

prioritizr

**Maximum cover objective function/
Función objetivo de cobertura máxima**



prioritizr.net

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Human-readable code/ Código entendible

Mental model/ Modelo mental

```
problem <- data +  
           objective +  
           constraints +  
           penalties +  
           decision type +  
           solver  
  
solution <- solve(problem)
```

Minimum set objective function/ Función objetivo de conjunto mínimo

Mental model/ Modelo mental

```
problem <- data +  
  objective +  
  constraints +  
  penalties +  
  decision type +  
  solver  
  
solution <- solve(problem)
```

Code/Código

```
p <- problem(areas, feats) %>%  
  add_min_set_objective() %>%  
  add_relative_targets(0.1) %>%  
  add_boundary_penalties(5) %>%  
  add_binary_decisions() %>%  
  add_rsymphony_solver()  
  
solution <- solve(p)
```

Objective functions/ Funciones objetivo

<https://prioritizr.net/reference/objectives.html>

The following objectives can be added to a conservation planning problem :

`add_min_set_objecti...` Minimize the cost of the solution whilst ensuring that all targets are met. This objective is similar to that used in *Marxan*.

`add_max_cover_objec...` Represent at least one instance of as many features as possible within a given budget.

`add_max_features_ob...` Fulfill as many targets as possible while ensuring that the cost of the solution does not exceed a budget.

`add_min_shortfall_o...` Minimize the shortfall for as many targets as possible while ensuring that the cost of the solution does not exceed a budget.

`add_max_phylo_div_o...` Maximize the phylogenetic diversity of the features represented in the solution subject to a budget.

`add_max_phylo_end_o...` Maximize the phylogenetic endemism of the features represented in the solution subject to a budget.

`add_max_utility_obj...` Secure as much of the features as possible without exceeding a budget.

Maths: minimum set/ Matemática: Conjunto mínimo

$$\text{Minimize } \sum_{i=1}^I x_i c_i$$

subject to

$$\sum_{i=1}^I x_i r_{ij} \geq T_j \quad \forall j \in J$$

x_i = decisions variable (e.g. specifying whether planning unit i has been selected (1) or not (0))/
Variable de decisión (Ej. Especificando si la unidad de planeación i se ha seleccionado (1) o no (0))

c_i = cost of planning unit i / costo de la unidad de planeación i

r_{ij} = amount of feature j in planning unit i / Cantidad de la característica j en la unidad de planeación i

T_j = target for feature j / Meta de la característica j

The first term is the objective function and the second is the set of constraints. / El primer término es la función objetivo y el segundo término son las restricciones

Maths: maximum cover-utility/ Matemática: Cobertura-utilidad máxima

$$\text{Maximize } \sum_{i=1}^I -s c_i x_i + \sum_{j=1}^J a_j w_j$$

subject to

$$a_j = \sum_{i=1}^I x_i r_{ij} \quad \forall j \in J$$

$$\sum_{i=1}^I x_i c_i \leq B$$

s = scaling factor for cost/ factor de escala para el costo

c_i = cost of planning unit i / costo de la unidad de planeación i

x_i = decisions variable (e.g. specifying whether planning unit i has been selected (1) or not (0))/ Variable de decisión (Ej. Especificando si la unidad de planeación i se ha seleccionado (1) o no (0))

r_{ij} = amount of feature j in planning unit i / Cantidad de la característica j en la unidad de planeación i

a_j = amount of feature j represented in the solution/ cantidad de la característica j representada en la solución

w_j = weight for feature j / peso de la característica j

B = budget allocated for the solution/ presupuesto asignado para la solución

Min set and max cover difference/ **Diferencia entre conjunto mínimo y cobertura máxima**

- **Minimum set/ Conjunto mínimo:**
 - Minimize the cost/area of a solution while meeting feature targets/ **Minimiza el costo/área de una solución mientras cumple con las características meta**
- **Maximum cover/ Cobertura máxima:**
 - Minimize the cost/area of a solution while staying within a budget and maximizing feature representation/ **Minimiza el costo/área de una solución mientras cumple con un presupuesto y maximiza la representación de las características meta**

What's the difference in prioritizr?/ ¿Cuál es la diferencia en prioritizr?

Minimum set/ Conjunto mínimo

```
p1 <- problem(pu, features) %>%  
  add_min_set_objective() %>%  
  add_relative_targets(T) %>%  
  add_binary_decisions() %>%  
  add_default_solver(gap = 0)  
  
s1 <- solve(p1)
```

Maximum cover/ Cobertura máxima

```
p2 <- problem(pu, features) %>%  
  add_max_utility_objective(B) %>%  
  add_feature_weights(w) %>%  
  add_binary_decisions() %>%  
  add_default_solver(gap = 0)  
  
s2 <- solve(p2)
```


What's the difference in prioritizr?/ ¿Cuál es la diferencia en prioritizr?

Minimum set/ Conjunto mínimo

Maximum cover/ Cobertura máxima

