as described below).

  If the measured groundwater level falls below the historic low level, RGF must confirm the measurement within seven days. If the water level has risen above the historic low level, RGF may continue transfer pumping. If the measured groundwater level remains below the historic low level, RGF will stop transfer-related pumping immediately or begin land surface elevation measurements in strategic locations within and/or near the transfer-related pumping area. Measurements may include (1) extensometer monitoring, (2) continuous global positioning system (GPS) monitoring, or (3) extensive land-elevation benchmark surveys conducted by a licensed surveyor. This data could be collected by RGF or from other sources (such as public extensometer data). Measurements must be completed on a monthly basis during the transfer.

  If the land surface elevation survey indicates an elevation decrease between 0.1 foot and 0.2 foot from the initial measurement, RGF would need to start the process identified below in the Mitigation Plan. RGF will also work with Reclamation to assess the accuracy of the survey measurements based on current limitations of technology, professional engineering/ surveying judgment, and any other data available in or near the transferring area.

  The threshold of 0.1 foot was chosen as this value is typical of the elastic (i.e., recoverable) portion of subsidence; the threshold of 0.2 foot was selected considering limitations of current land survey technology. This threshold is supported by a review of data from extensometers within the Sacramento Valley. Example data from a subsidence monitoring location in the Sacramento Valley is shown in Figure 3-10, which shows subsidence data from extensometer 22N02W15C002M, in Glenn County. This extensometer has not been identified as having long-term declining trends but exhibits a small amount of movement (up to about 0.1 foot).



Source: DWR 2015a

Figure 3-10. Measured Ground Surface Displacement (in feet) at Extensometer 22N02W15C002M in Glenn County

- *Coordination Plan.* The monitoring program will include a plan to coordinate the collection and organization of monitoring data. This plan will describe how input from third parties will be incorporated into the monitoring program and will include a plan for communication with Reclamation as well as other decision makers and third parties.

- *Evaluation and Reporting.* The proposed monitoring program will describe the method of reporting monitoring data. At a minimum, RGF will provide data summary tables to Reclamation, both during and after transfer-related groundwater pumping. Post-program reporting will continue through March of the year following the transfer. RGF will provide a final summary report to Reclamation evaluating the effects of the water transfer. The final report will identify transfer-related effects on groundwater and surface water (both during and after pumping), and the extent and significance, if any, of effects on local groundwater users. It shall include groundwater elevation contour maps for the area in which transfer operations are located, showing pre-transfer groundwater elevations, groundwater elevations at the end of the transfer, and recovered groundwater elevations in March of the year following the transfer. The summary report shall also identify the extent and significance, if any, of transfer-related effects to ecological resources such as fish, wildlife, and vegetation resources.

Mitigation Plan

RGF must complete and implement a mitigation plan to avoid groundwater impacts and ensure prompt corrective action in the event unanticipated effects occur. Mitigation actions could include:

- Curtailment of pumping until natural recharge corrects the issue.
- Lowering of pumping bowls in non-transferring wells affected by transfer pumping.
- Reimbursement for increases in pumping costs due to the additional groundwater pumping to support the transfer.
- Curtailment of pumping until water levels rise above historic lows if non-reversible subsidence is detected (based on local data to identify elastic versus inelastic subsidence).
- Reimbursement for modifications to infrastructure that may be affected by non-reversible subsidence.
- Other appropriate actions based on local conditions, as determined by Reclamation.

As summarized above, the purpose of Mitigation Measure GW-1 is to monitor groundwater levels during transfers to avoid adverse effects. To ensure that mitigation plans will be feasible, effective, and tailored to local conditions, the plan must include the following elements:

- A procedure for RGF to receive reports of purported environmental effects or effects to non-transferring parties;
- A procedure for investigating any reported effect;
- Development of mitigation options, in cooperation with the affected parties, when necessary; and
- Assurances that adequate financial resources are available to cover reasonably anticipated mitigation needs.

Mitigation to avoid effects from subsidence, and ensure prompt corrective action in the event that unanticipated effects occur is described by the following stages.

Stage 1: Groundwater Levels
Irreversible subsidence would not occur if groundwater levels stay above historic low levels for the entire transfer season. As groundwater is pumped from an aquifer, the pore water pressure in the aquifer is reduced. This reduction in pore water pressure increases the effective stress on the structure of the aquifer itself. This increase in effective stress can cause the aquifer structure to deform, or compress, resulting in subsidence of the ground surface. Subsidence can be irreversible if the reduced effective stress is lower than the historically low effective stress. Typically this would be the result of groundwater levels reaching levels lower than the historical low level.

Before a transfer, RGF will examine local groundwater conditions and groundwater level changes based on past pumping events or groundwater substitution transfers. This existing information will be the basis to estimate if groundwater levels are likely to decline below historic low levels as a result of the proposed transfer. If the pre-transfer assessment indicates that groundwater levels will stay above historic low levels, and this finding is confirmed by monitoring during the transfer-related pumping period, then no additional actions for subsidence monitoring or mitigation are necessary. RGF would proceed to stage 2 for land surface elevation monitoring if the pre-transfer estimates indicate that groundwater levels are anticipated to decline below historic low levels. If monitoring during the transfer-related pumping period (confirmed by two measurements within seven days) indicates that groundwater levels have fallen below historic low levels, RGF must immediately stop pumping from transfer wells in the area that is affected or proceed to stage 2.

Stage 2: Ground Surface Elevations
Stage 2 includes monthly ground surface elevation monitoring during transfer-related pumping if pumping could cause groundwater levels to fall below historic low levels, as described above in the Monitoring Plan. If ground surface elevations decrease between 0.1 and 0.2 foot, RGF will evaluate the accuracy of the information based on the current limitations of technology, professional engineering/surveying judgment, and other local data. If the elevations decline more than 0.2 foot, this change could indicate inelastic subsidence and RGF would cease transfer pumping. RGF would continue monitoring as discussed below even after discontinuing transfer pumping.

Stage 3: Continued Monitoring
RGF will continue to monitor for subsidence while groundwater levels remain below historic low levels. If RGF has ceased transfer-related pumping but groundwater levels remain below historic lows, subsidence monitoring will need to continue until the spring following the transfer. The results of

subsidence monitoring will be factored into monitoring and mitigation plans for future transfers.

Groundwater Quality

Groundwater quality in the Yolo Subbasin is generally hard and high in salt content. However, it is generally sufficient for municipal, agricultural, domestic, and industrial uses. Groundwater extraction under the Proposed Action would be limited to withdrawals during the irrigation season of the 2018 contract year. Groundwater extraction under the Proposed Action would be limited to short-term withdrawals during the irrigation season and extraction near areas of reduced groundwater quality would not be expected to result in a permanent change to groundwater quality conditions.

3.7 Cumulative Impacts

This cumulative impacts analysis identifies past, present and reasonably foreseeable future projects with the potential to contribute to cumulative effects, when combined with the Proposed Action. Information used in these cumulative impacts analysis is based on the best information available at this time.

Water transfers occur in many dry years to move water to agencies that may be experiencing shortages. The cumulative analysis considers other potential water transfers that could occur in the 2018 transfer season, including other CVP water transfers, SWP water transfers, and additional water transfers. Table 3-5 lists potential sellers, in addition to RGF, that have indicated interest in participating in transfers in 2018. This information is based on agencies that have submitted transfer requests to the State Water Resources Control Board (SWRCB) and would have some area of overlap associated with moving water through the Delta (SWRCB 2018).

Water transfer methods could include groundwater substitution (the same as described for the Proposed Action). The only other transfer method proposed for 2018 is a stored reservoir water release, which includes releases of water that would have remained in storage in non-CVP or SWP reservoirs.

Water volumes shown in Table 3-5 are proposed for sale to SWP contractors. Transfers to south of Delta buyers would be exported through the Delta via Banks or Jones Pumping Plants.

Table 3-5. Potential Cumulative Sellers (Upper Limits)

Water Agency	Groundwater Substitution (acre-feet)	Stored Reservoir Release (acre-feet)
American River Area		
Carmichael Water District	600	
City of Sacramento	8,200	
El Dorado Irrigation District		5,000
San Juan Water District	2,175	

Water Agency	Groundwater Substitution (acre-feet)	Stored Reservoir Release (acre-feet)
Feather River Area		
Garden Highway Mutual Water Company	6,000	
South Sutter Water District		15,000
Tule Basin Farms	3,520	
Plumas Mutual Water Company[1]	6,000	
South Feather Water and Power[1]		10,000
Sutter Extension Water District[1]	4,540	
Total	**31,035**	**30,000**

[1] Entity holds Settlement Agreement with DWR.
Source: SWRCB 2018

Table 3-5 lists the transfer method and associated maximum annual transfer quantity potentially available from each seller. The potential total transfers for 2018 are less than in many other years because 2018 is not a dry year with high transfer demand. Cross Delta transfers to south-of-Delta buyers require pumping at the CVP and SWP south Delta export facilities and historically account for the majority of the transfers. Table 3-6 lists the total quantities of cross Delta transfers from 2009 to 2015 that ranged from zero to 414,629 AF from 2009 through 2015. In 2014, RGF transferred 3,489 AF via cropland idling and 3,558 AF through groundwater substitution. In 2015, RGF transferred 8,202 through cropland idling and 7,500 AF through groundwater substitution. Neither RGF nor Zone 7 Water Agency engaged in any cross-Delta water transfers in 2016 or 2017.

Table 3-6. Historic Cross Delta Water Transfers (2009 – 2015)

Year	Total Acre-Feet
2009	274,551
2010	264,165
2011	0
2012	84,781
2013[1]	351,515
2014[1]	414,629
2015[1]	262,466

Source: DWR and SWRCB 2015

[1] Data for 2013, 2014 and 2015 are for quantities made available North of the Delta and include Streamflow Depletion losses (where applicable) but do not include carriage water losses across the Delta. Cross Delta water transfers using facilities operated by DWR in 2014 and 2015 were 305,699 AF and 104,348 AF, respectively, and Reclamation 73,930 AF and 157,018 AF, respectively.

Transfers originating from the Sacramento Valley represent a small portion of the Sacramento Valley's overall water supply. Applied water in the Sacramento Valley from 2001 to 2010 has ranged from a low of about 9,168,000 AF in 2005 up to 11,017,000 AF in 2007 (DWR 2014b). These figures include applied water from surface water, groundwater, and reuse.

In addition to the transfers described in Table 3-5, northern California CVP water contractors may also engage in "Project Water" transfers under the Central Valley Project Improvement Act section 3405(a)(1)(M). Reclamation analyzed potential impacts of these transfers in an EA in 2016, the "Accelerated Water Transfer and Exchange Program for Sacramento Valley Central Valley Project Contractors – Contract Years 2016-2020." The EA identified no effect to biological resources and potentially small, beneficial effects to other resources. Because these transfers would not have adverse effects, they are not included in the cumulative condition.

The Lower Yuba River Accord (Yuba Accord) transfers were not included in the cumulative condition because transfers would be made available in a different geographical area than the Proposed Action.

The Proposed Action could have potential cumulatively considerable impacts to biological resources and groundwater resources. The cumulative analysis for these resources follows. The Proposed Action would not have cumulatively considerable impacts to other resources evaluated in this EA.

Biological Resources

Transfers under cumulative conditions could also result in additional flow in the Feather River, American River, Lower Sacramento River, and the Delta. The Proposed Action would result in a slight decrease in Sacramento River flows if water made available for transfer through a groundwater substitution action is stored in upstream reservoirs until transfer capacity is available. (This operation would only occur if the resource agencies identify that holding the water in Shasta Reservoir would be beneficial to the cold-water pool.) RGF's transfer and other cumulative transfers would result in increased flows downstream of the points of diversion to the Delta in July through September. The cumulative change in flow due to transfers would not reduce the suitability of habitat conditions during adult immigration by Chinook salmon, steelhead, and green sturgeon. This magnitude of cumulative flow change would also not appreciably reduce spawning habitat availability and incubation, increase redd dewatering or juvenile stranding, or reduce the suitability of habitat conditions during juvenile rearing for these sensitive fish species because the increase in flow is so small compared to baseline flows. Other special-status fish species, including hardhead and Sacramento splittail (state species of special concern) would also not be affected by small changes in river flow.

Water made available for transfer through a groundwater substitution action under the cumulative condition would also result in streamflow depletion and potentially affect flows for fish and natural communities. The transfers included in Table 3-7 are generally spread throughout the Sacramento Valley and would not substantially increase streamflow depletion in any one area.

In the Delta, fishery resources are affected by a variety of stressors in the cumulative condition. Transfers under cumulative conditions could increase Delta inflows, Delta outflows, and exports. Delta inflow would increase in July, August, and September. A portion of this increase would be exported, and a portion would become Delta outflow because of the carriage water requirement that is included in the Proposed Action. A portion of water for transfers would become Delta outflow to maintain water quality conditions in the Delta. When water made available for transfer is moving through the Delta, the Delta outflow would be higher than under the No Action Alternative. However, after the water made available for transfer through a groundwater substitution action or a stored reservoir release is transferred, the groundwater aquifer and reservoir would refill from surface water bodies. Delta inflows and outflows may decrease during these periods compared to the No Action Alternative, if the Delta is not in balanced conditions (where CVP and SWP operations are controlling inflows and outflows). Decreased Delta outflow could affect fishery resources; however, the timing of the decrease during Delta excess conditions would minimize any potential effect.

Reclamation and DWR would facilitate the transfer of water within the current operating parameters set by USFWS and NOAA Fisheries biological opinions, which included water transfers within the project description. They would also follow all other Delta water quality requirements, such as those identified in D-1641, that are designed to protect fishery resources. The greatest decrease in Delta outflow could occur during wet periods, when high surface water flows would contribute to refilling groundwater basins and surface water storage. These reductions would occur when flows are greater than necessary to meet outflow criteria, and conditions for special status species would not be worsened. During lower flow periods, the Delta is in balanced conditions that require the CVP and SWP to release water from storage to meet flow requirements. Flows in the Delta would not change during these periods.

Groundwater Resources

The reduction in recharge due to the decrease in precipitation and runoff in the past years in addition to the increase in groundwater substitution transfers could lower groundwater levels. The groundwater modeling for the Proposed Action suggests that the pumping of groundwater used in lieu of the surface water made available for transfer, in addition to the groundwater pumping which would occur as a result of the dry conditions, could reduce groundwater levels below historic levels during a year such as 1977. As indicated in the modeling, groundwater levels return to normal in subsequent wet cycles. As there are very few groundwater substitution transfers this year, additional pumping by RGF this year is not expected to result in cumulative effects to groundwater levels.

Reclamation requires well review, monitoring, and mitigation to avoid or minimize effects to third party groundwater users for approval of transfers. Only wells that meet the requirements outlined in the *DRAFT Technical*

Information for Preparing Water Transfer Proposals (Reclamation and DWR 2015) will be allowed to participate in a transfer. Reclamation will not approve transfers if appropriate monitoring and mitigation does not occur. Monitoring and mitigation programs would reduce cumulative groundwater effects.

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Chapter 4
Consultation and Coordination

4.1 Agency Involvement

Reclamation continues to coordinate with RGF and Zone 7 Water Agency to implement a water transfer in 2018. In addition, Darren Cordova, MBK Engineers, acting on behalf of RGF, was consulted about potential transfers.

4.2 Endangered Species Act (16 USC § 1531 et seq.)

Section 7 of the Endangered Species Act requires Federal agencies to ensure that their actions do not jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of their critical habitat.

Reclamation determined that the Proposed Action would have no effect on ESA listed species or designated critical habitat. Therefore, consultation with USFS or NMFS is not required.

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Chapter 5
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