Water Fund Prioritization Tool Technical Workshop

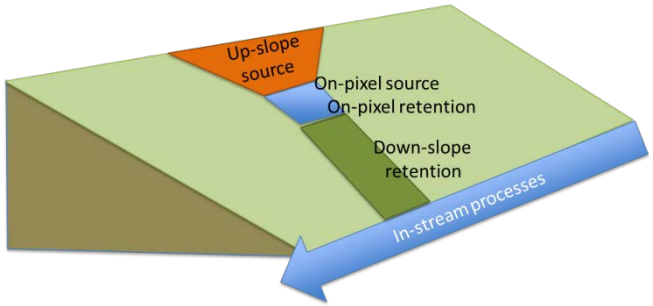
Day 2

August, 2012

Lima Peru

Beneficiaries in RIOS: Portfolio Design and Estimation of Returns

Erosion Control



Up-slope Source

- Slope
- Retention + Source Factors
- Source area

On-pixel

Source:

- Rainfall erosivity
- Soil erodibility
- Soil Depth
- Export (USLE C factor)

Retention:

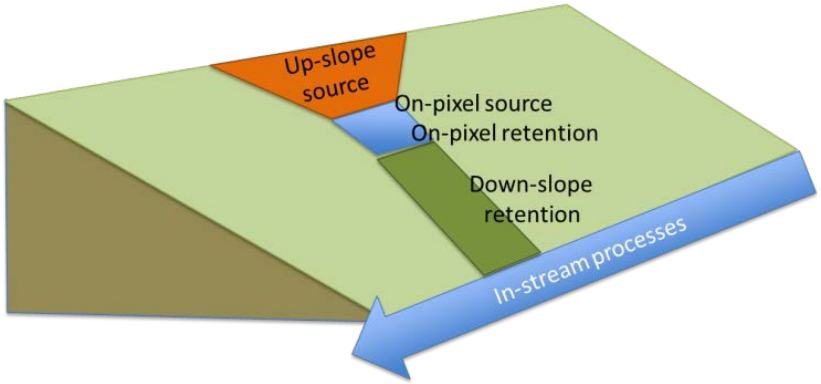
- % Sediment Retention
- Riparian Continuity

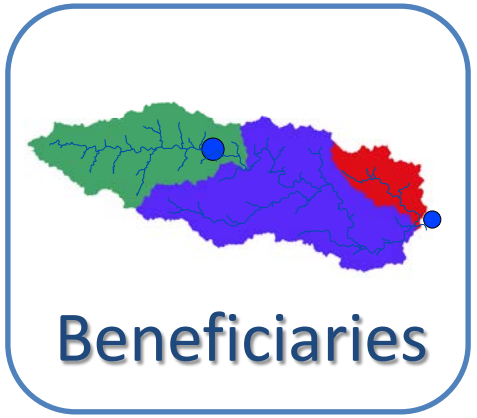
Downslope Retention

- Slope
- Sediment Retention
- Flow length to stream

Beneficiaries

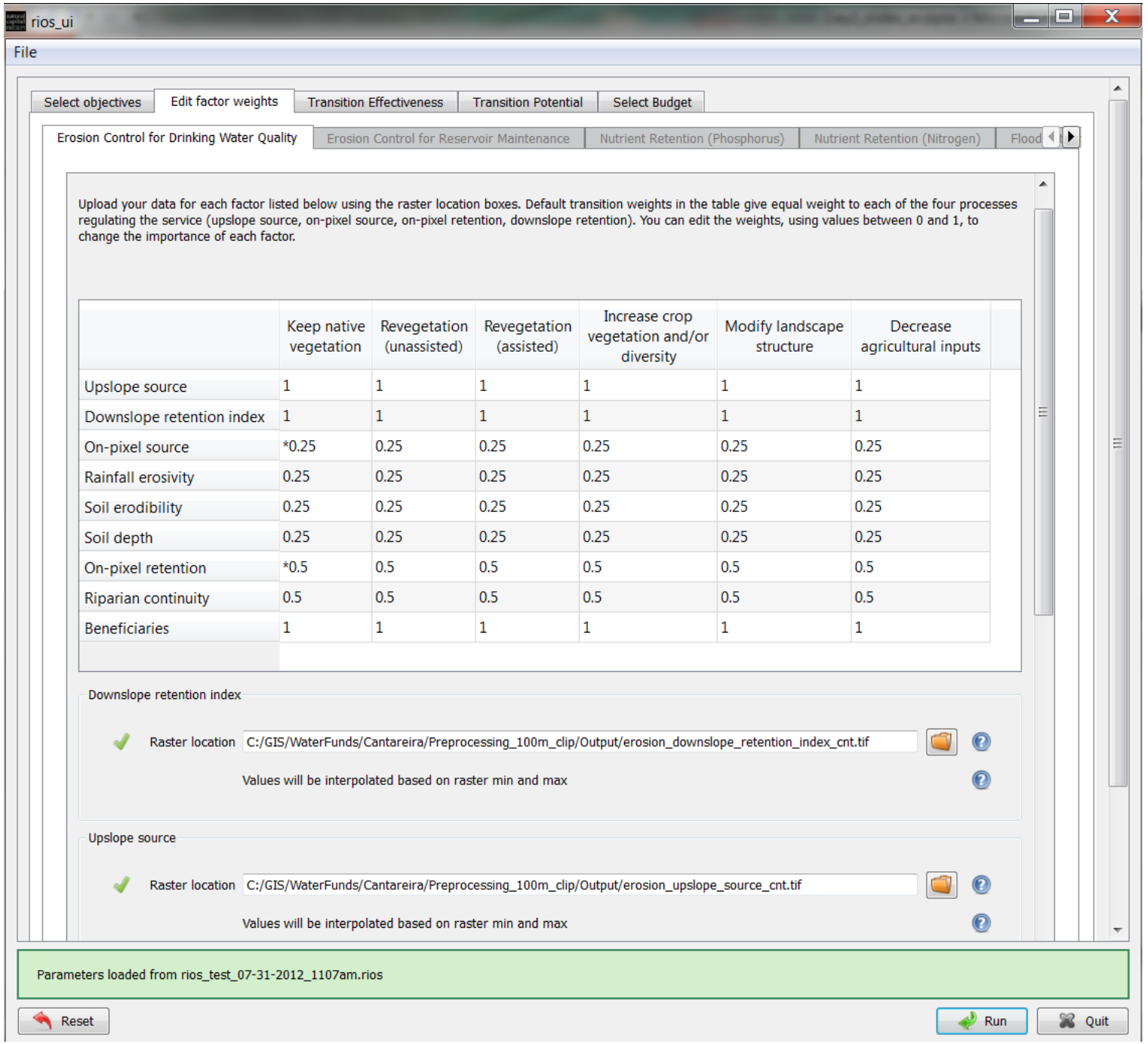
Ecosystem Services = Service Provision + Delivery



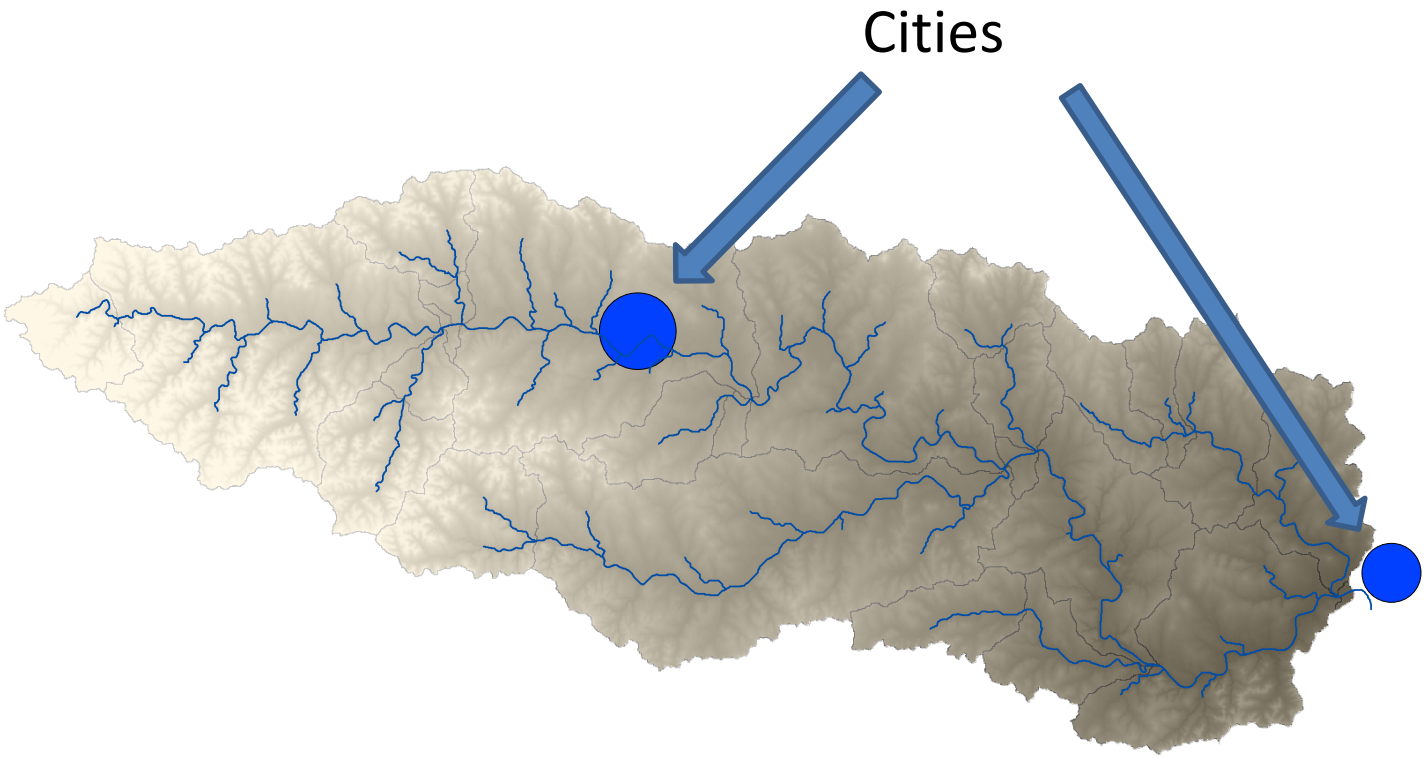


4 Physical Processes

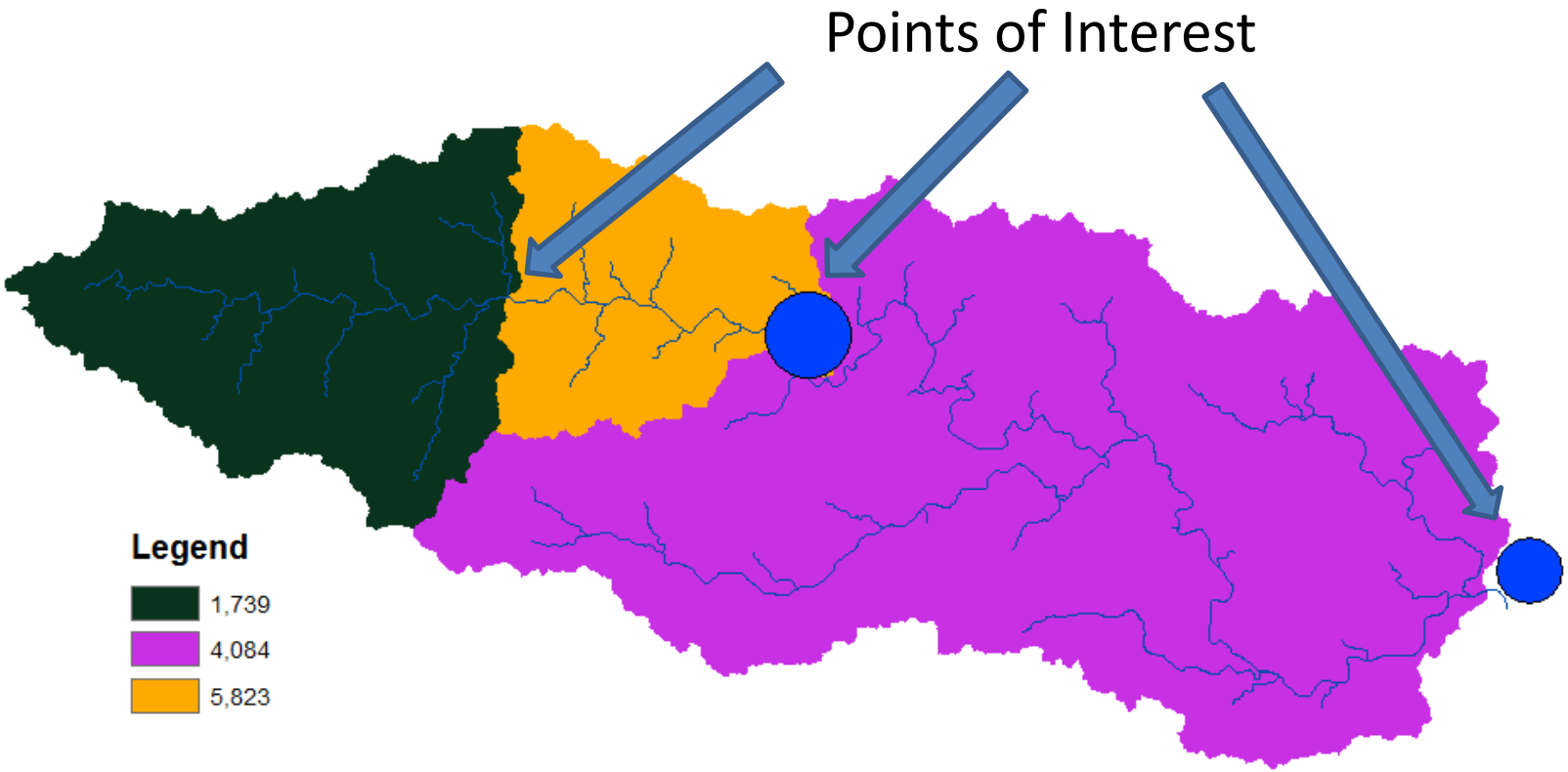
Service Delivery


rios_ui
File
Select objectives
Edit factor weights
Transition Effectiveness
Transition Potential
Select Budget
Erosion Control for Drinking Water Quality
Erosion Control for Reservoir Maintenance
Nutrient Retention (Phosphorus)
Nutrient Retention (Nitrogen)
Flood
Upload your data for each factor listed below using the raster location boxes. Default transition weights in the table give equal weight to each of the four processes regulating the service (upslope source, on-pixel source, on-pixel retention, downslope retention). You can edit the weights, using values between 0 and 1, to change the importance of each factor.
Keep native vegetation
Revegetation (unassisted)
Revegetation (assisted)
Increase crop vegetation and/or diversity
Modify landscape structure
Decrease agricultural inputs
Upslope source 1 1 1 1 1 1
Downslope retention index 1 1 1 1 1 1
On-pixel source *0.25 0.25 0.25 0.25 0.25 0.25
Rainfall erosivity 0.25 0.25 0.25 0.25 0.25 0.25
Soil erodibility 0.25 0.25 0.25 0.25 0.25 0.25
Soil depth 0.25 0.25 0.25 0.25 0.25 0.25
On-pixel retention *0.5 0.5 0.5 0.5 0.5 0.5
Riparian continuity 0.5 0.5 0.5 0.5 0.5 0.5
Beneficiaries 1 1 1 1 1 1
Downslope retention index
Raster location C:/GIS/WaterFunds/Cantareira/Preprocessing_100m_clip/Output/erosion_downslope_retention_index_cnt.tif
Values will be interpolated based on raster min and max
Upslope source
Raster location C:/GIS/WaterFunds/Cantareira/Preprocessing_100m_clip/Output/erosion_upslope_source_cnt.tif
Values will be interpolated based on raster min and max
Parameters loaded from rios_test_07-31-2012_1107am.rios
Reset
Run
Quit

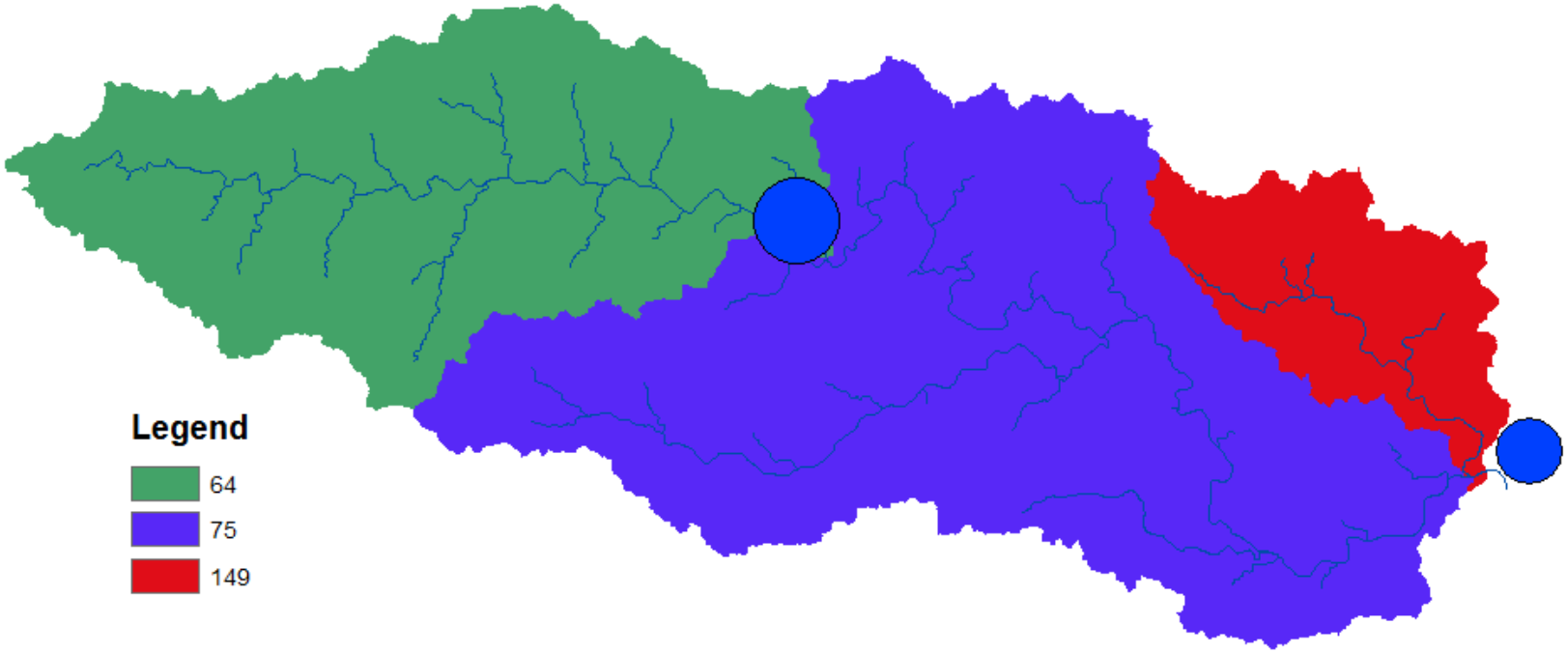
Example – Blanco Watershed



Surface Water Beneficiaries
- Sediment, Nutrient Retention -



Surface Water Beneficiaries
- Groundwater -

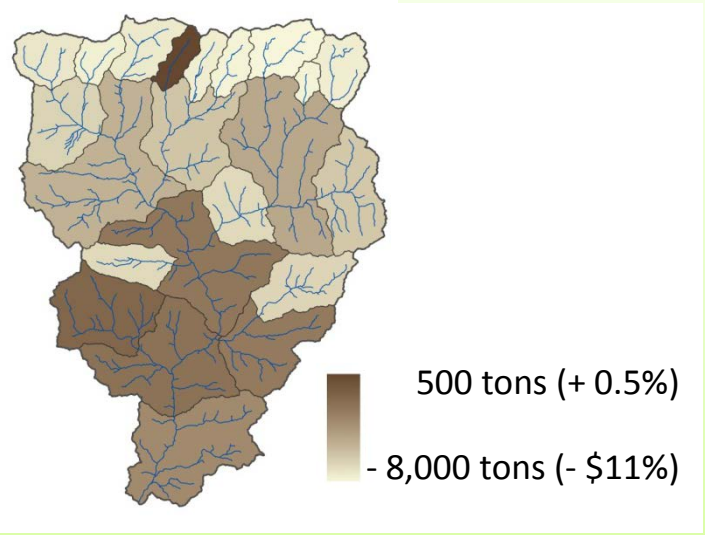


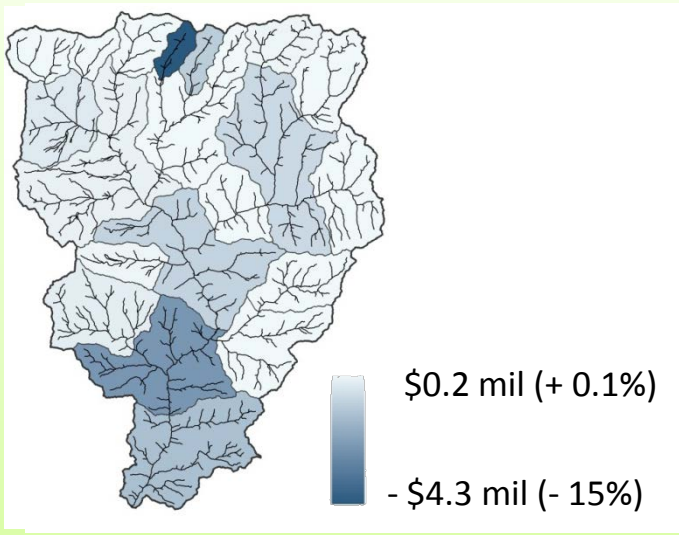
Beneficiaries in Estimation of Returns

CHANGE IN SEDIMENT EXPORT

CHANGE IN VALUE – AVOIDED TREATMENT COST

WITH CALIBRATION





	Sediment Exp		Value (change in treatment cost)		Bene-ficiaries
Sub-basin	Δ	% Δ	Δ	% Δ	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

Options for Mapping Portfolios to Landscape Scenarios

Options

100% Transition

All activities result in complete transition to target land cover

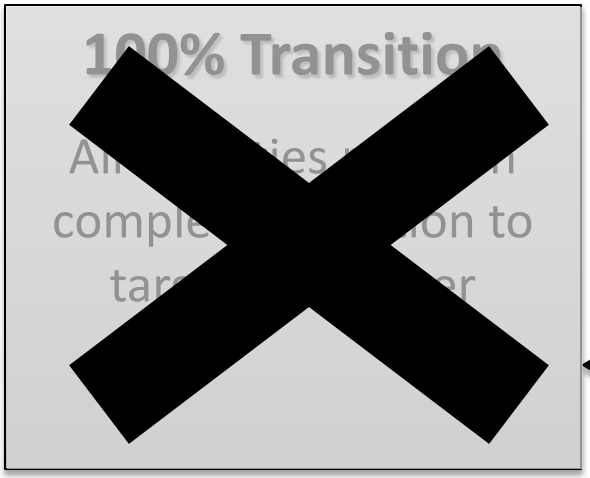
100% Dependency

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

- 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)

- 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

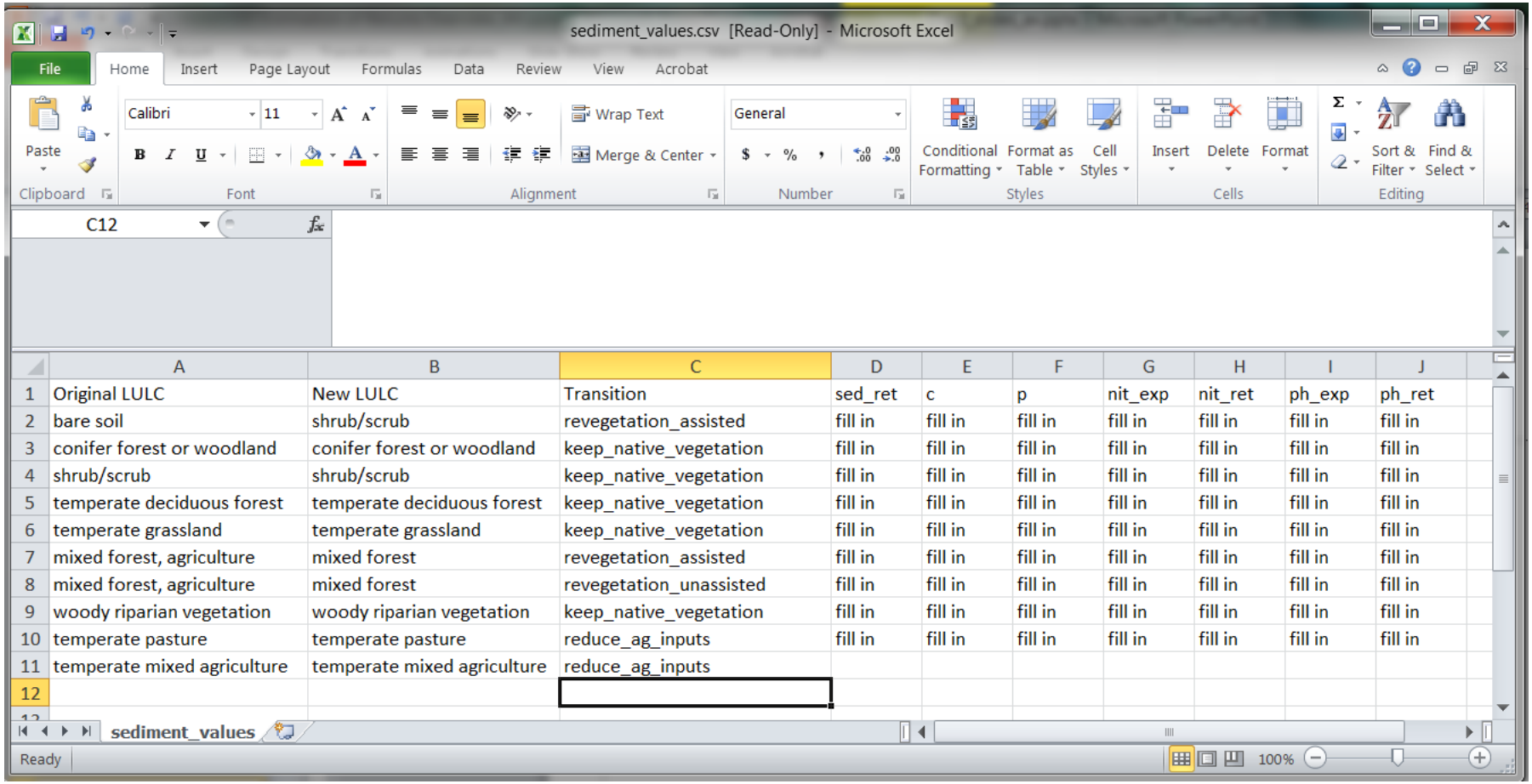


100% Dependency

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)	???	???

Enter all parameters for all combinations



	A	B	C	D	E	F	G	H	I	J
1	Original LULC	New LULC	Transition	sed_ret	c	p	nit_exp	nit_ret	ph_exp	ph_ret
2	bare soil	shrub/scrub	revegetation_assisted	fill in	fill in	fill in	fill in	fill in	fill in	fill in
3	conifer forest or woodland	conifer forest or woodland	keep_native_vegetation	fill in	fill in	fill in	fill in	fill in	fill in	fill in
4	shrub/scrub	shrub/scrub	keep_native_vegetation	fill in	fill in	fill in	fill in	fill in	fill in	fill in
5	temperate deciduous forest	temperate deciduous forest	keep_native_vegetation	fill in	fill in	fill in	fill in	fill in	fill in	fill in
6	temperate grassland	temperate grassland	keep_native_vegetation	fill in	fill in	fill in	fill in	fill in	fill in	fill in
7	mixed forest, agriculture	mixed forest	revegetation_assisted	fill in	fill in	fill in	fill in	fill in	fill in	fill in
8	mixed forest, agriculture	mixed forest	revegetation_unassisted	fill in	fill in	fill in	fill in	fill in	fill in	fill in
9	woody riparian vegetation	woody riparian vegetation	keep_native_vegetation	fill in	fill in	fill in	fill in	fill in	fill in	fill in
10	temperate pasture	temperate pasture	reduce_ag_inputs	fill in	fill in	fill in	fill in	fill in	fill in	fill in
11	temperate mixed agriculture	temperate mixed agriculture	reduce_ag_inputs							
12										

Options

100% Transition

All activities result in complete transition to target land cover

Compromise

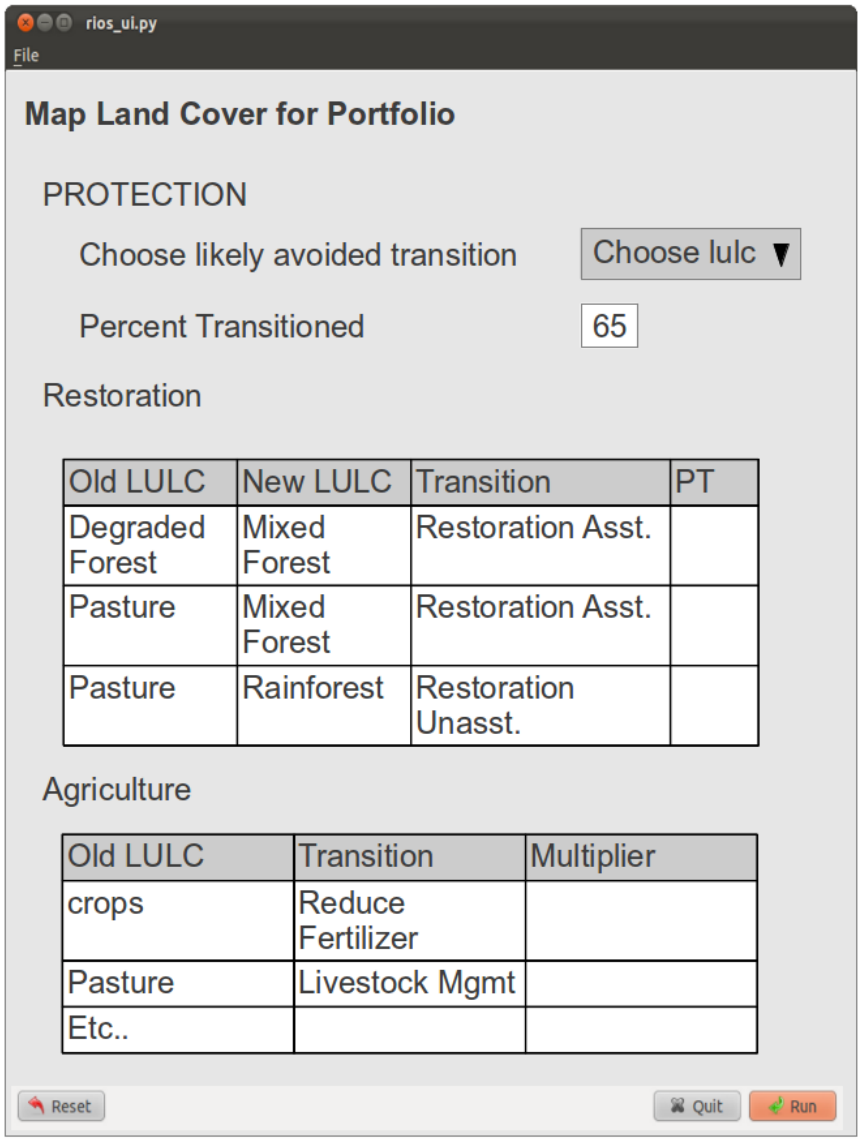
Estimation of returns – Estimate model parameters only for transitions chosen by portfolio, based on general rules & linear interpolation

100% Dependency

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

Compromise: Probability of Transitions

- Include option to edit table after doing linear interpolation based on these



Updates from funds around the region

- What is the status of funds in your region?
- What do you need the most technical support for in your region?
- What is missing from RIOS that could really help in your region?

What is the status of funds in your region?
What do you need the most technical support for in your region?
What is missing from RIOS that could really help in your region?

- MENCA
  - Guatemala, Monterrey, Honduras, need RIOS for Monterrey right away
  - Rivera Maya – lots of uncertainty, going for national PES program instead of detailed modeling
  - Guatemala needs to start looking at technical approach soon, Chiapas this year

MENCA, Objectives by Water Fund

- Monterrey – baseflow, floods, surface & gw
- Guatemala – surface & gw, need to understand system to define objectives
- Chiapas – sediment, floods, baseflows
- Honduras – surface water provision, need to prioritize watersheds

What is the status of funds in your region?
What do you need the most technical support for in your region?
What is missing from RIOS that could really help in your region?

- AFCS
  - Objectives – water supply, quality
  - Various stages of development, modeling, monitoring
  - Technical support for economic valuations
  - Need better processing capacity to handle high resolution data sets
- Central Caribbean (Dominican Republic)
  - RIOS could be very helpful, need to use tool before we can define issues & what is missing
  - Need technical help to design monitoring program
  - 2 planned water funds, potential members identified, institutional partnerships developed
  - Climate change impact is impt issue, contracted to start modelling
  - Water supply, climate change

What is the status of funds in your region?
What do you need the most technical support for in your region?
What is missing from RIOS that could really help in your region?

- Southern Andes
  - Lima water fund, water supply is primary issue, need technical help to answer where and in what activities to invest, prioritization, need better data & help to compile
  - Other funds in planning (i.e. Piura), Partnered with World Bank to protect biodiversity, sanitation (water quality), other projects in Peru
  - Other projects in Bolivia, Chile
  - Need to understand priority areas, impacts of activities, RIOS could be very helpful for prioritization
  - Need technical assistance to present results to potential partners, investors

What is the status of funds in your region? What do you need the most technical support for in your region? What is missing from RIOS that could really help in your region?

- NASCA
  - Various water funds, Costa Rica, Panama, in various stages of planning & implementation
  - RIOS could be helpful to generate data for Panama very quickly, if needed
  - Venezuela, Merida water fund in design, make portfolio in next 6 months with RIOS; Need RIOS to tell them where best places for replenish credits (Coca Cola program)
  - Need to decide if we can use RIOS to decide where to develop new water funds
  - Colombia, Agua por la Vida, want to use RIOS next 6 months for newly joined watersheds; Medellin & Bogota technical studies done, monitoring is priority now
  - Ecuador – 4 funds in implementation, monitoring is priority; Guayas will need to run RIOS by end of year
  - 3 things missing from RIOS: dry season baseflow, bacteria objectives, replenishment credits

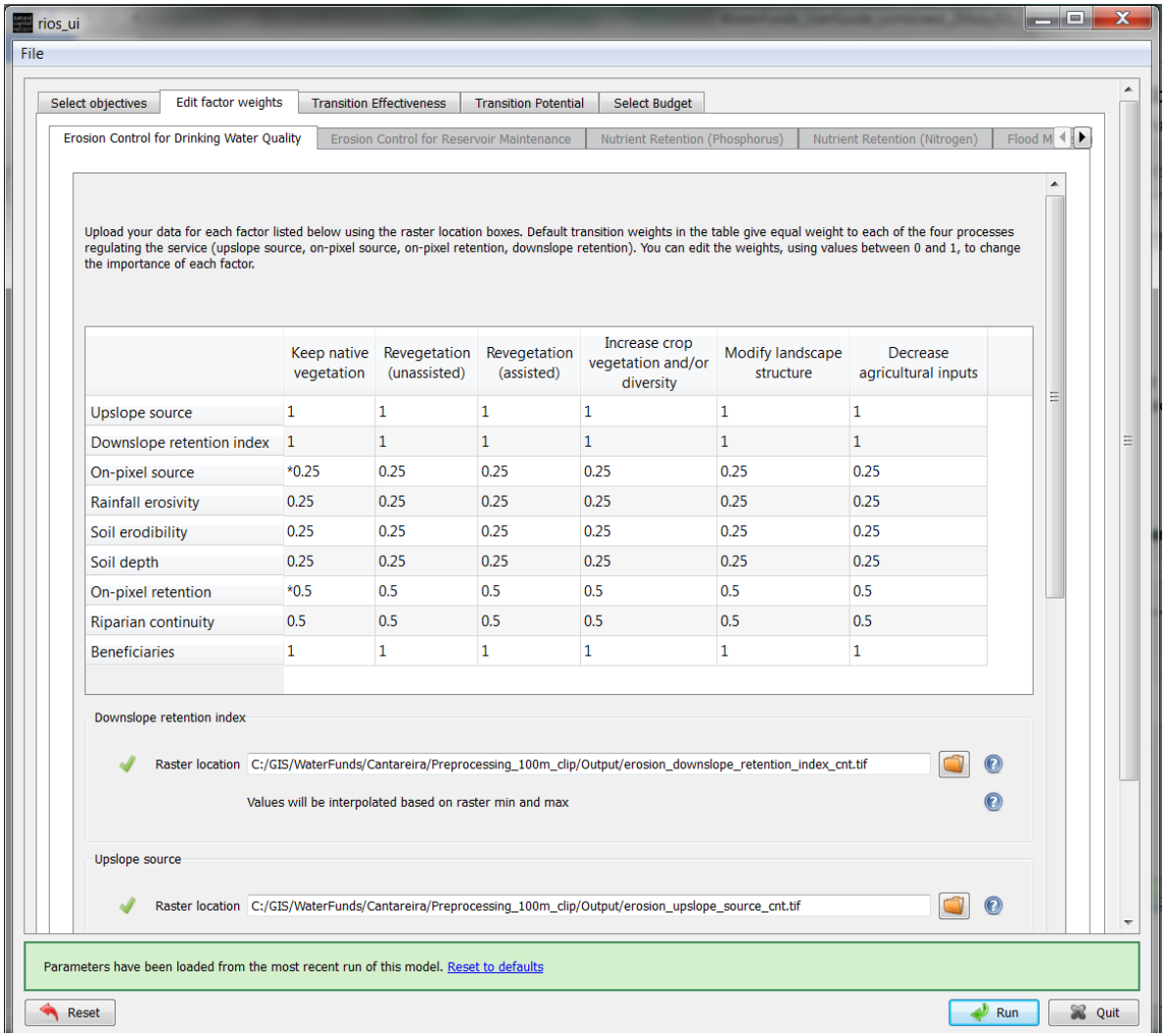
What is the status of funds in your region?
What do you need the most technical support for in your region?
What is missing from RIOS that could really help in your region?

- Amazon
  - USAID projects, projects in Ecuador and Peru
  - Feasibility study in progress in Ecuador, planned in Peru
  - RIOS could be very important for these projects in the future

Is RIOS too complicated?

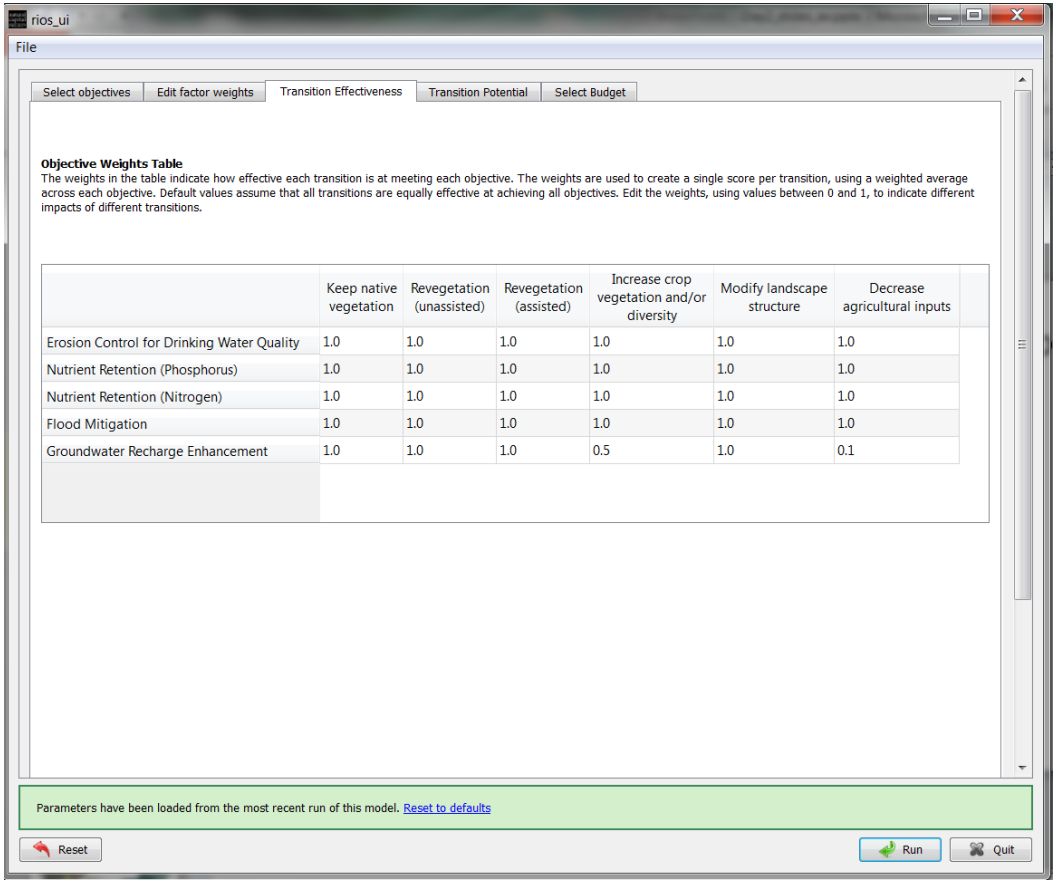
Is RIOS too complicated?

- Change factor weights
- KEEP



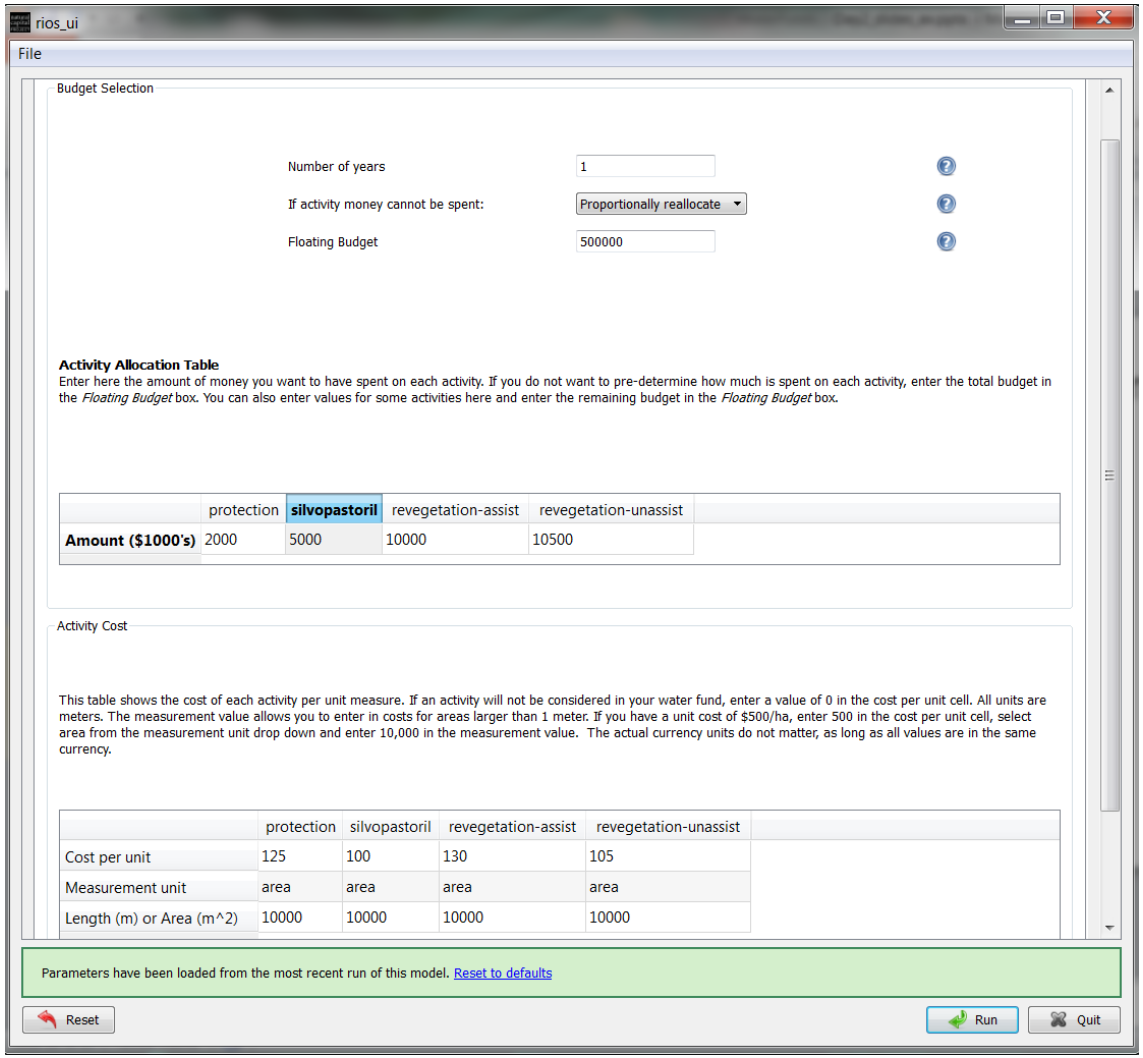
Is RIOS too complicated?

- Change objective weights (expert elicitation, if we give good defaults will you change them or should we make the defaults built in?)
- KEEP



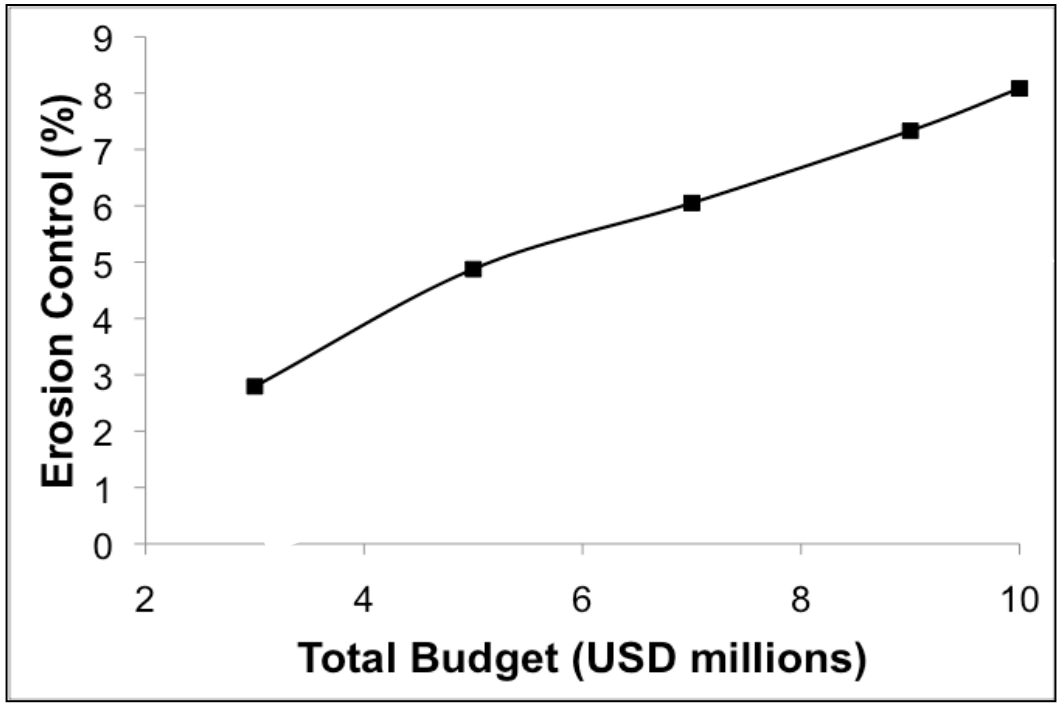
Is RIOS too complicated?

- Budget tab options
- KEEP



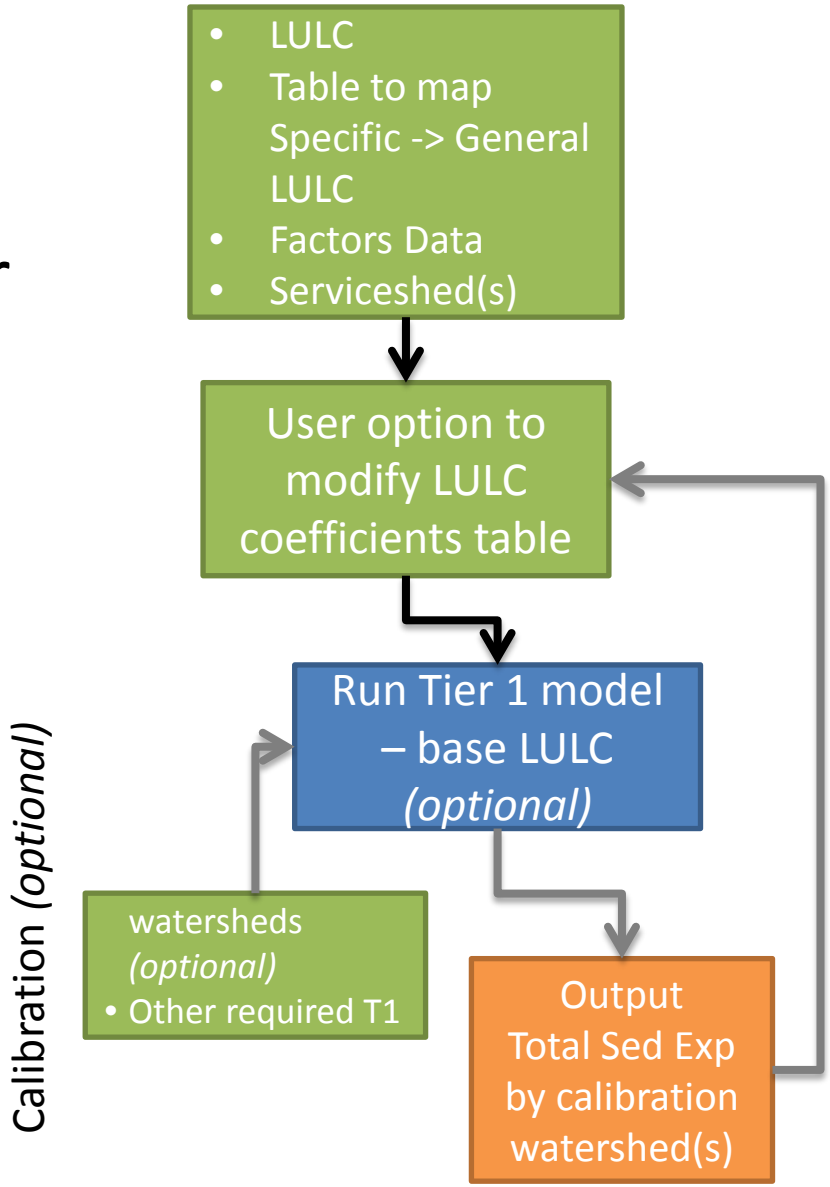
Is RIOS too complicated?

- Multiple budget levels to simultaneously create portfolios and estimate returns, output graph
- Put in documentation how to do this analysis, output not needed in RIOS



Is RIOS too complicated?

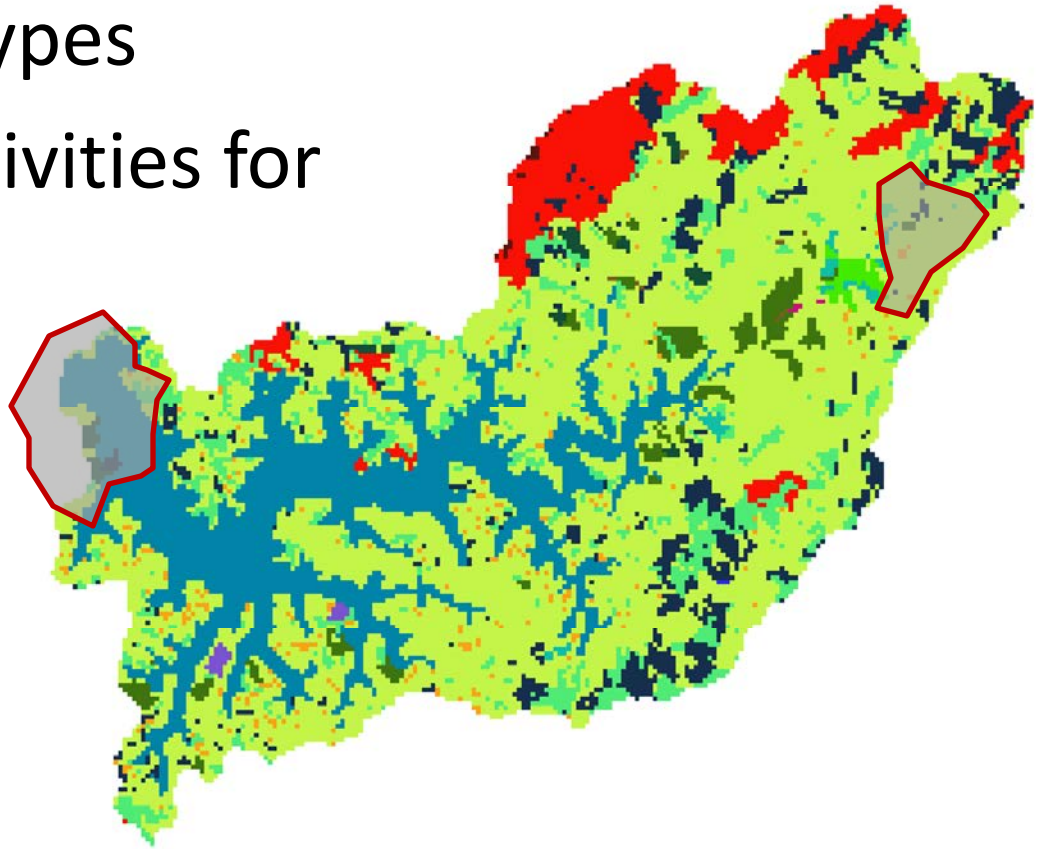
- Calibration option – provide guidance only or do we need specialized interface or tool to loop through calibration?
- Give option to run Est of Returns model only to enable calibration
- Full automation not needed



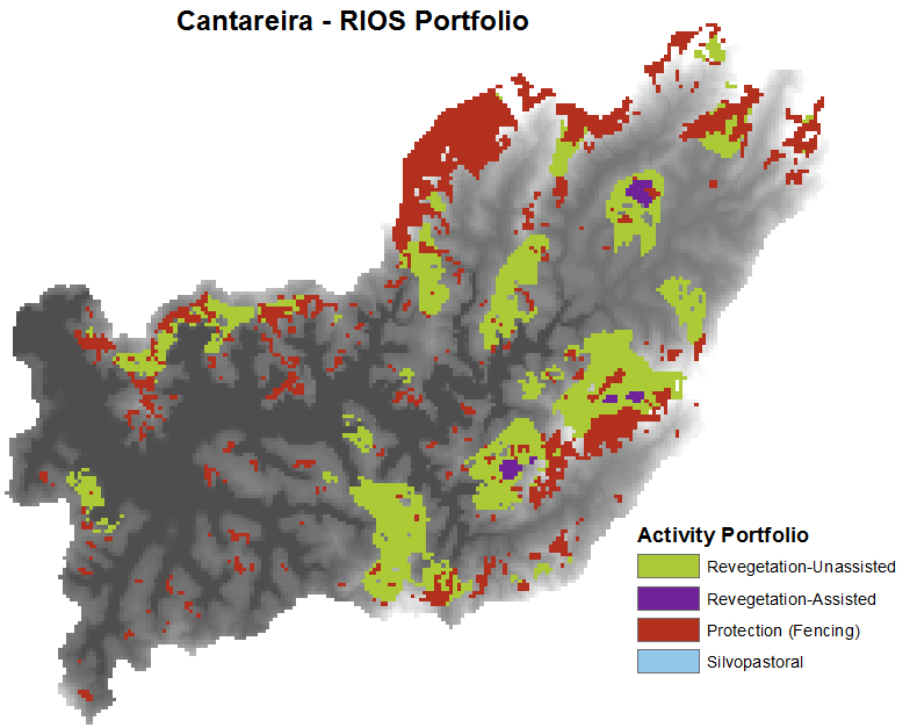
Comparing RIOS portfolio returns to “business as usual”

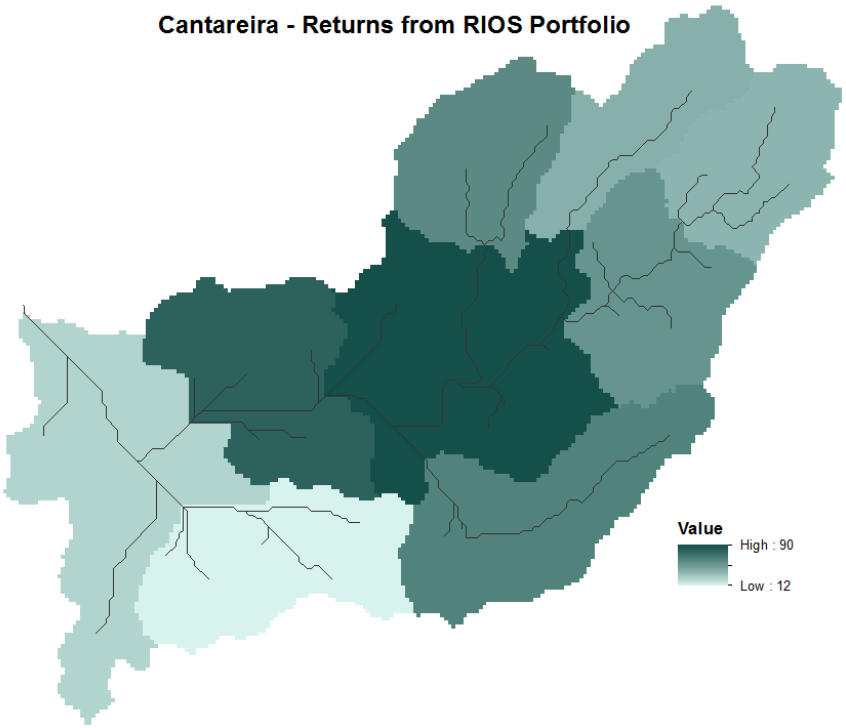
Comparing RIOS portfolio returns to "business as usual"

- Cantareira Example
- Restrictions on activities for some land cover types
- Restrictions on activities for some areas

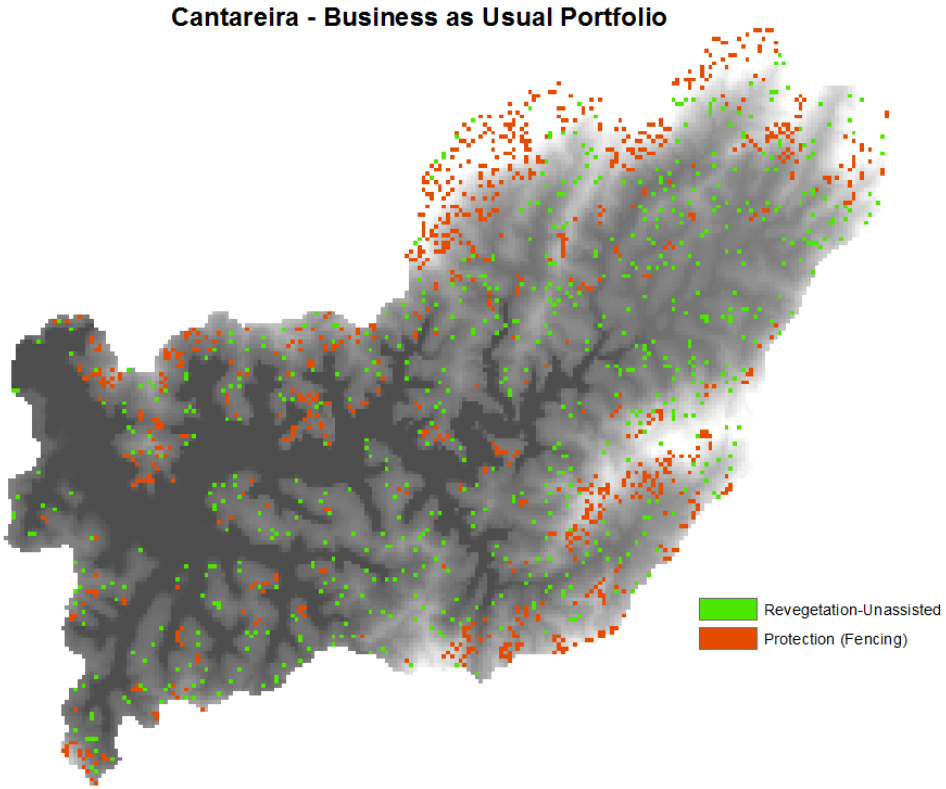


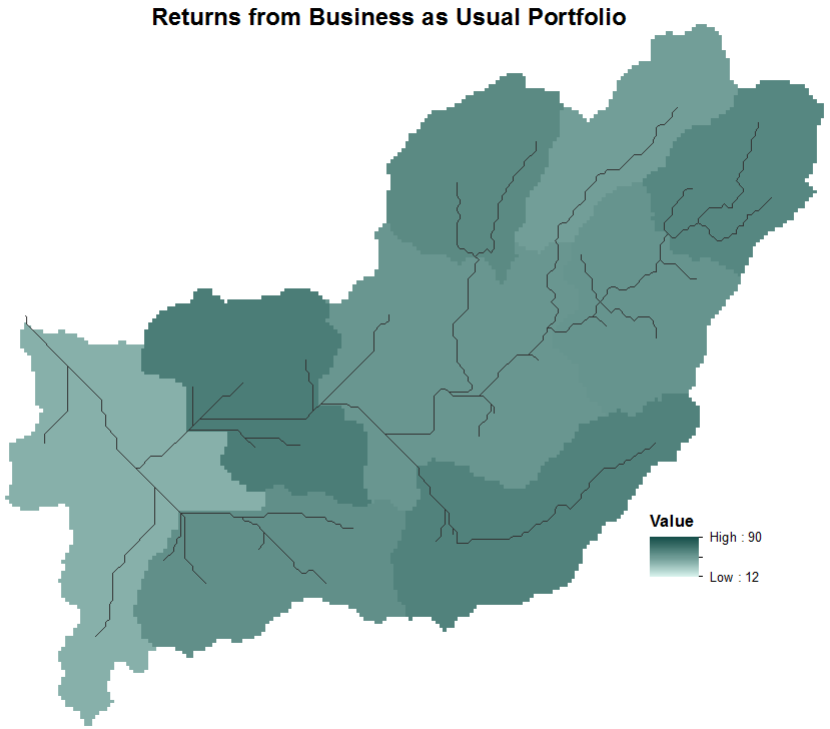
RIOS Portfolio





“Business as Usual” Scenario





Discussion
What is Business as Usual?

- Use legal requirements to guide business as usual scenarios (i.e. in Brazil law says you must restore within a certain distance of stream)
- Many funds already do environmental analyses to design implementation sites
  - These are often used to identify priority areas, not portfolio based on ROI
- Activities often happen close to roads, homes, streams rather than in upland areas
- Compare RIOS portfolio to actual implementation portfolios in 3-4 reference water funds, rather than trying to model business as usual
- Problem with analysis framework – using same model to evaluate effectiveness that you use to design portfolio, not a fair test

RIOS – Next Steps

RIOS – Next Steps
- Planned-

- Compare business as usual to portfolio scenarios
- Estimation of returns for nutrient retention, flood control
- Include way to show that avoided conversion is not 100% converted in absence of protection
- Implement compromise solution for mapping portfolio to new LULC for estimation of returns
- Up-front data checking in RIOS

RIOS – Next Steps
- Planned-

- Users input shapefiles to force or prevent activities in certain areas (can reflect based on many possible factors – land tenure, political or logistical considerations, existing conservation agreements, etc.)
- Intermediate scores should be easy to access, provide more reporting options
- Changing beneficiaries inputs to shapefiles
  - This addresses issue of accounting for different values/benefits to different beneficiaries for same serviceshed
- No need to include non-land-use activities

Documentation/Guidance

- Creating beneficiaries data
  - Concepts for developing spatial distribution of benefits
  - Different beneficiaries for different objectives
- How to input points of interest to get returns summarized the way you want
- Detailed guidance for calibration and sensitivity analyses
- Break into 2 pieces: phase I prioritization/portfolio design; phase II estimation of returns, make it clear what can be done with each

User interface/usability

- Change amount per activity field text “Amount ($1,000s)” to be “Amount”
- Map LULCs based on ID, not text description
- Bring back LULC/activity table to allow users to double-check that everything is correct from csv table (don’t need to edit here, just check)
- Create online forum for user group to share experiences, data prep, questions, help

RIOS – Next Steps
- Will Discuss -

- Baseflow, Bacteria objectives
- Variation in cost for activities across the landscape (spatially explicit costs)
- Provide guidance on substitutability of input factors
- Account for probability of transitions (for mapping portfolio to estimation of returns model) in spatially explicit way
- Biodiversity as an objective? (would be nice, not critical)
  - for portfolio selection, or just for ES returns?
  - Biodiversity as optional input raster?

RIOS – Next Steps
- Will Discuss -

- Keep track of how many times a pixel is selected for a portfolio between several different runs, with changing clumping factor (or other factors?)
- Change the terminology of ROI
- Replenishment model or guidance on using RIOS outputs to determine priority replenishment areas
- Separate out irrigation versus nutrient management in RIOS models

RIOS – Next Steps
- Will Discuss -

- Need to be able to input sediment, nutrient etc. contributions relative to other changes on the landscape outside of water fund activities
  - Cannot assume that the only thing changing in your modeling scenarios is your water fund activities
- Still need improvement in results given, outputs don't align with common sense
- Need to revisit factor weighting
- Clumping factor is not so useful, aggregating could be decision outside of RIOS based on some intermediate outputs
- Identify testing models (3-4 sites) for comparing to business as usual

Expert Elicitation

- Add promise to questionnaire that contributions will be recognized
- Add baseflow protection as an objective
- Follow-up with attendees and CP leads to distribute questionnaire to experts