Estimated Costs to Retire Drainage Impaired Lands in the San Luis Unit

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Food and Water Watch
California Water Impact Network
Citizens Against Taxpayer Funding of the BDCP

Final Report

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Disclaimer

Food and Water Watch, California Water Impact Network, and Citizens Against Taxpayer Funding of the BDCP commissioned the analysis described in this report.

Throughout the report we have identified our sources of information and assumptions used in the analysis. Within practical limits, ECONW has made every effort to check the reasonableness of the data and assumptions and to test the sensitivity of the results of our analysis to changes in key assumptions.

We gratefully acknowledge the assistance of the many individuals who provided us with information and insight. But we emphasize that we, alone, are responsible for the report's contents. We have prepared this report based on our own knowledge and training and on information derived from government agencies, the reports of others, and other sources believed to be reliable. ECONorthwest has not verified the accuracy of such information, however, and makes no representation regarding its accuracy or completeness. Any statements nonfactual in nature constitute the authors' current opinions, which may change as more information becomes available. Responsibility for its research and findings lies solely with the authors.

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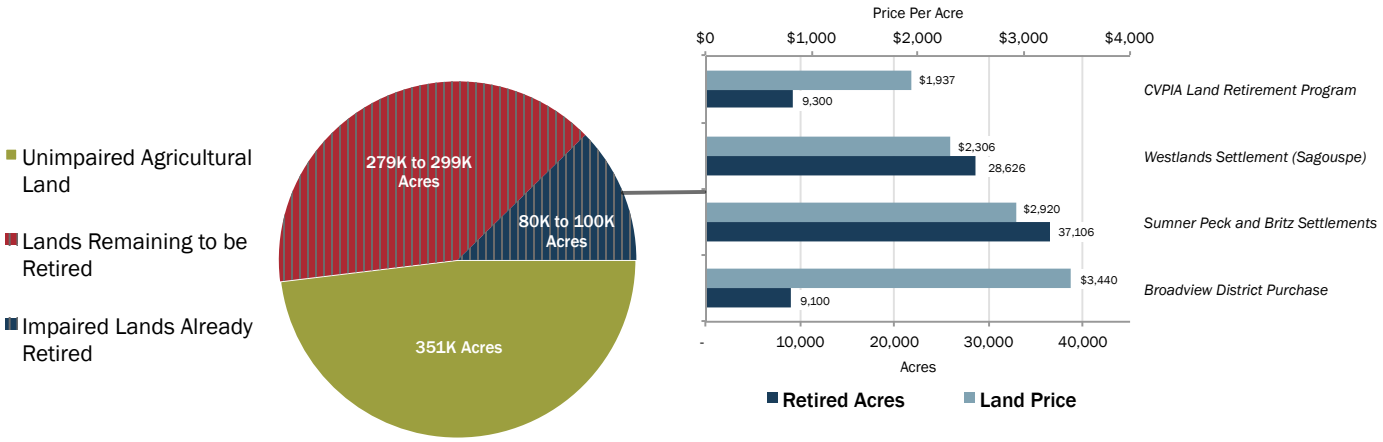
Executive Summary

- California faces unprecedented pressures on its water supplies. These scarcity conditions heighten the need to carefully balance water use and tradeoffs in allocation among the competing demands of urban users, agricultural producers, and the natural environment.
- Forty percent of California's total annual supply of surface water is devoted to agricultural production, which in turn accounts for roughly eighty percent of the water used by humans in the state
- Portions of the Central Valley, California's main agricultural region, have soils with high levels of salts and other elements that, when combined with irrigation water, can poison croplands and pollute natural waterways.
- Several assessments have identified land retirement - taking the most toxic lands out of irrigated production[1] - as the most viable, cost effective solution to the problem of polluted runoff from agricultural lands in the Central Valley.
- Drainage problems impair roughly half of all lands within the San Luis Unit, an important region within the Central Valley, and the focus of this study.
- Land retirement programs have retired a quarter of these impaired lands, to date.
- By taking the remaining seventy-five percent of impaired lands out of irrigated production, California residents could benefit from significantly reduced toxic runoff into the Delta, and increased supplies of precious and scarce water that can be put to better uses.
- Prices paid under past land retirement programs in the region are between $1,937 and $3,440 per acre.

[1] Retiring land from irrigated production does not preclude other economic uses, like dry farming and solar production, or habitat restoration.

Figure 1. Land Retirement in the San Luis Unit



- Using the estimated acreage of drainage-impaired lands remaining in the San Luis Unit and a range of land costs paid by previous retirement programs, we estimate that retirement of the remaining impaired lands would cost between $740 million and $793 million, on average.

Table 1. Summary of Cost Estimates

Land Categories	Acreages
Total Area of San Luis Unit	730,000
Total Drainage-impaired Lands	379,000
Lands Already Retired	80,000 to 100,000
Lands Remaining to be Retired	279,000 to 299,000

Cost Range	Land Prices	Total Cost Estimates ($M, 2015$)
Lower Bound	$1,937	$540 to $579
Average	$2,651	$740 to $793
Upper Bound	$3,440	$960 to $1,029

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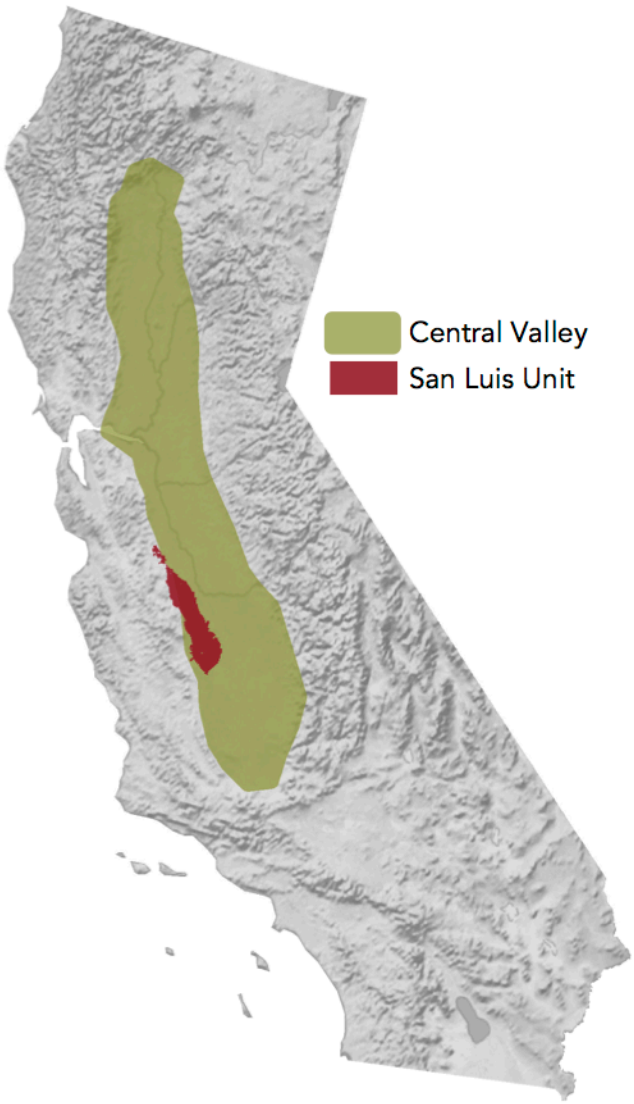
Introduction

California faces unprecedented pressures on its water supplies. According to climate scientists, the recent drought, now in its fourth year, may be the most severe over the past 1,200 years.[2] These scarcity conditions heighten the need to carefully balance water use and tradeoffs in allocation among the competing demands of urban users, agricultural producers, and the natural environment.

Figure 2. Location of the Central Valley and Study Area (San Luis Unit)



Source: ECONorthwest with data from the Bureau of Reclamation

[2] Griffin, D., & Anchukaitis, K. J. 2014. How unusual is the 2012–2014 California drought?. *Geophysical Research Letters*, *41*(24), 9017-9023.

Forty percent of California's total annual supply of surface water is devoted to agricultural production, which in turn accounts for roughly eighty percent of the water used by humans in the state.[3] Agricultural demand for water is concentrated mainly in the Central Valley (Figure 2).

With the declining availability of surface water, agricultural producers rely more heavily on groundwater supplies, use available water more efficiently, scale back their operations, or fallow their lands entirely. Farmers have pursued all of these options during the current drought. Over the last few years, dwindling surface water supplies have sharply curtailed water deliveries to farmers in the Central Valley,[4] leading many to rely exclusively on groundwater pumping.[5] Farmers have also fallowed extensive acreage; for example, in 2014, farmers in Westlands Water District fallowed 206,915 acres, or 36% of all lands in the District, due to lack of water.[6]

Farmers produce more than 250 different crops in the Central Valley, with an estimated value of $21 billion per year.[7] Despite the region's overall productivity, large swaths of land, primarily in the San Joaquin Valley, are unsuitable for irrigated agriculture. The soils in these naturally dry areas have high levels of salts, selenium and boron, trace elements that – when combined with irrigation water – can poison crops if allowed to remain on lands without proper drainage. Related problems include contaminated waterways, increased toxic runoff into the Delta, and deformities in birds and fish. These problems were first comprehensively described in a 1990 report by the San Joaquin Valley Drainage Program (SJVDP):

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[3] Mount, J. 2011. *Water—Who uses how much?.* California Water Blog. Available at: http://californiawaterblog.com/2011/05/05/water%E2%80%94who-uses-how-much/

[4] In April 2015, for the first time since 1977, the State Water Resources Control Board restricted the amount of water available for senior water right holders in the San Joaquin and Sacramento watersheds and the Delta. See California Environmental Protection Agency, State Water Resources Control Board. 2015. *Notices of Water Availability - Curtailment and Emergency Regulations*. Available at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/water_availability.shtml

[5] Typically, groundwater provides about 30 to 40 percent of the state's agricultural water supply and, in drought years, this increases to 60 percent. California Department of Water Resources, 2003. *California's Groundwater, Bulletin 118 - 2003 Update*. Available at: http://www.water.ca.gov/pubs/groundwater/bulletin_118/california's_groundwater__bulletin_118_-_ and Richtel, M. 2015. *California Farmers Dig Deeper for Water, Sipping Their Neighbors Dry*. The New York Times. Available at: http://www.nytimes.com/2015/06/07/business/energy-environment/california-farmers-dig-deeper-for-water-sipping-their-neighbors-dry.html

[6] Westland's Water District. 2014. *Crop Report*. http://wwd.ca.gov/wp-content/uploads/2014/10/croprpt14.pdf

[7] US Department of Agriculture, National Agricultural Statistics Services. 2013. *National Agricultural Statistics Services database*. Available at: http://www.nass.usda.gov/index.asp.

"Inadequate drainage and accumulating salts have been persistent problems in parts of the valley for more than a century, making some cultivated land unusable as far back as the 1880s and 1890s. Widespread acreages of grain, first planted on the western side of the valley in the 1870s and 1880s were irrigated with water from the San Joaquin and Kings rivers. Poor natural drainage conditions, coupled with rising ground-water levels and increasing soil salinity, meant that land had to be removed from production and some farms ultimately abandoned".[8]

In the decades since the SJVDP published its report, several assessments have identified land retirement as the most viable, cost effective solution to the problem of polluted runoff from agricultural lands in the Central Valley. Chief among these assessments is the Bureau of Reclamation's *San Luis Drainage Feature Re-evaluation* (Re-evaluation), which evaluated drainage-service options for the San Luis Unit of the Central Valley Project (Figure 2). Of the many options and alternative considered, only the strategy featuring maximum land retirement had net economic benefits (that is, benefits exceeding costs), estimated at $3.64 million/year.

Even though the Bureau of Reclamation ultimately chose not to pursue this strategy, several separate land retirement programs and actions, sponsored by government entities and agricultural districts, have taken thousands of toxic acres out of production.[9] In most cases, the water that would have otherwise flowed over these acres was re-allocated to nearby agricultural lands that do not suffer from the same drainage problems. These programs and actions include the San Joaquin Valley Drainage Program (administered jointly by the Bureau of Reclamation, the U.S. Fish and Wildlife Service, and the Bureau of Land Management), as well as several legal settlements and land acquisitions undertaken by the Westlands Water District.

In spite of these past programs, many thousands of acres of impaired lands remain. By taking these remaining lands out of irrigated production, California benefits in two ways. First, taking these lands out of irrigated production would significantly reduce toxic runoff into the San Joaquin River and the Delta. This would help reduce pollution in the Delta and improve the quality of water flowing out of the Delta to other beneficial uses. Second, retiring these lands could potentially increase supplies of precious and scarce water that can be put to better uses.

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[8] San Joaquin Valley Drainage Program. 1990. *A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley*. Available at: https://www.c-win.org/webfm_send/10

[9] It is worth noting that all land retirements, to date, have been voluntary, involving willing landowners. Water districts are typically supportive of land retirement programs; see, for example, Westlands Water District. 2002. *Why Land Retirement Makes Sense for Westlands Water District*. Available at: http://www.westlandswater.org/long/200201/landretirebro.pdf

In this report we describe the results of our analysis of the estimated costs of retiring toxic and impaired acres in the San Luis Unit. Our analysis focuses on the costs of buying out these acres at fair market value for impaired lands. The proposed settlement between San Luis Unit water agencies and the U.S. Department of the Interior regarding drainage services for these lands does not include retiring impaired acres. Our report gives the settlement parties and the public information on the cost of land retirement as a permanent solution to the problems caused by irrigated agriculture on drainage-impaired lands.

Land retirement raises the question, What becomes of the Central Valley Project water that San Luis Unit water agencies would otherwise apply to the drainage impaired lands? Answering this question involves legal and policy aspects that were not part of our analysis. We note that an analysis of retiring drainage impaired lands in the San Luis Unit was conducted as a mitigation measure for the 2004 Trinity River Fishery Restoration Supplemental EIS/EIR.[10] The authors of this report concluded that retiring drainage impaired lands would save over 454,000 acre-feet of Central Valley Project water.

In the next section we summarize information on the total acreage of impaired lands that exist in the San Luis Unit. We then describe the results of our review of the available information on the number of acres retired by previous land retirement programs and actions. Next, we summarize data on per-acre prices paid in these retirement programs. Finally, we develop a range of cost estimates to retire the remaining impaired lands.

Study Area

The toxic soils at issue in our study are located in the San Luis Unit (Unit). The Unit, part of the Central Valley Project (CVP), encompasses the entire Westlands, Broadview, Panoche, and Pacheco water districts, and the southern portion of the San Luis Water District.[11] The *San Luis Drainage Feature Re-evaluation*, described previously, also incorporated the Grassland Drainage Area (GDA), which lies outside the Unit, into the study area (see Figure 3).[12]

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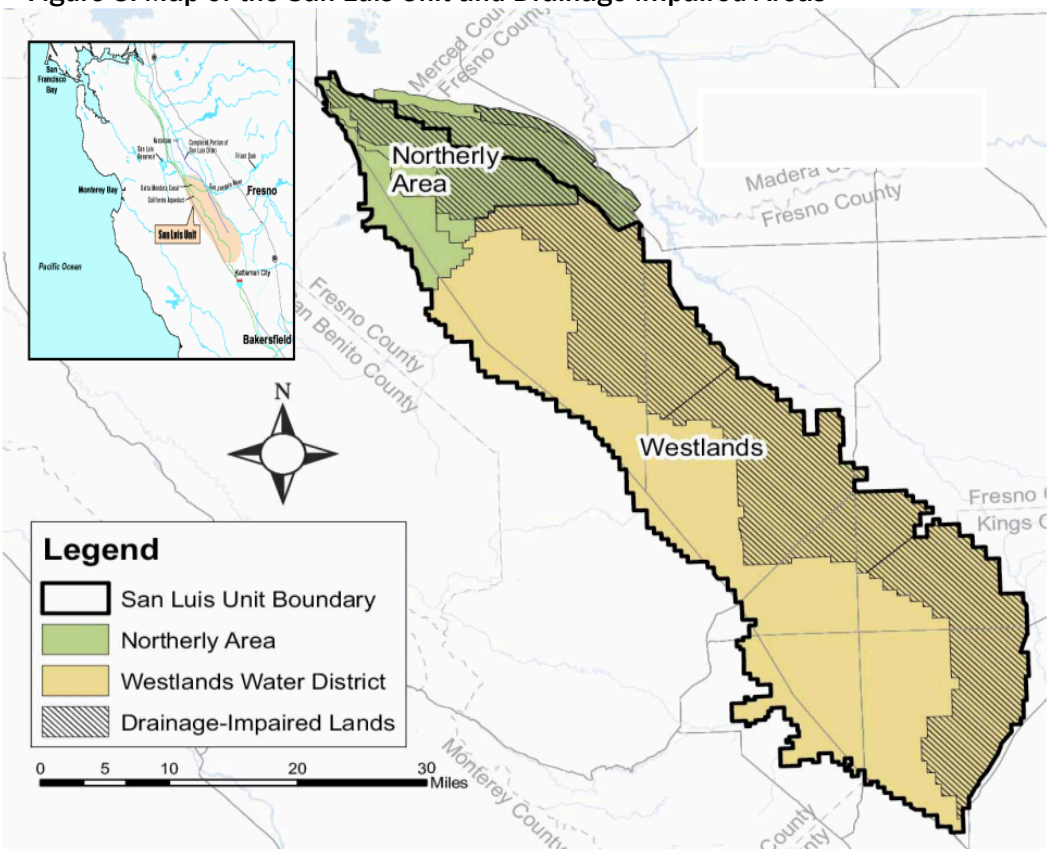
[10]U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, Hoopa Valley Tribe, and Trinity County. 2004. *Trinity River Fishery Restoration, Supplemental Environmental Impact Statement/Environmental Impact Report*. Pages 112 – 116. Available at: http://www.usbr.gov/mp/mp150/envdocs/trinity_seis/App_A.pdf

[11] Water and irrigation districts are special districts charged with obtaining and distributing irrigation water for agricultural producers within a given area.

[12] The GDA was included in the Re-evaluation because the drainage systems are closely interrelated with the lands in the Unit. US Bureau of Reclamation. 2004. *San Luis Drainage Feature Re-evaluation, Plan Formulation Report, Addendum - Executive Summary*. Available at: http://www.usbr.gov/mp/sccao/sld/docs/sld_pfr_addendum/02_exec_summ.pdf

Figure 3. Map of the San Luis Unit and Drainage-impaired Areas



Source: US Bureau of Reclamation. 2005. *San Luis Drainage Feature Re-Evaluation Draft EIS - Presentation.* Available at: http://www.calwater.ca.gov/content/Documents/meetings/2005/07-22-05San_Luis_Drainage.pdf

Total Area

The entire study area (including the lands to the north and outside of the Unit) encompasses approximately 730,000 acres:

- The total land area within the Unit itself is 689,600 acres.[13]
  - 604,400 of these acres lie within the Westlands Water District.[14]
  - The portion of the Northerly Area lying within the Unit comprises 85,600 acres.[15]
- The GDA, contiguous to the Unit's northern districts, adds roughly 40,400 acres.[16]

[13] US Bureau of Reclamation. 2004. *San Luis Drainage Feature Re-evaluation, Plan Formulation Report, Addendum, Section Two – Study Area*. Available at: http://www.usbr.gov/mp/sccao/sld/docs/sld_pfr_addendum/04_sec02_study_area.pdf

[14] US Bureau of Reclamation. 2008. *San Luis Drainage Feature Re-evaluation Feasibility Report.* Available at: http://www.usbr.gov/mp/sccao/sld/docs/sldfr_report/slfr_3-08_v02.pdf

[15] Ibid.

[16] Ibid.

Drainage Impaired Acres

Lands identified as 'drainage impaired' typically have low productivity, poor drainage, and high selenium concentrations in shallow ground water (see Table 1 and Figure 3). The Re-evaluation Plan Formulation Report (PFR - a phase in the Bureau of Reclamation's Re-evaluation process), identified 298,000 acres in Westlands and 45,000 acres in the Northerly Area for a total of 343,000 drainage-impaired acres within the San Luis Unit. The PFR identified an additional 36,000 acres of drainage-impaired lands contiguous to the Northerly Area district lands, but outside the Unit, for a total of 379,000 acres needing drainage service (shown as the hatched area in Figure 3).[17] This is the figure we adopt for the total acreage of drainage-impaired lands in the Unit, before accounting for the acreages that have already been retired, as described below.

Past Land Retirement Programs

Past land retirement programs provide insight into a likely range of costs to retire the remaining drainage-impaired acres. The lands in these past programs compare favorably to the lands at issue in our analysis for their location, agricultural production methods and outputs, climate conditions and water availability.[18] To account for the time difference between past programs and the present we inflate past retirement-program costs using the Consumer Price Index price adjustor.[19]

Our analysis focuses on the cost of land, without the value of associated federal water service, the only significant surface water source for these lands. We base our approach on the fact that the lands at issue in our analysis have junior water contracts within the federal Central Valley Project operated by the U.S. Bureau of Reclamation, and lack guaranteed water deliveries. The recent drought and the number of acres fallowed because of the drought highlight this point. Also, we assume that federal dollars would fund future land-retirement programs. All but a fraction of the federally built and paid for water infrastructure that serves these

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[17] US Bureau of Reclamation. 2004. *San Luis Drainage Feature Re-evaluation, Plan Formulation Report, Addendum*. Available at: http://www.usbr.gov/mp/sccao_new/west_sjv/sld/docs/sld_pfr_addendum/index.html_. Areas needing drainage service were revised based on land retirement actions that occurred between 2002 (when the PFR was released) and 2004 (when the Addendum was released; see http://www.usbr.gov/mp/sccao/sld/docs/). Lands in Westlands needing drainage service were reduced to 253,900 acres for a revised Unit total of 334,900 acres.

[18] US Environmental Protection Agency. 2000. *Guidelines for preparing economic analyses*. Washington, DC: EPA 240-R- 00-003.

[19] Bureau of Labor Statistics. 2015. *CPI Inflation Calculator*. Available at: http://www.bls.gov/data/inflation_calculator.htm

acres remains unpaid. Double counting would result if we included the value of this infrastructure in with the land value.

Available data on past land retirement actions and programs in the Unit show the following:

- *9,300 acres have been retired under the Central Valley Improvement Act (CVPIA) Land Retirement Program*.[20]Average costs for the CVPIA Land Retirement Program were $2,600 an acre ($3,833/acre, in 2015 dollars).[21] The Bureau of Reclamation (Reclamation) also adopted this cost per acre estimate in its analyses of land retirement costs, including the Re-evaluation reports.[22]

  This price includes the price of water service contracts associated with the lands. In the past, Westlands paid Reclamation $1,150 per acre ($1,536 per acres in 2015$) for these contracts, which means the price of land alone was approximately $1,450 per acre (or, $1,937 in 2015$)[23].

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[20] US Bureau of Reclamation and Bureau of Land Management, Land Retirement Program. 2013. *Draft CVPIA Fiscal Year 2014 Annual Work Plan* . Available at: http://www.usbr.gov/mp/cvpia/docs_reports/awp/2014/docs/LRP_all.pdf. We note that, in 2006, the USFWS expressed doubts about whether the Land Retirement Program's figures are accurate: *"With respect to the CVPIA Land Retirement Program, the Draft EIS (Table 2.3-1) projects 7,000 acres total retired lands within Westlands through this program by 2007 (with or without SLDFR action). The Service is not convinced this assumption is accurate. While the table footnotes indicate an assumed retirement rate of 981 acres per year each year from 2003-2007, as of this writing in 2006, the CVPIA Retirement Program stands at 2,091 acres within Westlands - none of the anticipated expansions have occurred."* - United States Department of the Interior, Fish and Wildlife Service. 2006. *Fish and Wildlife Coordination Act Report for the San Luis Drainage Feature Re-Evaluation*. Available at: http://wwwrcamnl.wr.usgs.gov/Selenium/Library_articles/san_luis_articles/USFWS_SanLuisDrainageFeatureReevaluation_Fish&Wildlife_CoordinationActReport_3-06.pdf.

[21] *"Proposals submitted to the CVPIA Land Retirement Program in 1997 ranged from $1,500 per acre to $6,200 per acre, with an average price of about $2,600 per acre for land sold with water"*. In 2015 dollars, this is a low of $2,211, a high of $9,140, and an average price of $3,833 per acre. CALFED Bay-Delta Program. 1997. CVPIA Administrative Proposal. Available at: http://www.calwater.ca.gov/Admin_Record/E-015903.pdf. Additionally, the Re-evaluation feasibility report stated: *"Capital costs of acquiring land for both land retirement purposes and to locate project facilities were estimated at $2,600 per acre, based on available data obtained from Fresno County land sale records, as well as land purchases by Westlands."* US Bureau of Reclamation. 2008. *San Luis Drainage Feature Re-evaluation Feasibility Report.* Available at: http://www.usbr.gov/mp/sccao_new/west_sjv/sld/docs/sldfr_report/index.html

[22] The original 1990 SJVDP Report, meanwhile, estimated per acre costs as ranging from $1,500 to $1,900 ($2,715 to $3,439, per acre, in 2015$). San Joaquin Valley Drainage Program. 1990. *A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley.* Available at: https://www.c-win.org/webfm_send/10

[23] *"The cost of retiring land is driven largely by the market value of land. Land values can vary substantially, depending on soil quality, salinity problems, access to water, structures, etc., and depending on whether land is valued with project water and drainage costs. Recent prices paid by Reclamation's Land Retirement*

- *37,106 acres were retired under the Peck and Britz Settlements* (*Sumner Peck Ranch, Inc., et al. vs. Bureau of Reclamation et al.).* At issue in the Sumner Peck litigation was Reclamation's failure to provide drainage service to lands within the Westland Water District; plaintiffs sought to force the Bureau to provide drainage service, or, alternatively, compensate land owners within the District for damages associated with lack of water delivery and drainage service. Summarizing the settlement's payment arrangement, the U.S. Fish and Wildlife Service stated: *"… Reclamation paid $107 million, in addition to $32 million from Westlands, in exchange for the right to prohibit irrigation on 34,000 acres*[24] *of highly seleniferous lands owned by Simmer Peck Ranch; and $7.3 million for a similar arrangement with Blitz Farms for 3,006 impaired acres."* [25]. Westland's 2012 Bond Issuance files indicate that the District acquired 29,487 acres of land (and 90,597 acre-feet of water rights) at a total cost of $31,921,273.[26] While the details of the payment arrangements are not available, the dual payment structure between Reclamation and Westlands suggests a land/water right cost agreement similar to that of the Land Retirement Program. To complicate matters, some of the amount paid by Reclamation may also reflect damage payments, and there is also no indication that Westlands paid the difference back to Reclamation, as in the Land Retirement Program purchases.[27]

  Based on similarities to the purchase arrangements under the CVPIA Land Retirement Program, described previously, we assume that the

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Program are approximately $2,400-$2,600 per acre, including the CVP water entitlement. Westlands Water District paid Reclamation $1,150 per acre to retain the water entitlement. Westlands has implemented its own program to retire land, and has recently paid $1,500 per acre. (R. May, 2001)." U.S. Bureau of Reclamation. 2001. *Preliminary Alternatives Report, San Luis Unit Drainage Feature Re-evaluation*. Available at: http://www.usbr.gov/mp/sccao/sld/docs/prelim_alt_rpt/sect06.pdf. Westlands *"was permitted to reallocate the CVP water to which the retired lands were entitled to other lands in the District, provided that they did not lie within the designated drainage-impacted region of the District…"* http://www.water.ca.gov/pubs/groundwater/land_retirement_final_report__san_joaquin_valley_drainage_implementation_program/05-landretirement.pdf

[24] More precise estimates indicate this figure as being 34,100 acres. US Bureau of Reclamation. 2006. *Final Environmental Assessment EA-06-76, Non-irrigation Covenant Exchange*. Available at: http://www.usbr.gov/mp/nepa/documentShow.cfm?Doc_ID=2348

[25] United States Department of the Interior, Fish and Wildlife Service. 2006. *Fish and Wildlife Coordination Act Report for the San Luis Drainage Feature Re-Evaluation*. Available at: http://wwwrcamnl.wr.usgs.gov/Selenium/Library_articles/san_luis_articles/USFWS_SanLuisDrainageFeatureReevaluation_Fish&Wildlife_CoordinationActReport_3-06.pdf.

[26] Westlands Water District. 2012. *Westlands Water District, Refunding Revenue Bonds, Series 2012A*. Available at: http://emma.msrb.org/EP701882-EP545283-EP946396.pdf

[27] US Bureau of Reclamation. 2002. *Statement on Settlement of Sumner Peck Ranch, Inc. V. Bureau of Reclamation. Available at:* http://www.propertyrightsresearch.org/statement_on_settlement_of_sumne.htm

$32 million Westlands paid in the Peck Settlement Agreements was predominantly for water entitlements. Per acre prices were $1,083 (or, $1,424 in 2015$), which is close to the $1,150 paid in the Land Retirement Program purchases).

Assuming that Reclamation's payment was for the land alone, and removing the estimated water right payments, total costs provide a rough estimate of a per acre settlement amount:

  - Sumner Peck/Britz: $82.3 Million (($107M Sumner Peck +$7.3M Britz land payments) - $32 M Westlands water payments)/37,106 acres (34,100 Sumner Peck + 3,006 Britz acres) acres = $2,220/acre[28] ($2,920/acre, in 2015 dollars).

- *At least 28,626 acres were retired under the Westlands Settlement Agreement* (*Sagouspe vs.Westlands Water District*). A variety of conflicting retirement and cost estimates exist for this settlement.[29] We rely primarily on information provided in Westlands' 2012 Bond Issuance files, which states that: "*Approximately 28,626 acres of land and 85,749 acre-feet of water rights at a cost of $50,185,291 has been acquired…*".[30]

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[28] A figure that is supported elsewhere: "*Though the settlement will provide the families with about $4,000 per acre…"* Sterngold, S. 2002. *Settlement raises ire of water officials / Other projects could suffer when farmers get millions for salty land.* San Francisco Chronicle. Available at: http://www.sfgate.com/news/article/Settlement-raises-ire-of-water-officials-Other-2746206.php

[29] No distinction between land and water values can be made, from the available information.

Westland's 2003-2003 Annual Report states *"… the settlement of the water priority litigation Sagouspe v. Westlands Water District resulted in the budgeting of $105 million from the issuance of debt and district reserves for land and water supply acquisition."*(Westlands Water District. 2004. *Annual Report 2002–2003.* Available at: http://www.westlandswater.org/long%5C200301%5Cannual_report_2002_2003_small.pdf). The 2012 bond issuance files also cite a figure of $108 million, but no corresponding acreage estimates.

Westlands' 2012 annual report indicates that, as of 2012, a total of 36,441 acres had been retired in this settlement (Westlands Water District. 2012. *Water Management Plan*. Available at: http://wwd.ca.gov/wp-content/uploads/2014/06/Water-Management-Plan-2012.pdf).

A 2006 estimate also placed retired acreages at 38,022 (California Water Research Associates. 2011. *Mendota: Evidence That Soil and Groundwater Salinization is the Predominant Cause of Land Fallowing*. Available at: http://www.scribd.com/doc/56909617/Mendota-Evidence-that-soil-and-groundwater-salinization-is-the-predominant-cause-of-land-fallowing#scribd) and in 2008 a separate source estimated retired acreages at around 44,000 acres (*"Separate from the USBR retirement program, Westlands Water District agreed to buy another 65,000 acres of impaired land, and reallocate the contracted water to equalize water contracts in the district. As of February 14, 2008, the district had acquired over 44,000 acres."* - Save the California Delta Alliance (STCDA). 2015. *Myths and Facts about Land Fallowing in Westlands Water District*. Available at: http://nodeltagates.com/mythsfacts/#fallow)

[30] Westlands Water District. 2012. *Westlands Water District, Refunding Revenue Bonds, Series 2012A*. Available at: http://emma.msrb.org/EP701882-EP545283-EP946396.pdf

No information is available to discern whether the prices paid in this settlement reflect the value of land, water, or both. These figures suggest a price of $1,753 per acre (assuming that this corresponds to 2002 dollars, this value inflates to $2,306/acre, in 2015$).

- *9,100 acres were retired when Westlands purchased the Broadview District.* Westlands purchased the entire Broadview District in 2004, [31] and subsequently retired the areas' croplands from production, retaining all water contracts at a total cost of $25 million dollars. This works out to approximately $2,752 per acre, or $3,440 per acre in 2015 dollars.[32] Again, no information is available to discern whether the prices paid in in the Broadview purchase reflect the value of land, water, or both.[33]

Summary

In the sections above, we summarize the available information on past land retirement programs that targeted the drainage-impaired lands in the San Luis Unit that produce toxic runoff. We estimate the number of impaired acres, the number of acres retired, and the number of remaining impaired acres. The prices paid in past retirement programs provide the best insight into the likely range of prices to retire the remaining drainage-impaired acres in the Unit.

Based on the available information for the land retirement programs listed above, we estimate that *at least* 84,132 acres have been retired in the San Luis Unit (Table 2 and Figure 4).[34] For comparison, the 2004 Re-evaluation PFR Addendum

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[31] Environmental Science Associates (ESA). 2004. *Broadview Water Contract Assignment Project*. Prepared for the US Bureau of Reclamation. Available at: http://www.swrcb.ca.gov/waterrights/water_issues/programs/hearings/dwr/docs/exbhts/cwin_2.pdf

[32] Wichelns, D., & Cone, D. 2006. A water transfer and agricultural land retirement in a drainage problem area. *Irrigation and Drainage Systems*, *20*(2-3), 225-245.

[33] To the extent that this price, as well as the price in the Westlands Settlement Agreement, includes payments for water contracts, our estimates of the buyout cost may overstate the true cost.

[34] According to Westlands' 2012 Water Management Plan (Westlands Water District. 2012. *Water Management Plan*. Available at: http://wwd.ca.gov/wp-content/uploads/2014/06/Water-Management-Plan-2012.pdf), existing retired lands in Westlands stand at a total of 88,067 assessable acres and 85,900 irrigable acres in Westlands. The District retained the water allocations for **95,811** acres.

A 2011 report (California Water Research Associates. 2011. *Mendota: Evidence That Soil and Groundwater Salinization is the Predominant Cause of Land Fallowing*. Available at: http://www.scribd.com/doc/56909617/Mendota-Evidence-that-soil-and-groundwater-salinization-is-the-predominant-cause-of-land-fallowing#scribd) estimated retired acreages, as of 2006, at **77,130** acres.

Meanwhile, a 2006 Environmental Assessment by the US Bureau of Reclamation (US Bureau of Reclamation. 2006. *Final Environmental Assessment EA-06-76, Non-irrigation Covenant Exchange*.

reported a total of 109,100 acres retired. This figure, however, may overstate the actual acres retired because the Re-evaluation analysis assumed that 65,000 acres would be retired under the Westland Settlement Agreement/Sagouspe settlement. We have not found information that confirms this assumption.[35]

Table 2. Summary of Land Retirement Acres

Land Purchase Program	Acreage Retirement Estimates
CVPIA Land Retirement Program	9,300
Sumner Peck and Britz Settlements	37,106
Westlands Settlement (Sagouspe)	28,626
Broadview	9,100
Total	**84,132**

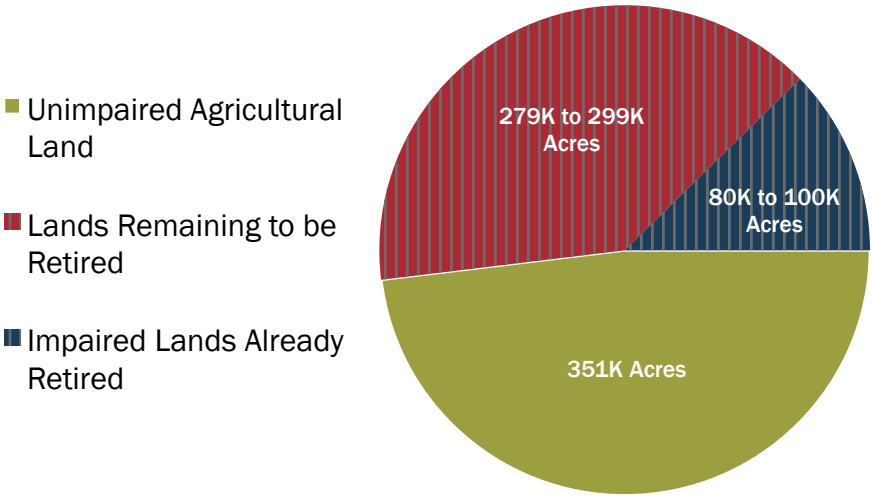
Sources: see sources cited and notes in section above

As we describe above, we estimate a total of 379,000 drainage-impaired acres in the Unit. Given the uncertainty regarding the number of acres retired, we assume a range of retired acres in our analysis: 80,000, 90,000 and 100,000 acres. Using these figures, we estimate that 279,000 to 299,000 drainage-impaired acres remain to be retired in the Unit.

Available at: http://www.usbr.gov/mp/nepa/documentShow.cfm?Doc_ID=2348) estimated Westlands' acquired land at **88,935** acres.

[35] US Bureau of Reclamation. 2004. *San Luis Drainage Feature Re-evaluation, Plan Formulation Report, Addendum*. Available at: http://www.usbr.gov/mp/sccao_new/west_sjv/sld/docs/sld_pfr_addendum/index.html_. The report states a total of 109,100 acres, but this was before retirement of the Broadview district, which retired all 9,100 acres in the Broadview District, and reapplied its water allocation to lands in Westlands.

Figure 4. Summary Land Retirement



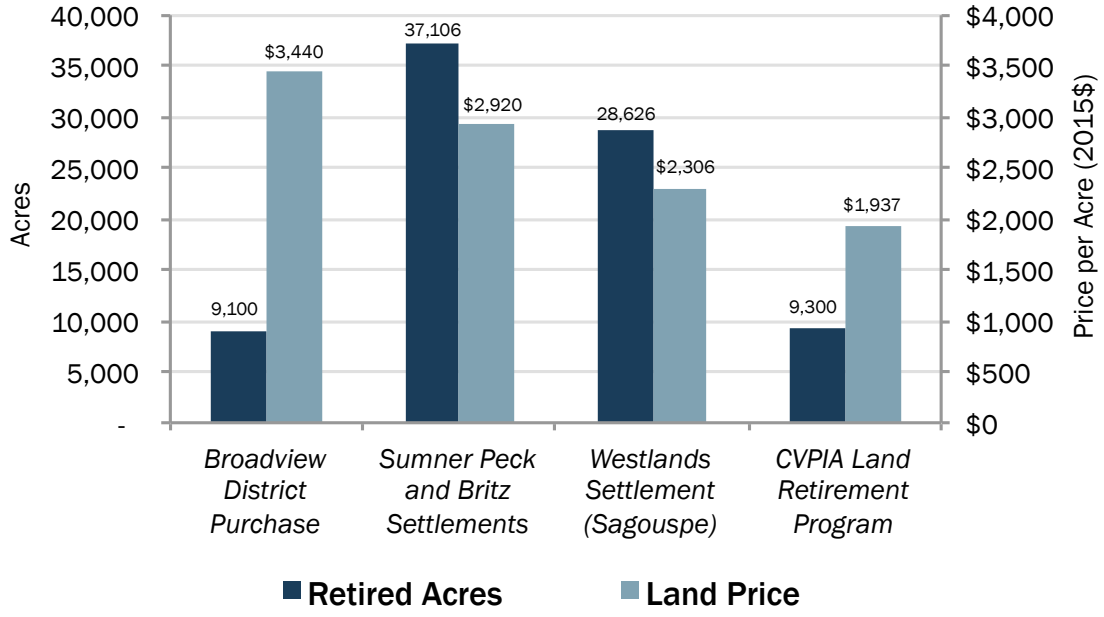
We report the per acre costs paid under previous land retirement programs and actions in the Unit in Table 3.

Table 3. Summary of Per Acre Costs from Past Land Retirement Programs

Land Purchase Program	Cost Per Acre	
	Nominal	2015$
Broadview	$2,752 *(2004$)*	$3,440
Sumner Peck and Britz Settlements	$2,220 *(2002$)*	$2,920
Westlands Settlement (Sagouspe)	$1,753 *(2002$)*	$2,306
CVPIA Land Retirement Program	$1,450 *(2001$)*	$1,937

The lowest land price we found in our review of costs is the $1,937 per acre (in 2015$) paid by Reclamation for land under the CVPIA Land Retirement Program. The highest price is the $3,440/acre (in 2015$) Westlands paid for the Broadview Water District. This range likely bounds the cost per acre for land retirement implemented in 2015. The average of these four estimates, which we apply later in our calculations, is $2,651 per acre (2015$). Prices paid under the Broadview purchase, which serves as our high-end estimate, may include the value of water; therefore, our upper estimate of the total cost of land retirement may overstate the true cost.

Figure 5. Summary of Past Land Retirement Data



Land Prices

Current prices for agricultural land provide a context for our range of estimated land-retirement costs. According to the 2014 Agricultural Census, irrigated cropland in California has an average value of $12,100 per acre, a single acre of non-irrigated land has an average value of $3,650, and pastureland (or, land that is normally grazed by livestock and which receives no water or planting) has an average value of $2,700 per acre.[36] The California Association of Farm Managers and Rural Appraisers' '2014 Trends in Agricultural Land and Lease Values', meanwhile, reported that cropland values for the west side of Fresno County are $5,000 to $8,500 per acre.

These estimates align well with our identified price ranges. The values of non-irrigated croplands and pasturelands, for example, fall within our estimated range of land retirement costs of $1,937 and $3,440 per acre. We note that prices paid in land retirement programs, especially with respect to lands that experience reduced productivity due to salt and boron poisoning, lack of water, or other drainage issues, are typically 'distress sales', in some respect, and thus do not achieve the prices observed for, say, irrigated croplands with reliable water supplies.

[36] United States Department of Agriculture, National Agricultural Statistics Service. 2014. *Land Values 2014 Summary*. Available at: http://www.nass.usda.gov/Publications/Todays_Reports/reports/land0814.pdf

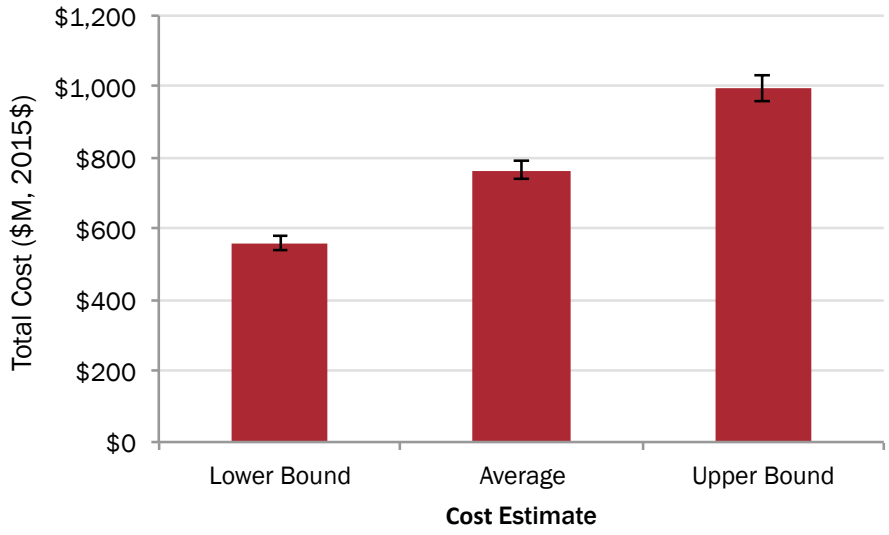
Cost Estimates of Land Retirement

Using the estimated acreage of drainage-impaired lands remaining in the San Luis Unit (279,000 to 299,000 acres) and the identified range in per-acre costs ($1,937 to $3,440 per acre), we estimate that full retirement would cost between $540 million and $1.03 billion, with an average estimate of $740 to $793 million (Table 4 and Figure 6).[37]

Table 4. Cost Estimates

Land Categories		Acreages		
Total Area of San Luis Unit		730,000	730,000	730,000
Total Drainage-impaired Lands		379,000	379,000	379,000
Lands Already Retired		-80,000	-90,000	-100,000
Lands Remaining to be Retired		299,000	289,000	279,000
Cost Range	**Land Prices**	**Total Cost Estimates** ($M, 2015$)		
Lower Bound	$1,937	$579	$560	$540
Average	$2,651	$793	$766	$740
Upper Bound	$3,440	$1,029	$994	$960

Figure 6. Cost Estimates



[37] Additional costs might be incurred to manage or restore lands that are purchased, but estimation of these factors is beyond the scope of this report, which is focused primarily on the costs associated with land acquisition. To provide an example of these sorts of secondary costs, the 1990 SJVDP report suggested that ongoing maintenance costs of retired lands would be around $170/acre/year. Other estimates have also included the costs of land restoration and program administration.