SC3 PROJECT DELIVERABLES

Santa Cruz County

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Valuation products & scales

RESOURCE CONSERVATION DISTRICT OF SANTA CRUZ COUNTY

1. Countywide "appraisal of natural systems":
   - Countywide valuation of ecosystem services and natural capital assets (benefit transfer valuation by land cover type – "ESV Report")
2. Economic assessment of land stewardship actions:
   - **Land acquisition and stewardship** – Applying benefit transfer valuation to conduct benefit-cost analysis of State Parks properties within the county
   - **Program level economic impacts** – Leveraged funds and jobs creation analysis for Santa Cruz County's Integrated Watershed Restoration Program (IWRP)
   - **Project level return on investment analysis** – Primary valuation of ecosystem services (and ROI) associated to Managed Aquifer Recharge in Pajaro Valley
   - **Synergy between built capital and natural capital** – Illustrative stories on the economic value of multi-benefit stewardship projects

Inform decisions and future investments on conservation and stewardship

Total Annual Value provided
by Santa Cruz County's natural assets

Land Cover		Area (Ac)	Low Value ($/year)	High Value ($/year)
DECIDUOUS FOREST		128.5	$495,194	$2,178,151
EVERGREEN FOREST		143,513.5	$466,139,770	$1,234,818,447
MIXED FOREST		47,951.5	$208,563,856	$539,937,280
SHRUB/SCRUB		23,742.2	$46,729,225	$52,524,955
GRASSLAND		18,609.8	$71,423,686	$152,195,394
ESTUARINE EMERGENT WETLANDS		165.9	$2,602,300	$8,375,231
PALUSTRINE EMERGENT WETLANDS		856.8	$1,827,646	$54,974,085
ESTUARINE WOODY WETLANDS		213.1	$370,097	$11,170,642
PALUSTRINE WOODY WETLANDS		1,054.9	$1,609,721	$58,075,084
PASTURE/HAY		681.3	$331,912	$7,122,612
Cultivated		15,349.7	$1,862,251	$38,633,761
Open Water	Bay	14.2	$65,632	$217,584
	Lake	351.7	$998,783	$1,168,233
	Reservoir	148.3	$702,244	$702,244
	River	88.6	$251,677	$294,376
High Intensity Developed		1,972.3	$0	$0
Low Intensity Developed		10,822.5	$0	$0
Medium Intensity Developed		9,531.0	$0	$0
Developed Open Space		9,633.7	$5,049,678	$28,520,353
Bare Land		537.7	$0	$0
Unconsolidated Shore		74.7	$0	$0
Beach		665.4	$1,978,122	$6,135,304
		286,107	**$811,001,795**	**$2,197,043,736**

$ 800 million – $2.1 billion per year

HEALTHY LANDS
HEALTHY ECONOMIES

Estimated Net Present Value (or **Asset Value**) of Santa Cruz County's natural capital over the next 100 years

$22 to $58 billion at a discount rate of 3.5%
(which treats natural capital like a short lived built capital asset)

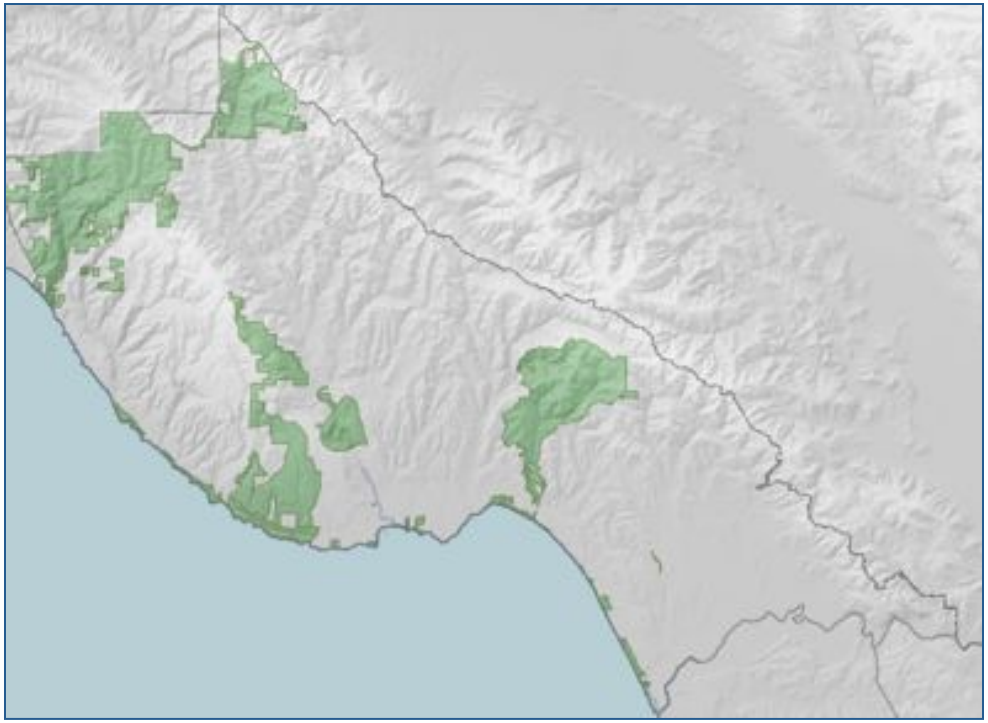
$81 to $207 billion at a discount rate of 0%
(which assumes 100 years from now people will enjoy the same level of benefits from this natural capital that we enjoy today)

***Key message**: The Asset Value of natural capital can be increased with effective conservation and stewardship.

HEALTHY LANDS
HEALTHY ECONOMIES

Land Acquisition & Stewardship

California Department of Parks & Recreation (State Parks)



14 State Parks in Santa Cruz County (45,000 acres)

- Wildlife corridors linking mountains to coastline
- Recreation and tourism destination
- Multiple Ecosystem Services

HEALTHY LANDS
HEALTHY COMMUNITIES

Benefit Cost Analysis

Ecosystem Services + Park Revenues

Divided by

Land Acquisition Costs + Operation and Maintenance Costs

→ 1906 - 2011

HEALTHY LANDS
HEALTHY COMMUNITIES

Ecosystem Services Value

(Benefit Transfer Valuation)

Step 1 – Avg of $200million annual flow of benefits (in 2012 dollars), from benefit transfer valuation

Step 2 – Estimated total value between 1906-2011: $11.7 billion (annual benefits weighted by how many of the 45,000 acres had been acquired by each given year)

Step 3 – Corrected total value, considering that some level of ecosystem services would still have been provided in absence of State Parks: **$1.2 billion**

HEALTHY LANDS
HEALTHY COMMUNITIES

Benefit Cost Analysis

	Total (1906-2011)	Data Source
Public Benefits		
Ecosystem Services	$1,171,182,753	BTV
Parks Revenue	$419,270,316	2012-2013 records
Total	**$1,590,453,069**	
Public Costs		
State Parks Land Acquisition	$153,720,885	1906-2011 records
State Parks O&M	$892,895,643	2010 records
State Parks O&M (Volunteers)	$146,703,434	2010 records
Total	**$1,193,319,962**	
BCA Ratio	**1.33**	

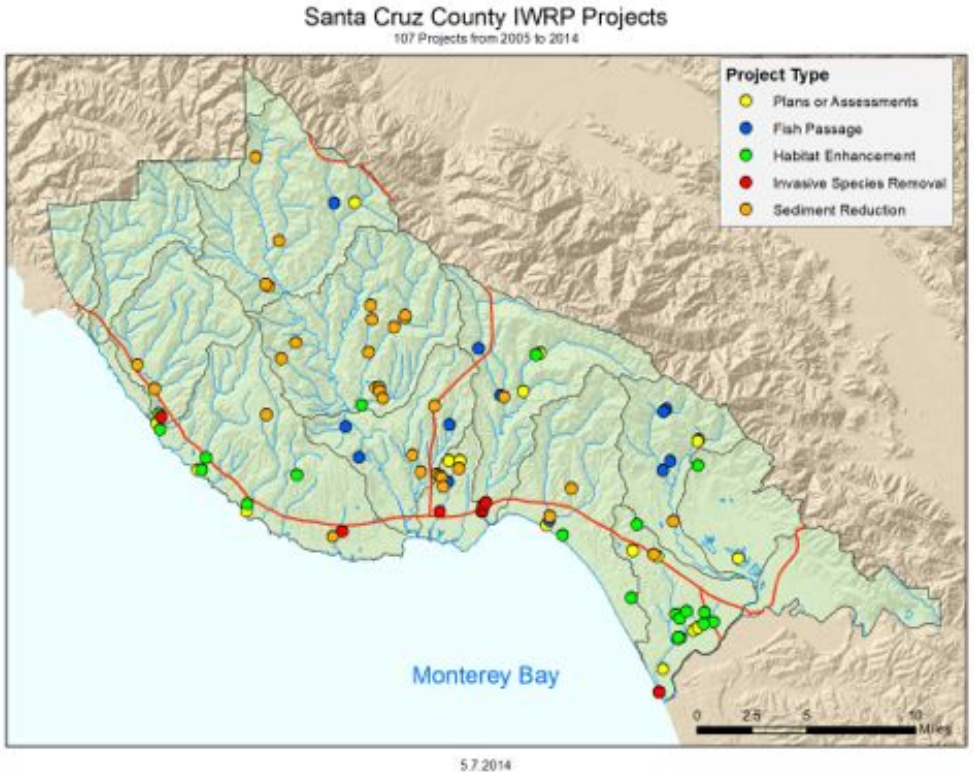
* Revenue and Costs data for "non-recorded" years was extrapolated to the 1906-2011 period by inflating to 2012 dollars and weighing annual estimates by the percentage of land acquired by each given year (compared to the current 45,000 acres)

HEALTHY LANDS
HEALTHY COMMUNITIES

Program Level: IWRP

Integrated Watershed Restoration Program

IWRP: 107 projects since 2005



IWRP economic analysis:

Leveraged funds: From an annual tax funding base of $40-50K the RCDSCC leveraged partnerships and raised **$17 million** from private and public sources for IWRP projects between 2005-2012.

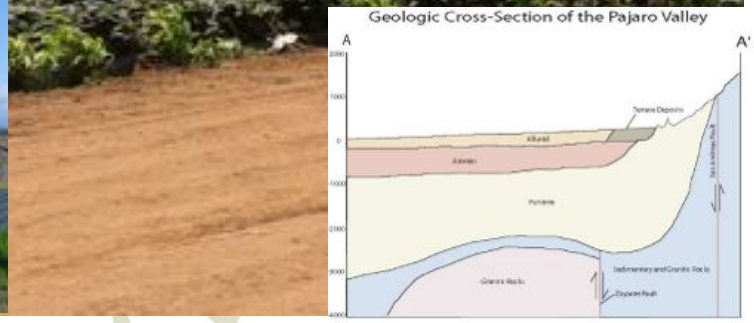
Local Economic Effects: Based on peer-reviewed job and economic multipliers, such investment resulted in a total economic impact of **$46 - $65 million** and supported **250 to 400 local jobs**.

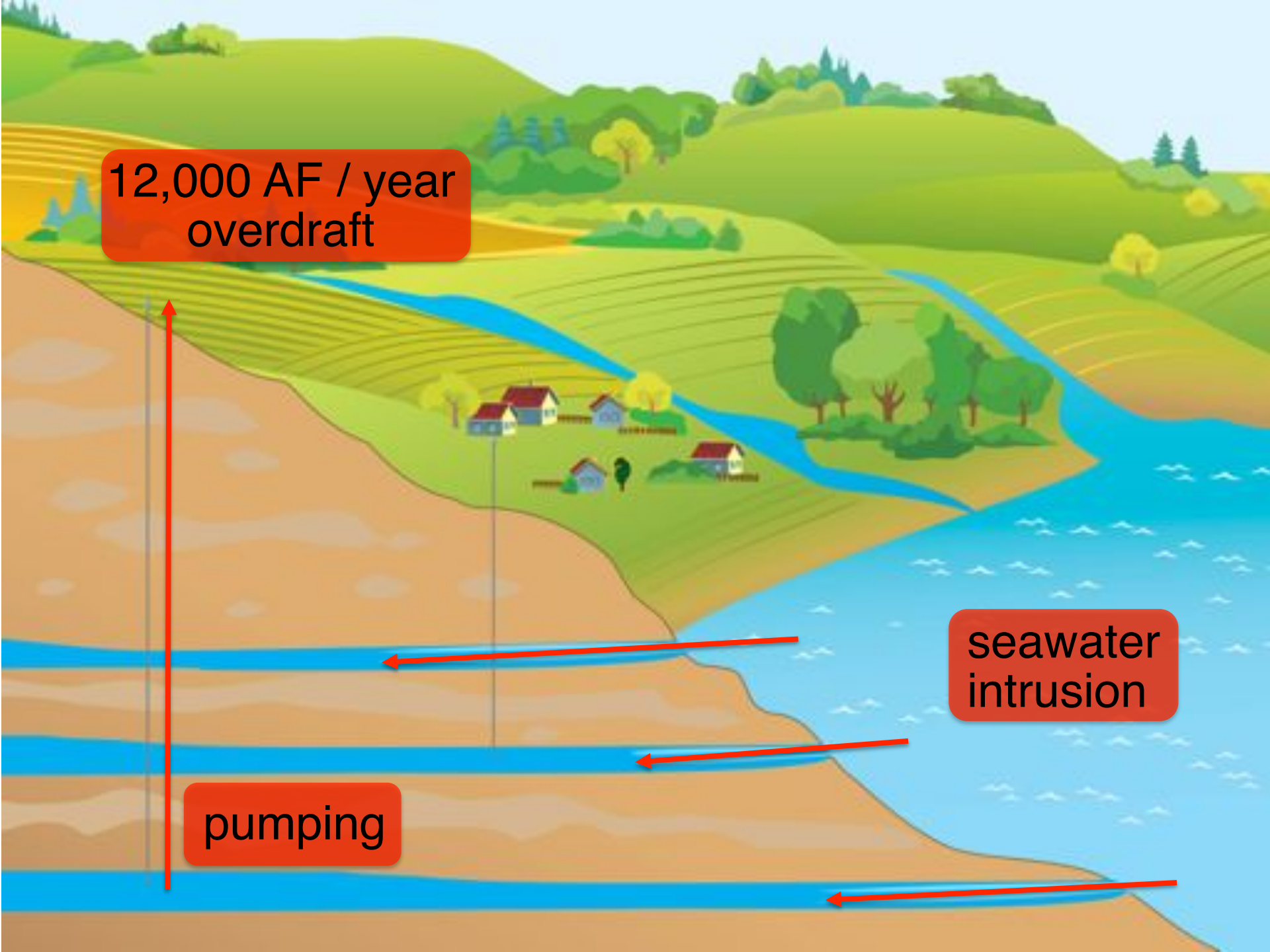
Benefit-cost: How does program cumulative benefit compare to $$ invested? (including ES)

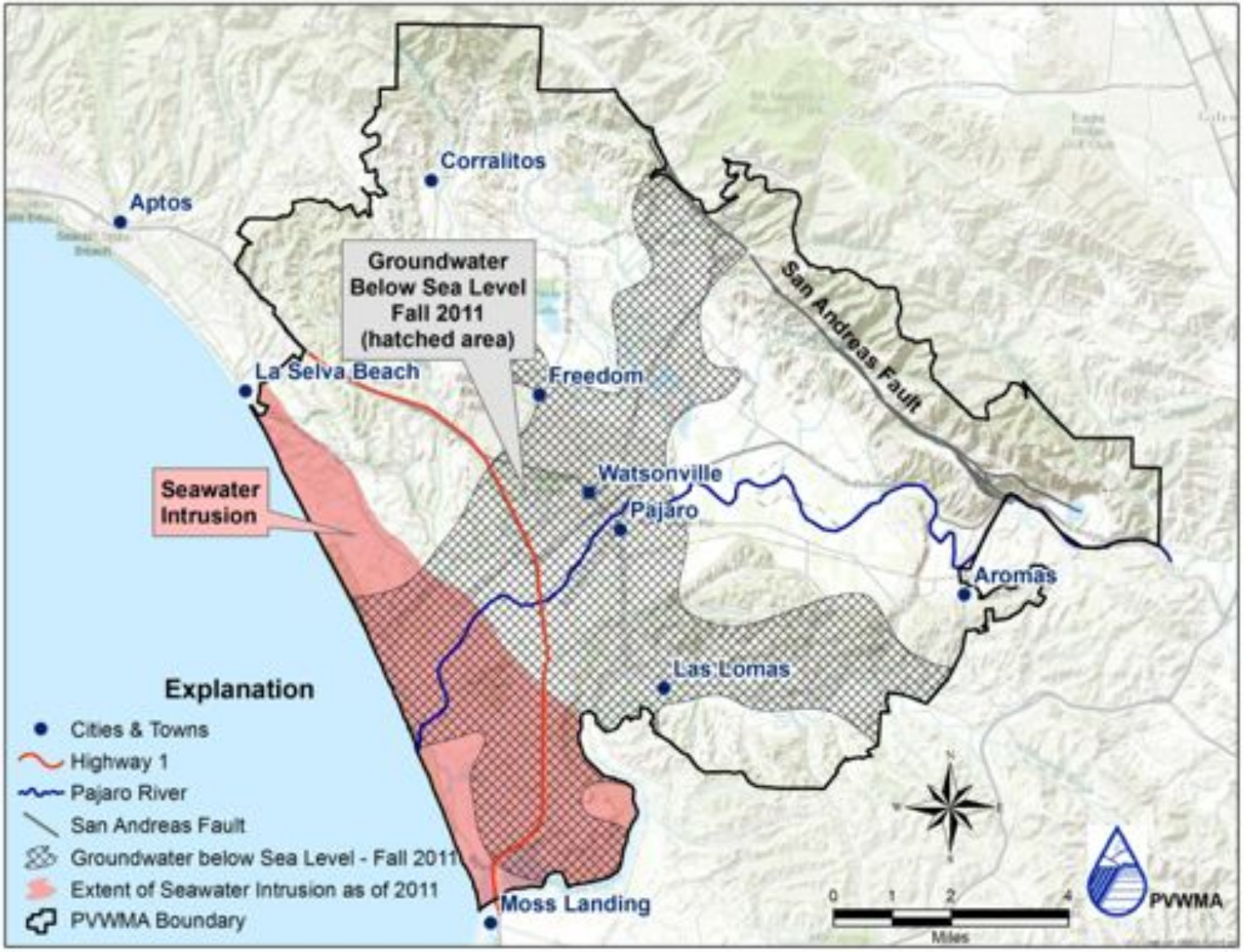
HEALTHY LANDS
HEALTHY ECONOMIES

Project Level:
Managed Aquifer Recharge (MAR)

Addressing Groundwater Overdraft in the Pajaro Valley



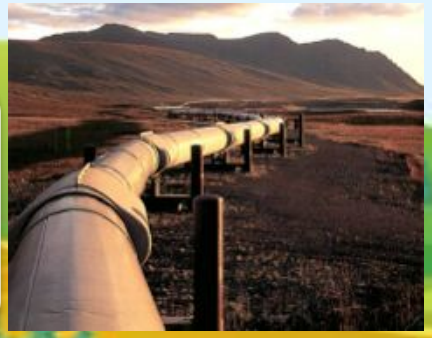

12,000 AF / year
overdraft
seawater
intrusion
pumping

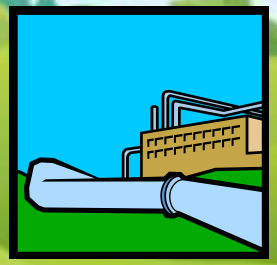


HEALTHY LANDS
HEALTHY ECONOMIES

Import Pipeline

$1,037/AF





Water Recycling Plant

$1,500/AF

Desal Plant

$3,400/AF

CONSERVATION (Management + Green Infrastructure)

$200/AF

5000 AF/yr

Table 4-1 Ranking of Screened Projects

	Project or Program	Estimated Yield, AFY	Planning Level C Estimate, $/af
D-6	Increased Recycled Water Deliveries	1,250	[1]
D-7	Conservation	5,000	$200[2]
S-22	Harkins Slough Recharge Facilities Upgrades	1,000	400
R-6	Increased Recycled Water Storage at Treatment Plant	750	700
S-2	Watsonville Slough with Recharge Basins	1,200	800
S-3	College Lake with Inland Pipeline to CDS	2,400	1,000
S-1	Murphy Crossing with Recharge Basins	500	1,400
I-1	CDS expansion	[3]	[3]
R-11	Winter Recycled Water Deep Aquifer ASR	3,200	1,500
S-11	River Conveyance of Water for Recharge at Murphy Crossing	2,000	1,500
G-3	San Benito County Groundwater Demineralization at Watsonville WWTP	3,000	2,500
S-4	Expanded College Lake, Pinto Lake, Corralitos Creek, Watsonville Slough, and Aquifer Storage and Recovery	2,000	2,900
SEA-1	Seawater Desalination	7,500	3,400
S-5	Bolsa de San Cayetano with Pajaro River Diversion	3,500	3,500

Key:
Green = Could be implemented within the first 10 years of the BMP (by 2025)
Orange = Could be implemented after 2025
Bold = Seven projects included in BMP portfolio
Not bold = Seven projects potentially added in the future if needed

Footnotes:
1. No cost is associated with increased recycled water deliveries.
2. Cost does not include 3- to 5-year program cost of approximately $250,000-300,000 annually.
3. The estimated capital cost of CDS expansion is $13 millions. Since the project conveys water from other projects, it does not have a yield.

10 other alternatives in Basin Management Plan

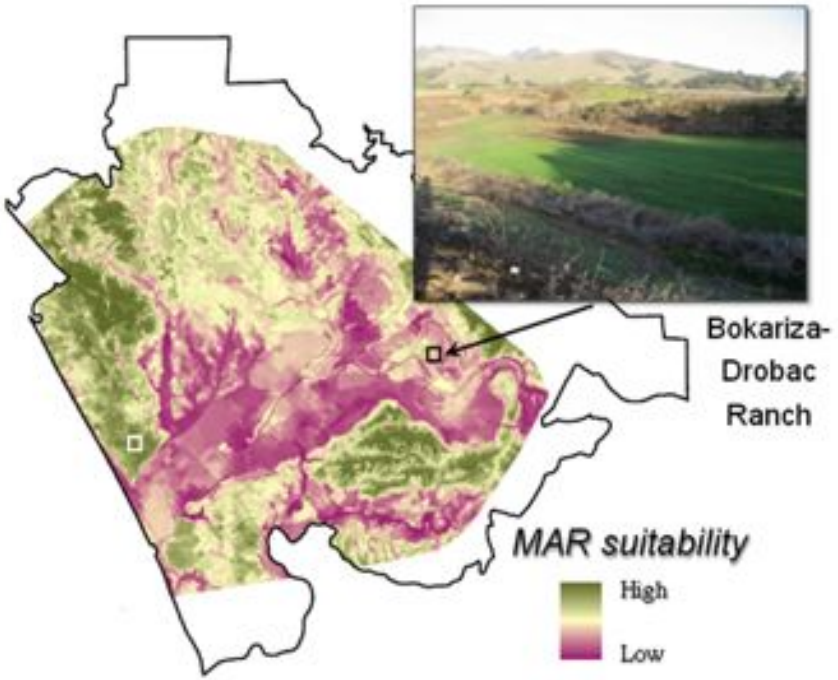
Avg $1,781/AF

Community Water Dialogue

Stakeholder-driven collaboration / Portfolio of multi-benefit conservation projects to address aquifer overdraft in the Pajaro Valley

Wireless Irrigation Network

Managed Aquifer Recharge

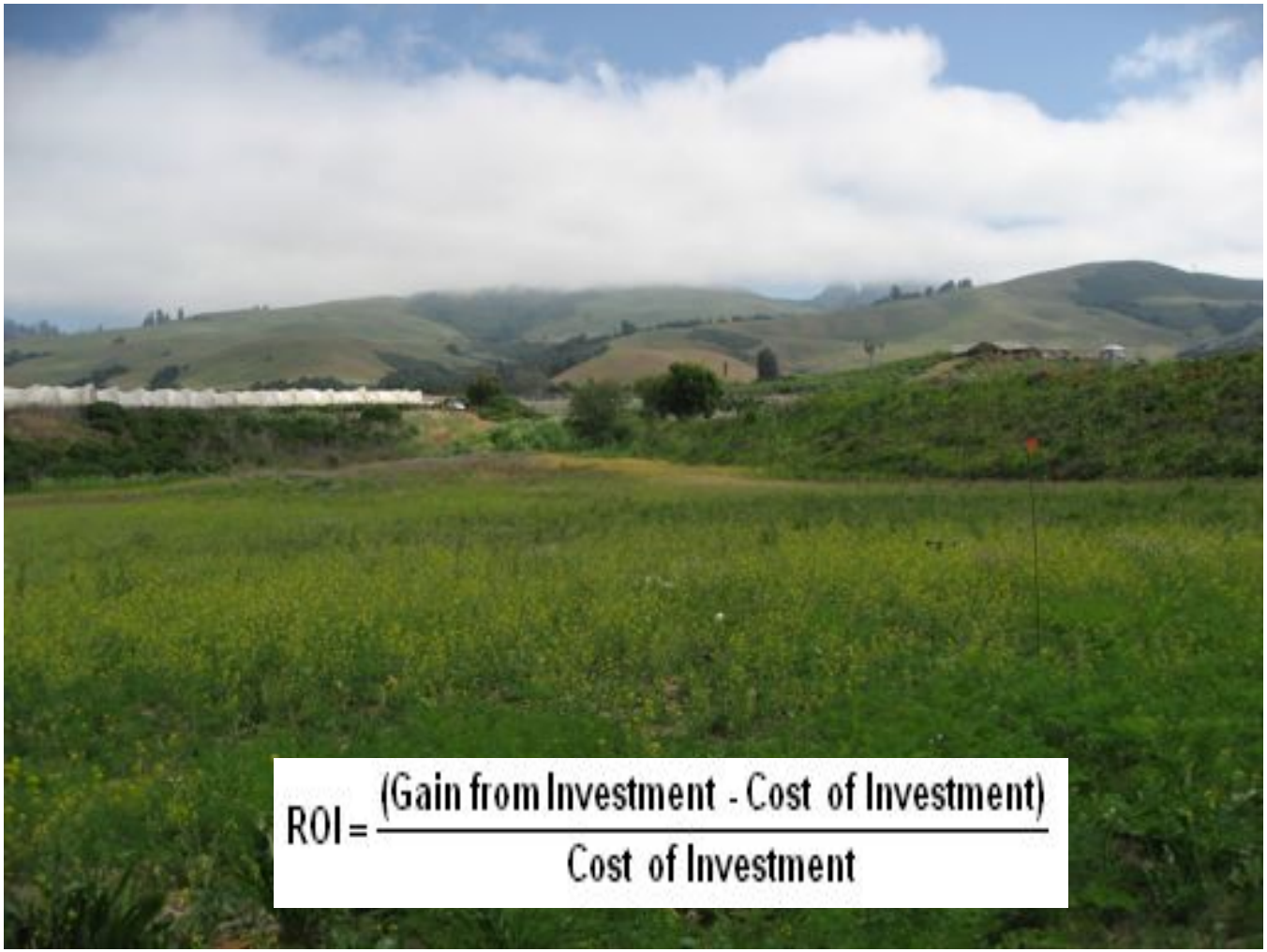


(Grey & Green infrastructure synergy)

HEALTHY LANDS
HEALTHY ECONOMIES

Return on Investment (ROI) analysis

Bokariza-Drobac MAR site



HEALTHY LANDS
HEALTHY ECONOMIES

Photo Credit: Andy Fisher

120 acres drain into 2 acres

HEALTHY LANDS
HEALTHY ECONOMIES

HEALTHY LANDS
HEALTHY ECONOMIES

Photo Credit: Andy Fisher

HEALTHY LANDS
HEALTHY ECONOMIES

Photo Credit: Emily Paddock

Bokariza MAR project ROI

Ecosystem Service Benefit Values:

Ecosystem Services	Market Proxy	Valuation Method	Calculation	Range of Values Per Yr
Water supply (quantity)	Cost of alternative water sources based on PVWMA BMP 2000 alternatives	Replacement cost	$551 per AF x 90 AFY = $49,590 (2015-2025) and $2,023 per AF x 90 AFY = $182,070 (2025-2040)	Min $49,590 Max $182,070
	Water as input to strawberry production	Input Factor Income	45ac x $50,000 = $2,250,000	Max $2,250,000
Water quality	Saltwater intrusion prevention through recharge, priced at cost of desalination based on PVWMA's BMP	Avoided cost	$3,400 per AF x 90 AFY = $306,000	$306,000
	Biological denitrification treatment costs (least expensive option)	Replacement cost	$439 x 90acft = $39,510	$39,510
Flood control	Costs of road protection against soil erosion based on a California study (Rein 1999)	Benefit transfer	Between $204 -$1393/ ac/yr if we assume 2ac = $408 to $2786	Min $408 - Max $2786
Recreation	Wetland values in California from primary studies based on recreation	Benefit transfer	$177 x 2= 354 or $1,500 x2= $3,000	Min $354 - Max $3000
Habitat	Wetland Reserve Program as implemented under USDA Natural Resource Conservation Service (NRCS)	Direct Market Price	$24,000 / 25 years = $960/year	$960

Bokariza MAR project ROI

Summary of Project Costs:

Type of cost	Market proxy	Per year
Opportunity cost of not producing in recharge area	2 acres of strawberry at $50,000/acre	$100,000
Fixed Costs: Infrastructure and staff, permit coordination	Total since 2010 = $70,000	$70,000 / 15 years of operation = $4,600
Maintenance cost	Assumption per year	$5,000

Bokariza MAR project ROI

All benefit values averaged 15yr horizon:

Benefits	Value per yr	Costs	Value per yr
Average value of water supply	$ 1,149,795	Opportunity cost of strawberry production	$ 100,000
Average value of flood control	$ 1,597	Fixed costs distributed over 15 years	$ 4,600
Average value of recreation	$ 1,677	Maintenance costs	$ 5,000
Average value of habitat	$ 960		
Total	**$ 1,154,029**	**Total**	**$ 109,600**
		ROI	**953 %**

Low benefit values only (conservative) 25yr horizon:

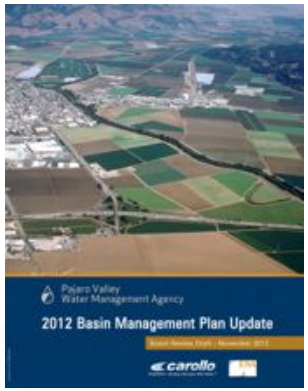
Benefits	Value per yr	Costs	Value per yr
Average value of water supply 90 acft per yr until 2040	$ 129,096	Opportunity cost of strawberry production	$ 100,000
Average value of flood control	$ 408	Fixed costs with a life of 25 years	$ 2,800
Average value of recreation	$ 354	Maintenance costs	$ 5,000
Average value of habitat	$ 960		
Total	**$130,818**	**Total**	**$107,800**
		ROI	**21 %**

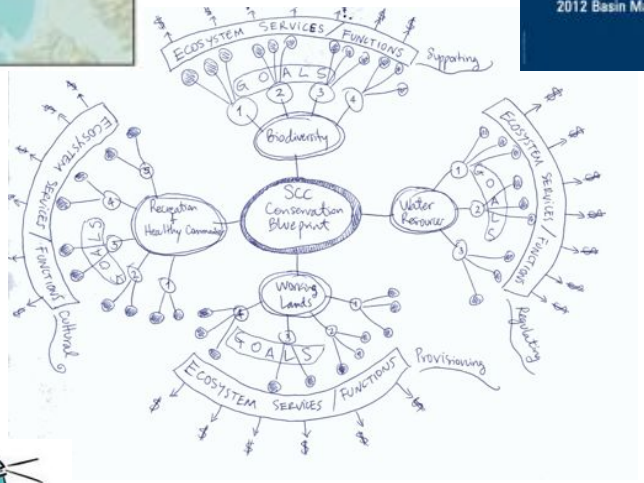
HEALTHY LANDS
HEALTHY ECONOMIES

Practical Applications

- **Inform Benefit-Cost Analysis (BCA)**
  - Flood hazard mitigation in Pajaro Valley (FEMA funds)
  - STARS rating system (triple bottom line)
- **Inform environmental impact statements**
  - Site/project specific CEQA, NEPA
- **Estimate rates of return on investment in conservation**
  - Managed Aquifer Recharge
  - Conservation Easements
  - Watershed Restoration
  - Multi-benefit stewardship of working lands
- **Define scale of investment**
  - Quantify and communicate local economic impact of conservation and stewardship actions
  - Identify and develop funding and investment mechanisms
  - Support public funding measure for collaborative stewardship of natural assets in Santa Cruz County

Next step: place Ecosystem Service Values in the context of local stakeholder processes and plans





CITY OF SANTA CRUZ
Water Department

SOQUEL CREEK WATER DISTRICT

HEALTHY LANDS
HEALTHY ECONOMIES

SONOMA COUNTY
AGRICULTURAL PRESERVATION
AND OPEN SPACE DISTRICT

Coastal Conservancy

RESOURCE
CONSERVATION DISTRICT
OF SANTA CRUZ COUNTY

Thank You!

GORDON AND BETTY
MOORE
FOUNDATION

Santa Clara County
Open Space Authority

EARTH
ECONOMICS

HEALTHY LANDS
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