

# Estimating Returns from RIOS Portfolios

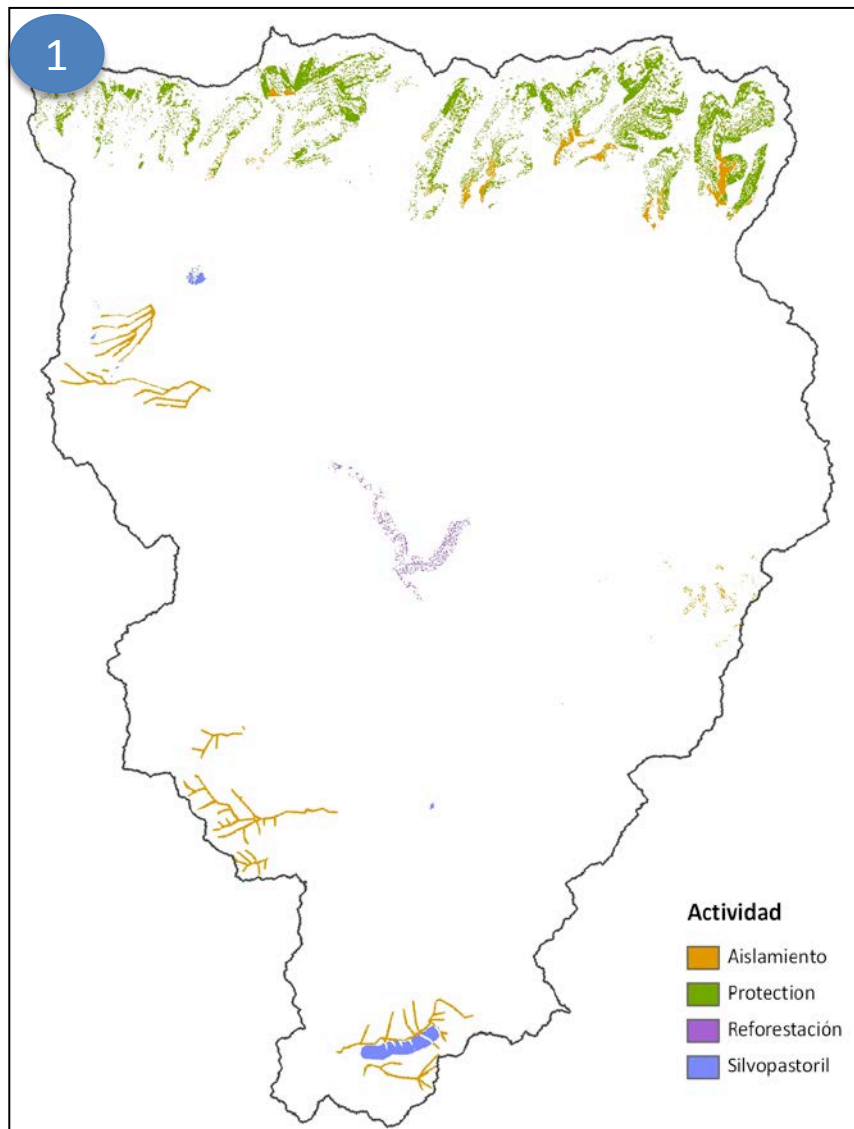
Water Fund Prioritization Tool Technical  
Workshop

1 – 3 August, 2012

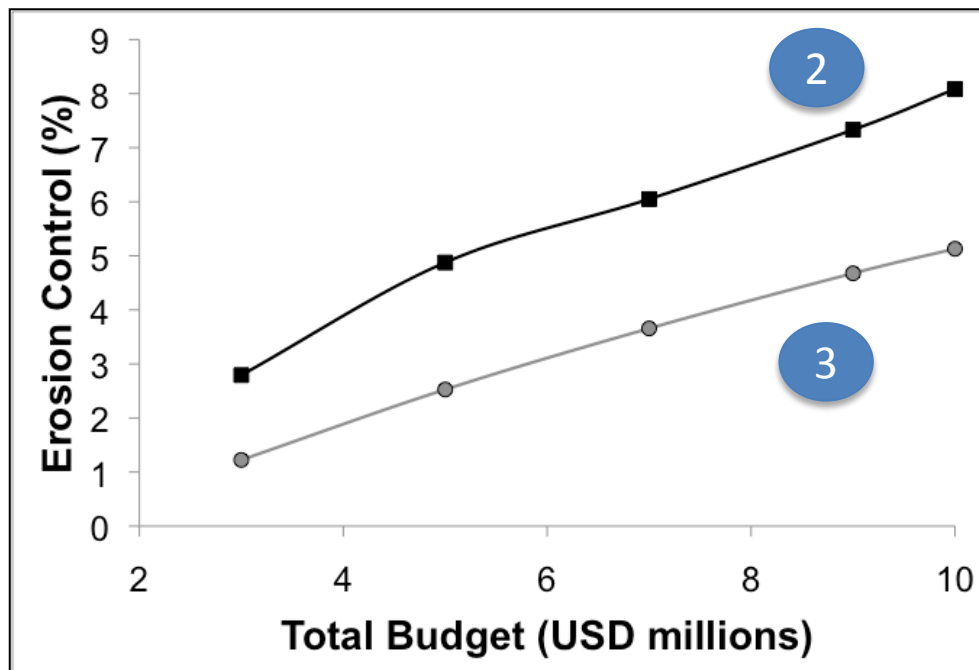
Lima Peru



# The Birth of the RIOS (Resource Investment Optimization System) Tool



- 1 Investment Portfolio  
(Objectives, Activities, Budget, Diagnostic Screen, Priority Areas)
- 2 Estimated Return on Investment  
(Estimate Returns)
- 3 Estimated Value of Science  
(Business case for approach)





## Portfolio Selection (Ranking Models)

### Choose Objectives

Negotiate

### Choose Activities

Experience

### Allocate Budget

Experience

### Diagnostic Screen

Ranking Models

### Select Priority Areas

ROI

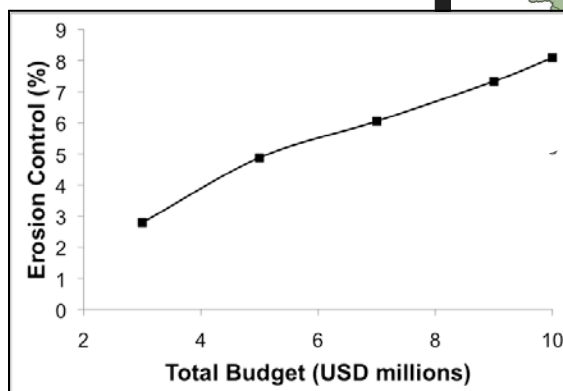
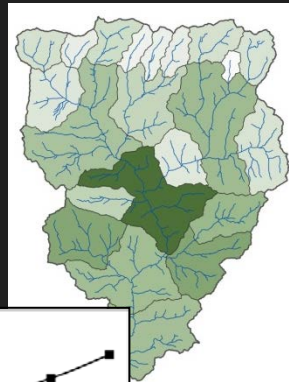


Forest  
Pasture  
Agriculture crop

## Estimate Returns

Models

DIFFERENCE







# InVEST Tier 1 Tools

## RIOS TOOL

### 2 Objectives:

Erosion Control for Drinking Water Quality  
Erosion Control for Reservoir Maintenance

## PLANNED

Phosphorus Retention for Drinking Water Quality  
Nitrogen Retention for Drinking Water Quality  
Flood Mitigation  
Groundwater Recharge (karst)

## DISCUSSED

Groundwater Recharge  
Bacteria Retention for Drinking Water Quality

RIOS:Sediment Retention

✓ Select workspace	C:\Program Files (x86)\rios_0_3_0_2012-07-30_15_23_2
✓ DEM raster	C:/GIS/WaterFunds/Lima/General/EXT_dem/extract_dem
✓ LULC from RIOS run	C:/GIS/WaterFunds/Lima/General/Iso_class_index_RECLAS
✓ Erosivity raster	C:/GIS/WaterFunds/Lima/Sediment/imf_erosivity1.tif
✓ Erodibility raster	C:/GIS/WaterFunds/Lima/Sediment/soil_erodibility.tif
✓ Watersheds shapefile	C:/GIS/WaterFunds/Lima/cuencas.shp
✓ Sediment Value Table	C:/GIS/WaterFunds/Lima/Sediment/sed_value_sample_table_lima.csv
✓ Threshold Flow Accumulation	2000
✓ Slope Threshold	5

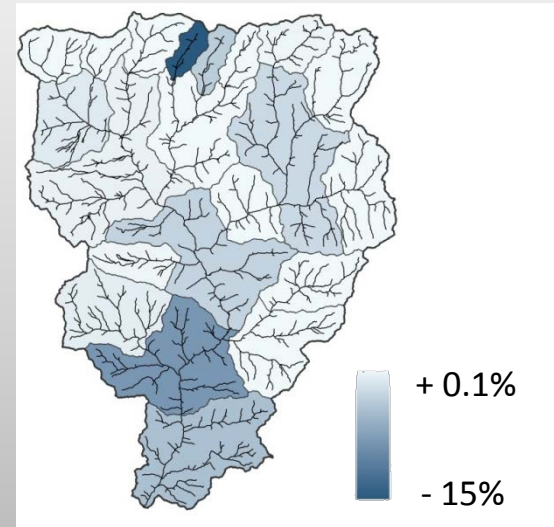
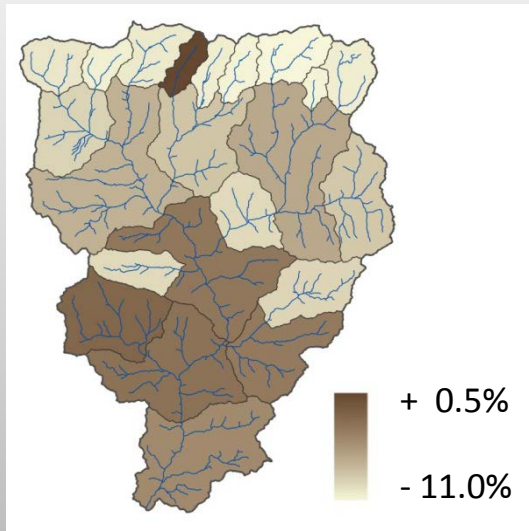
Parameters reset to defaults.

Reset Run Quit



# Outputs - Estimation of Returns

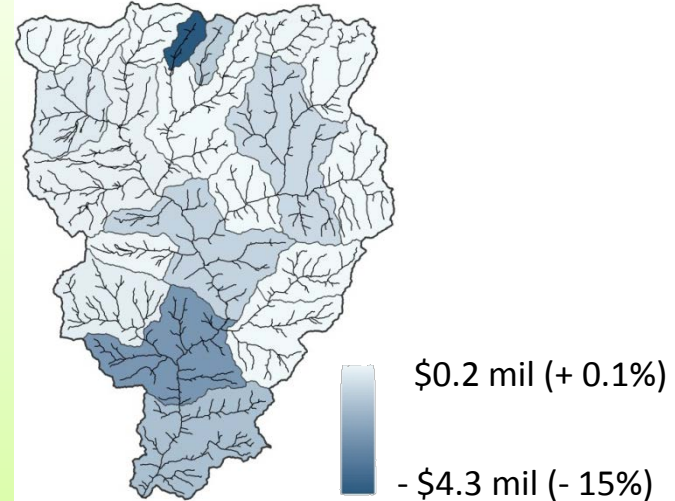
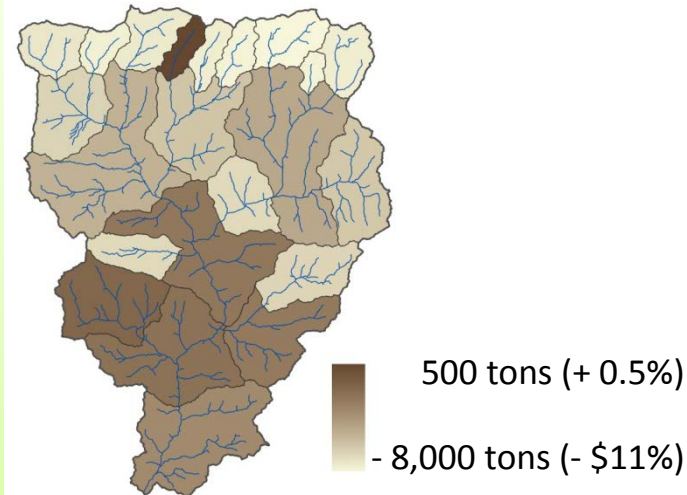
NO CALIBRATION



CHANGE IN SEDIMENT EXPORT

CHANGE IN VALUE – AVOIDED TREATMENT COST

WITH CALIBRATION

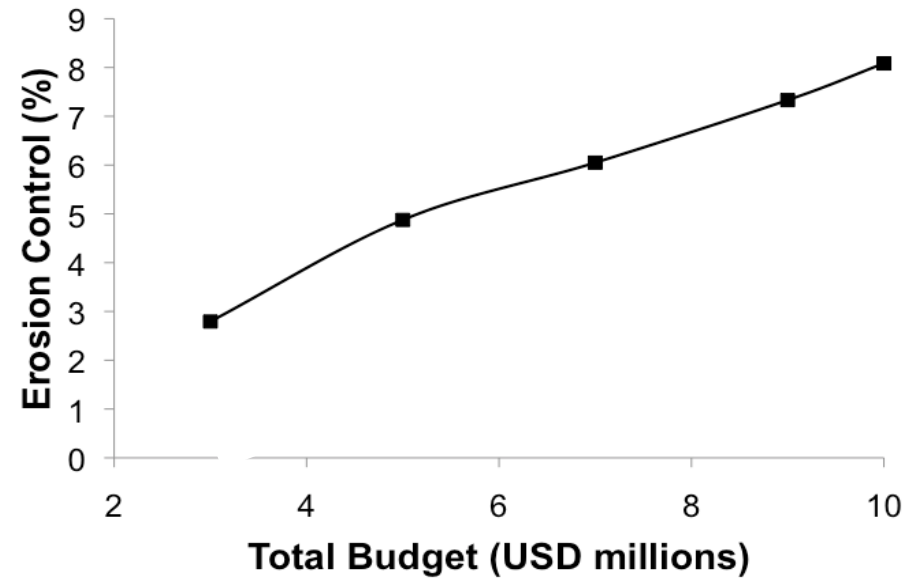




# Outputs - Estimation of Returns

NO CALIBRATION

Sub-basin	Sediment Exp		Value (change in treatment cost)		Bene-ficiaries
	$\Delta$	% $\Delta$	$\Delta$	% $\Delta$	TTL
1		0.5 %		0.1 %	5,341
2		- 17 %		- 14 %	10,700
3		- 5 %		- 6 %	12,550
ALL		- 9 %		- 11 %	240,300



WITH CALIBRATION

Sub-basin	Sediment Exp		Value (change in treatment cost)		Bene-ficiaries
	$\Delta$	% $\Delta$	$\Delta$	% $\Delta$	TTL
1	495	0.5 %	\$0.2 mil	0.1 %	5,341
2	-7,998	- 17 %	- \$4.3 mil	- 14.5 %	10,700
3	-2,123	- 5 %	- \$0.9 mil	- 6.2 %	12,550
ALL	-1,375	- 9 %	- \$13 mil	- 11 %	240,300



## Portfolio Selection (Ranking Models)

### Choose Objectives

Negotiate

### Choose Activities

Experience

### Allocate Budget

Experience

### Diagnostic Screen

Ranking Models

### Select Priority Areas

ROI

Investment  
Portfolio



Portfolio land  
cover

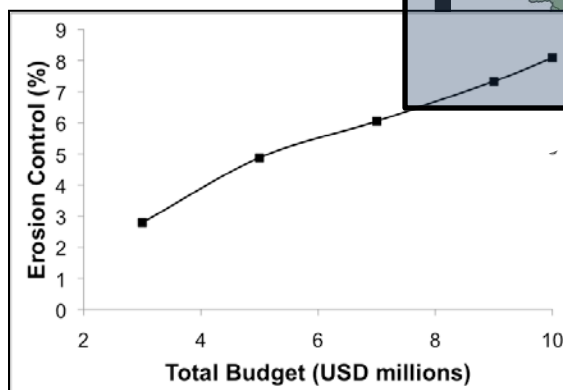
Base land  
cover

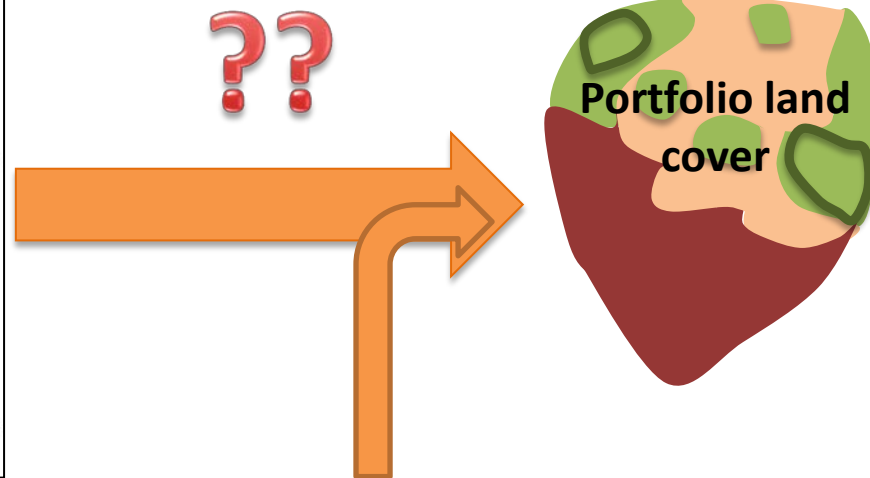
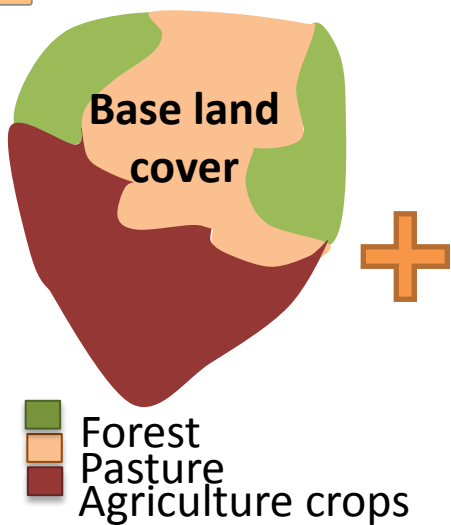
Forest  
Pasture  
Agriculture crop

## Estimate Returns

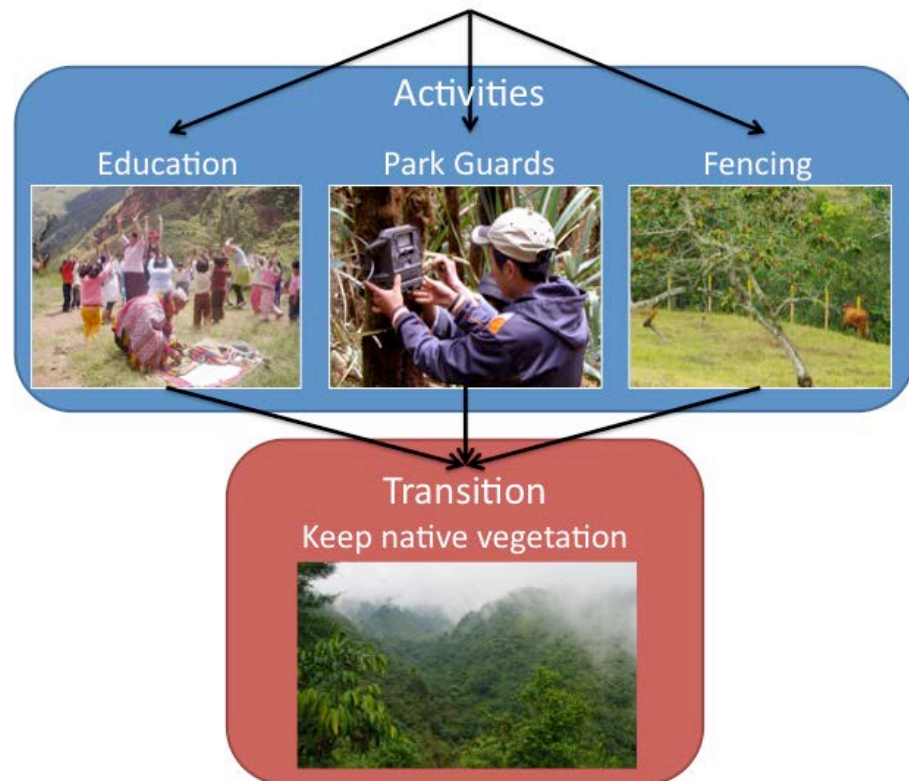
Models

DIFFERENCE





Water Fund Investments





# Options

## **100% Transition**

All activities result in complete transition to target land cover

- Non-informative
- Makes no distinction between starting points for ability to achieve the transition (i.e. restoration from bare ground to forest = restoration from pasture to forest)

## **100% Dependency**

Ending land cover is defined by starting land cover, ending land cover, and transition/activity combination

- Adds huge burden on developers and users to define new land covers and model parameters for all possible combinations of transitions, starting and ending LULC

# Options

## 100% Transition

All activities result in complete transition to target land cover

## Compromise

**Estimation of returns** –  
Estimate model parameters only for transitions chosen by portfolio, based on general rules & linear interpolation

## 100% Dependency

Ending land cover is defined by starting land cover, ending land cover, and transition/activity combination

# Options

## 100% Transition

All activities result in complete transition to target land cover

## Compromise

Estimation of returns –  
Estimate model parameters only for transitions chosen by

## 100% Dependency

Ending land cover is defined by starting land cover, ending land cover, and transition/activity combination

LULC base - target	Export	Retention
Pasture	0.8	0.3
Forest	0.2	0.9
Pasture – forest (assisted)	???	???
Pasture – forest (un-assisted)	???	???
Pasture – paramo (assisted)	???	???
Pasture – paramo (un-assisted)	???	???

# 3 major types of transitions

## Estimate returns

Protection:  
Estimate avoided  
conversion; users  
specify likely  
transition LULC

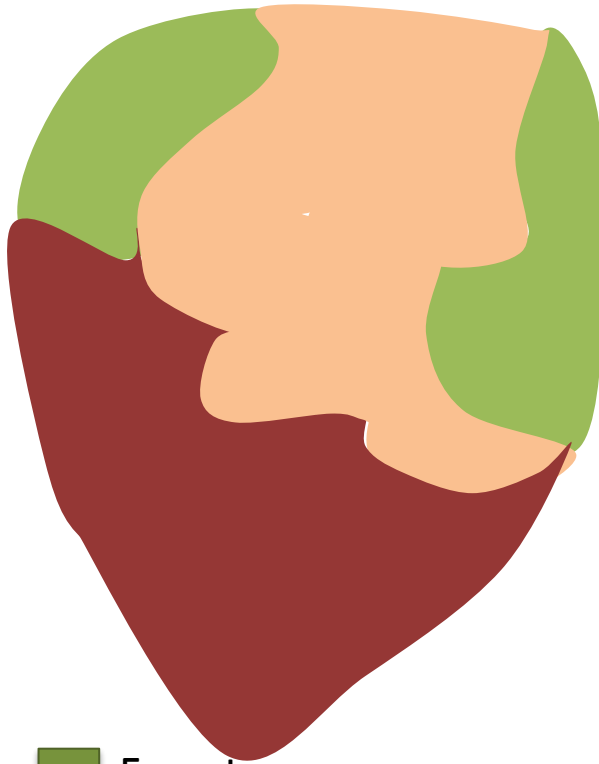
Re-vegetation:  
Use neighborhood to  
define target “native”  
LULC

Decrease Ag Inputs, etc:  
Users input multiplier for  
each LULC-Transition

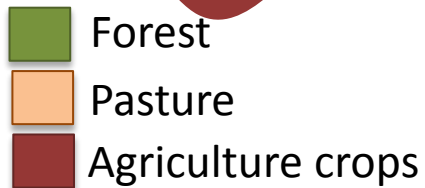
	PT
Pasture – forest (assisted)	0.7
Pasture – forest (un-assisted)	0.4
Pasture – paramo (assisted)	0.6
Pasture – paramo (un-assisted)	0.2



**BASE**



**Sediment export = 100**



**Sc1**

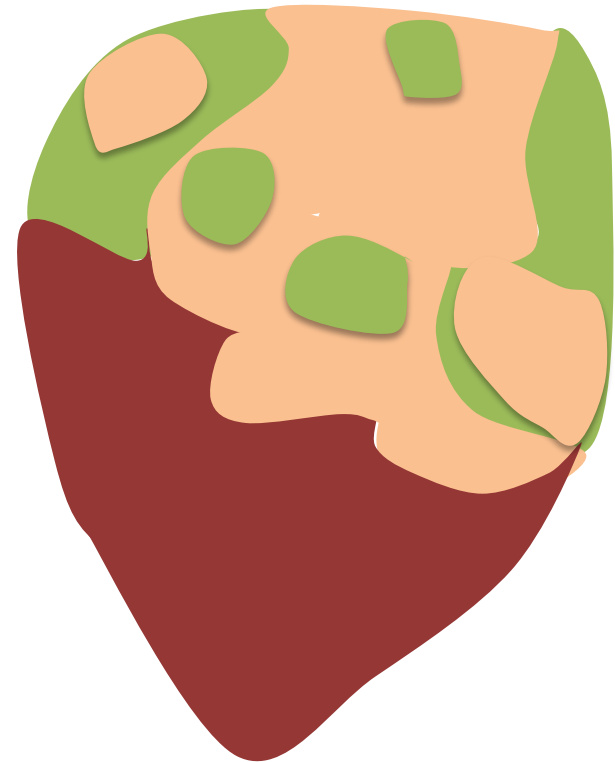
**Portfolio + Protection**



**Sediment export = 90**

**Sc2**

**Portfolio, No Protection**



**Sediment export = 95**

**CALCULATE RETURNS:**

**Base – Sc1 = 10**

**Sc2 – Sc1 = 5**

**Total benefit = 15**

