Sediment Basins

On site practices for protecting surface water can include modifying small areas of a field so drainage water from irrigations or storms passes through specially designed structures. These structures can assist in removal of sediment and farm inputs.

Sediment Basin Description

The most commonly used drainage management structure in the Central Valley is the sediment pond or silt basin. Sediment basins are typically simple in design and maintenance. Sediment basins used in agriculture reduce erosion and improve water quality by trapping water, sediment and potential pollutants. They can be effective to manage runoff from both winter storms and irrigation.

Sediment basins are located at the end of tail water ditches and collect drainage water, allowing time for sediment in the runoff to settle out. The runoff flows through the basin at a low velocity so sediment drops to the bottom of the pond. Water releases slowly through soil infiltration or a pipe outlet, improving the quality of the water leaving the basin.

Sediment basins are most effective when used in conjunction with other field-level erosion control practices, such as irrigation scheduling, use of polyacrylamide (PAM), vegetated filter strips or vegetated ditches/swales. Use of these practices can also reduce the costs of maintaining the sediment basin.

Sediment basins can be very cost-effective because they can be easily constructed with farm machinery and are efficient for most soil types. Sediment basins can also be used in conjunction with tailwater recovery systems.

Advantages

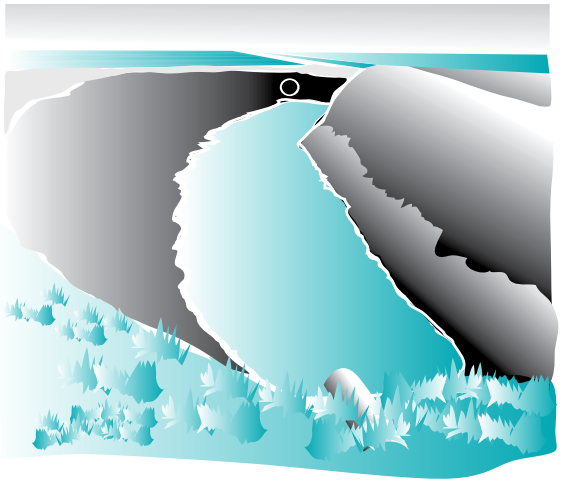
- Reduces sediment leaving property
- Enhances downstream water quality
- Possible pollution reduction
- Can provide near complete off-farm sediment control

Disadvantages

- Requires frequent clean out
- Sediment mounds must be spread on fields
- Loss of farmable acres
- To handle large quantities of off-farm sediment, basins can be expensive to install and maintain

*Design and Construction**

Sediment basins should be long and narrow so that sediment carried in the water has sufficient time to settle out before the tail water passes through. The length-to-width ratio can vary, but optimum settling can be achieved when the length is about three to four times greater than the width. Generally, the embankment should have a minimum top width of 4 feet and side slopes of 2:1 or flatter. The embankment top and edge can be planted with vegetation (annual, non-native perennial or native perennial grasses) to help prevent sloughing and erosion. The outlet should be lower than the inlet structure/inflow level of the basin. Outlet structures can be flashboard riser type to allow for ponding and outflow control.



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SEDIMENT BASINS Central Valley Installation and Maintenance Costs

Sediment basins should be designed to store at least one year's accumulation of sediment. Natural Resource Conservation Service (NRCS) technicians can assist in computing sediment yield. A drying area is needed so sediment can dry after it is removed. Dredged sediment can be used to increase the bank height and therefore the capacity of the basin, or can be spread on adjacent farmland.

*The USDA Natural Resource Conservation Service National Practice Standard 350 addresses the general design and installation of sediment basins. Local NRCS technical advisors can provide site-specific specifications.

Maintenance

Maintenance costs are directly proportional to the field size and sediment yield. Reducing sediment yield before it enters the pond will reduce the cost significantly. It is recommended that other sediment management practices be installed in conjunction with a sediment basin. The construction cost is a one-time cost: maintenance is a continuous cost to keep the sediment basin operating properly.

For best operation, sediment basins and structural components should be inspected regularly and restored as needed. Maintenance activities include removal of collected sediment, repair of rodent holes, vehicular traffic, seepage, erosion, or woody vegetation. Drainage outlets should be periodically checked for clogging and/or pipe damage.

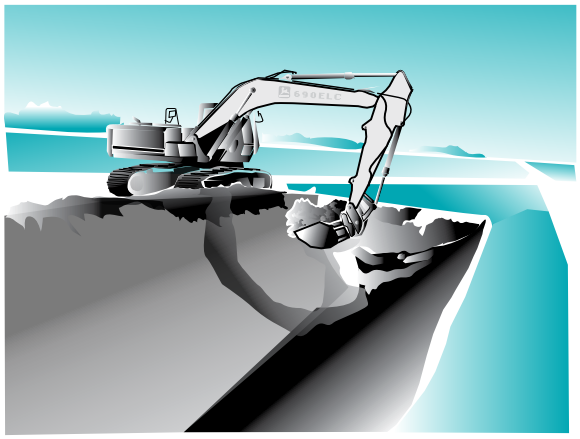
Below are cost estimates for hiring a subcontractor to install and maintain sediment basins in 2005:

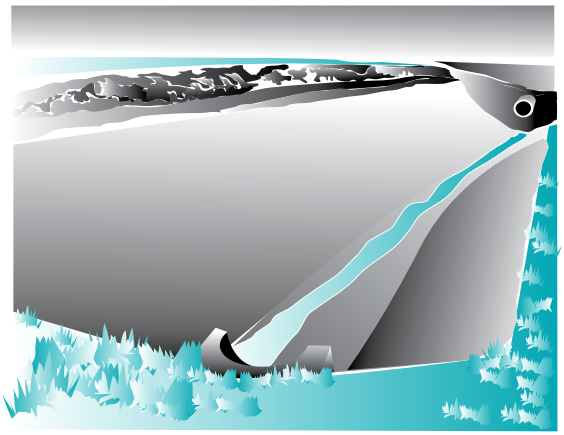
Central Valley Construction/Maintenance Costs

Costs for Contractor-Installed Sediment Basin; 2005 estimate

Item	***Costs**** 30' x 200'	30' x 400'
Installation	$2,675	$3,175
Annual maintenance (silt removal)	$ 925	$1,375

*Including $175 equipment transport





Example Construction/Maintenance Costs (Based on Central Coast study)

Sediment Basins Non-Engineered Water/Sediment Control Basin (237 Cubic Yards) – Partial Budget – Central Coast – 2003

COSTS PER UNIT*	ESTIMATED COSTS		
Installation (Year 1)	LOW	REP**	HIGH
Layout & Mark Site	$41	$41	$41
Clear Site	$9	$9	$9
Excavate & Compact Basins	$220	$440	$880
Install Pipes, Couplers, Riser	$1,065	$1,431	$2,055
Channel/Check Water-Sandbags	$0	$57	$154
Plant Cover at Installation	$0	$45	$77
(1a) Installation – Subtotal	*$1,335*	*$2,023*	*$3,216*
Annual Operation & Maint. (Years 2-5):			
Remove & Redistribute Sediment	$330	$1,320	$2,310
Mow Basin Perimeter	$0	$12	$54
Spot Spray-Herbicide	$9	$13	$31
Plant Annual Cover	$0	$45	$77
Channel/Check Water-Sandbags	$0	$57	$154
(1b) Ann. Oper. & Maint. Costs – Subtotal	**$339**	**$1,447**	**$2,626**
Interest on Operating Capital @ 7.4%	$9	$21	$35
(1c) Costs – Subtotal	*$1,683*	*$3,491*	*$5,877*

POTENTIAL BENEFITS			
ADDITIONAL RETURNS PER UNIT	LOW	REP	HIGH
None	$0	$0	$0
(5) Additional Returns – Subtotal	*$0*	*$0*	*$0*

REDUCED RETURNS PER UNIT	LOW	REP	HIGH
Strawberry Acreage Removed (.1 Ac)	$15	$570	$1,125
(2) Reduced Returns – Subtotal	*$15*	*$570*	*$1,125*

REDUCED COSTS PER UNIT	LOW	REP	HIGH
Labor & Equip. Use for Prevention & Repairs	$0	$650	$1,950
(6) Reduced Costs – Subtotal	$0	$650	$1,950

COSTS & REDUCED RETURNS	LOW	REP	HIGH
(3) Totals Per Unit Year 1 (1c+2)	*$1,698*	*$4,061*	*$7,002*
(4) Totals Per Unit Per Year – Years 2-5 (1b+2)	*$354*	*$2,017*	*$3,751*

ADD. RETURNS & REDUCED COSTS	LOW	REP	HIGH
(7) Totals Per Unit Year 1 (5+6)	*$0*	*$650*	*$1,950*
(8) Totals Per Unit Per Year – Years 2-5 (5+6)	*$0*	*$650*	*$1,950*

NET CHANGE IN INCOME PER UNIT (Basin = 237 cubic yards) YEAR 1 (7-3)	-$1,698	-$3,411	-$5,052
NET CHANGE IN INCOME PER UNIT (Basin = 237 cubic yards) PER YEAR – YEARS 2-5 (8-4)	-$354	-$1,367	-$1,801
NET CHANGE IN INCOME PER CUBIC YARD YEAR 1	-$7	-$14	-$21
NET CHANGE IN INCOME PER CUBIC YARD YEARS 2-5	-$1	-$6	-$8

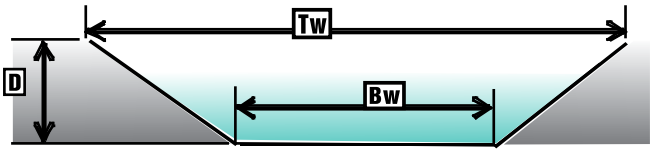
*Unit = Basin = 237 cubic yards; 1,600 square foot area with a 4 foot depth.
**Rep = Representative Cost.

Excel Spreadsheet for Tailwater Pond Design

Notes	Please Fill in the information Below:		
1	Total size of the fields that will drain into the pond	205	(acres)
2	Typical annual applied water	4	(af/acre)
3	Typical turnout delivery	7	(cubic feet per second)
4	Typical number of irrigations per season	10	
* 5	Tailwater Fraction	25%	(% of Applied Water)
* 6	Pond Hold Time	12	(hours)
* 7	Operating Depth (D)	5	(feet)
* 8	Length / Width	1	(1 will provide a square pond)

* Assumptions (Typical values: adjust to fit specific field conditions)

Use the Excel spreadsheet in the CD below to calculate the size of tailwater pond to fit your field. The example below shows the information needed and the design parameters it will produce.



Calculation accounts for drained acreage, applied water rate and amount of suspended solids

Pond Dimensions	
Top Width (Tw)	131 (feet)
Bottom Width (Bw)	116 (feet)
Length (L)	131 (feet)
Depth (D)	5 (feet)
Total Volume	1.8 (acre feet)
Expected Annual Sediment Volume	155 (cubic yards)

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