



Instituto
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Sustentabilidade



CSRIO

Incorporando a decisão do proprietário na priorização da restauração florestal

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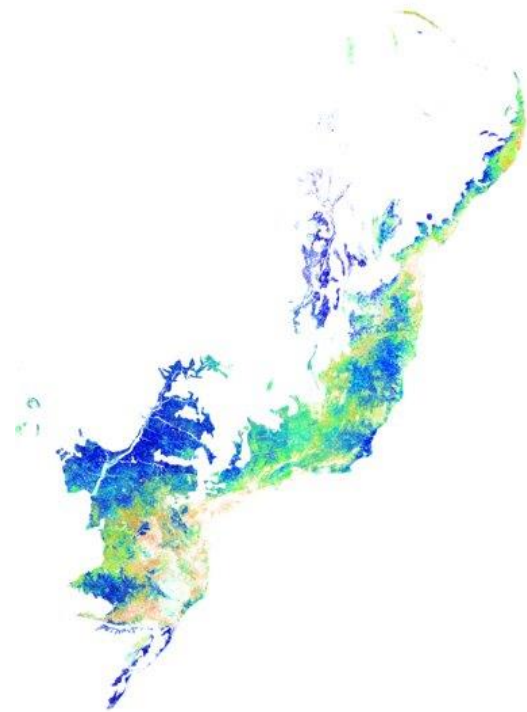
Razões para encorajamento da restauração

- Retorno ao investimento feito
 - Pagamento por serviços ambientais
 - Exploração de produtos não florestais
 - Exploração florestal de nativas e/ou exóticas
- Adequação a lei
- Interesse puramente conservacionista

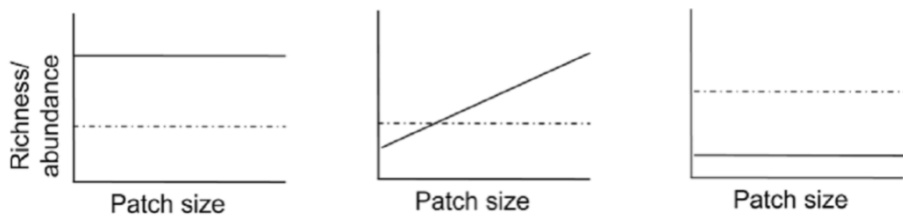
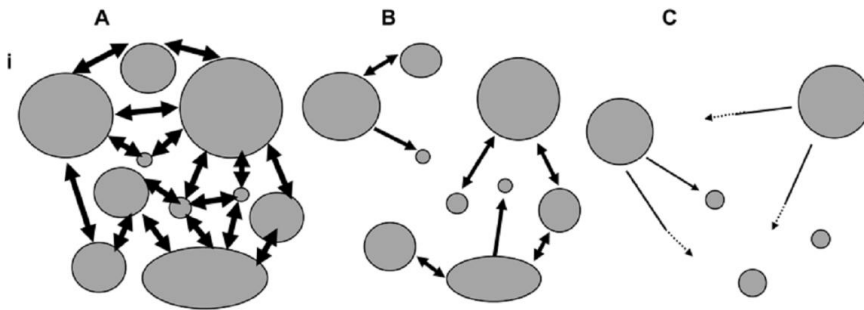
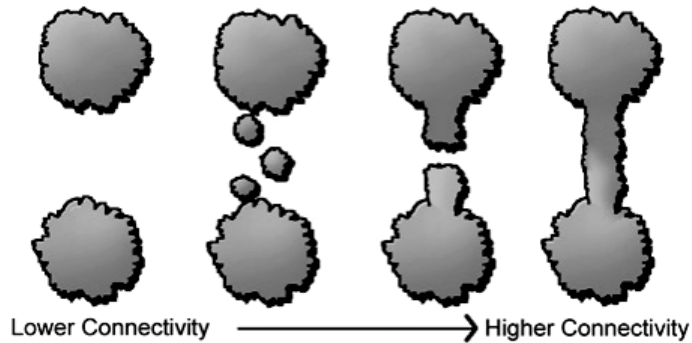
Custos associados

Oportunidade

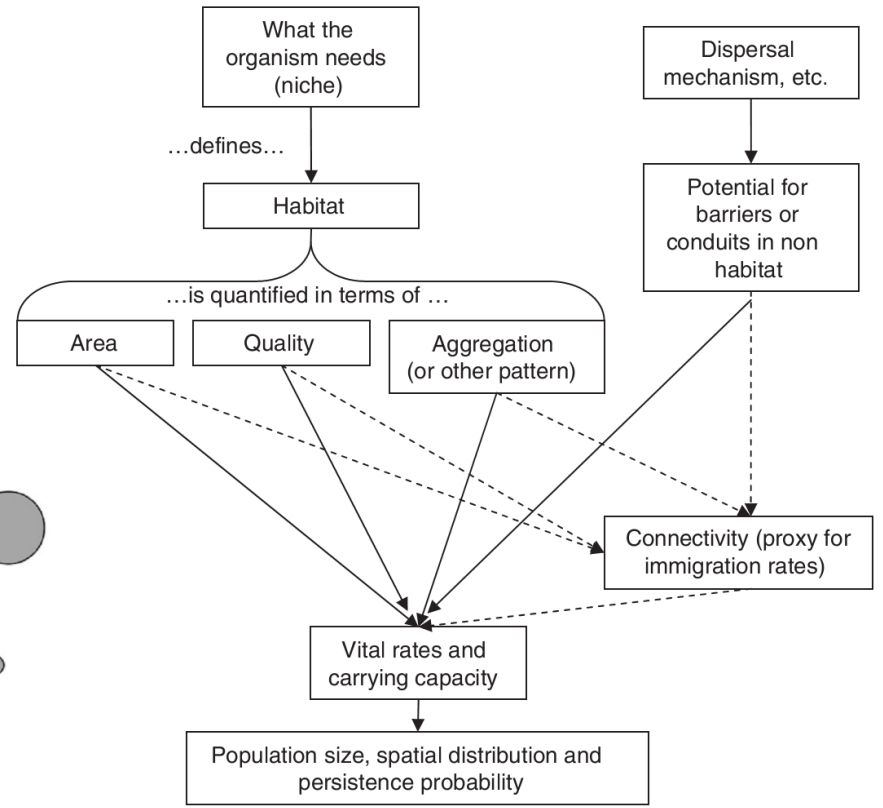
Implementação
regeneração natural <<<< restauração ativa



Benefícios e conectividade na paisagem



Pardini et al. 2010

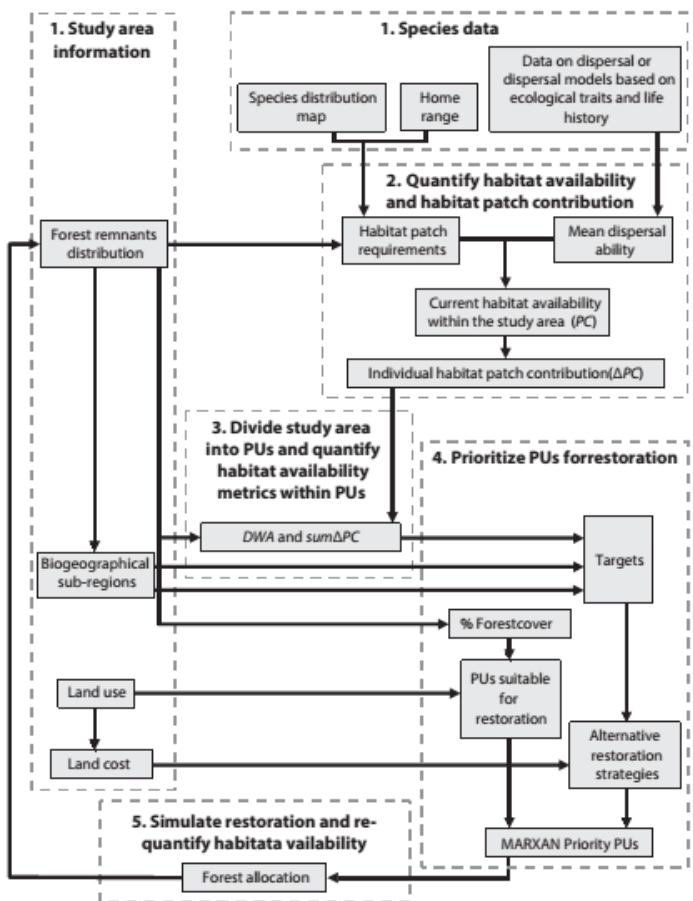


Hodges et al. 2009



Incorporating habitat availability into systematic planning for restoration: a species-specific approach for Atlantic Forest mammals

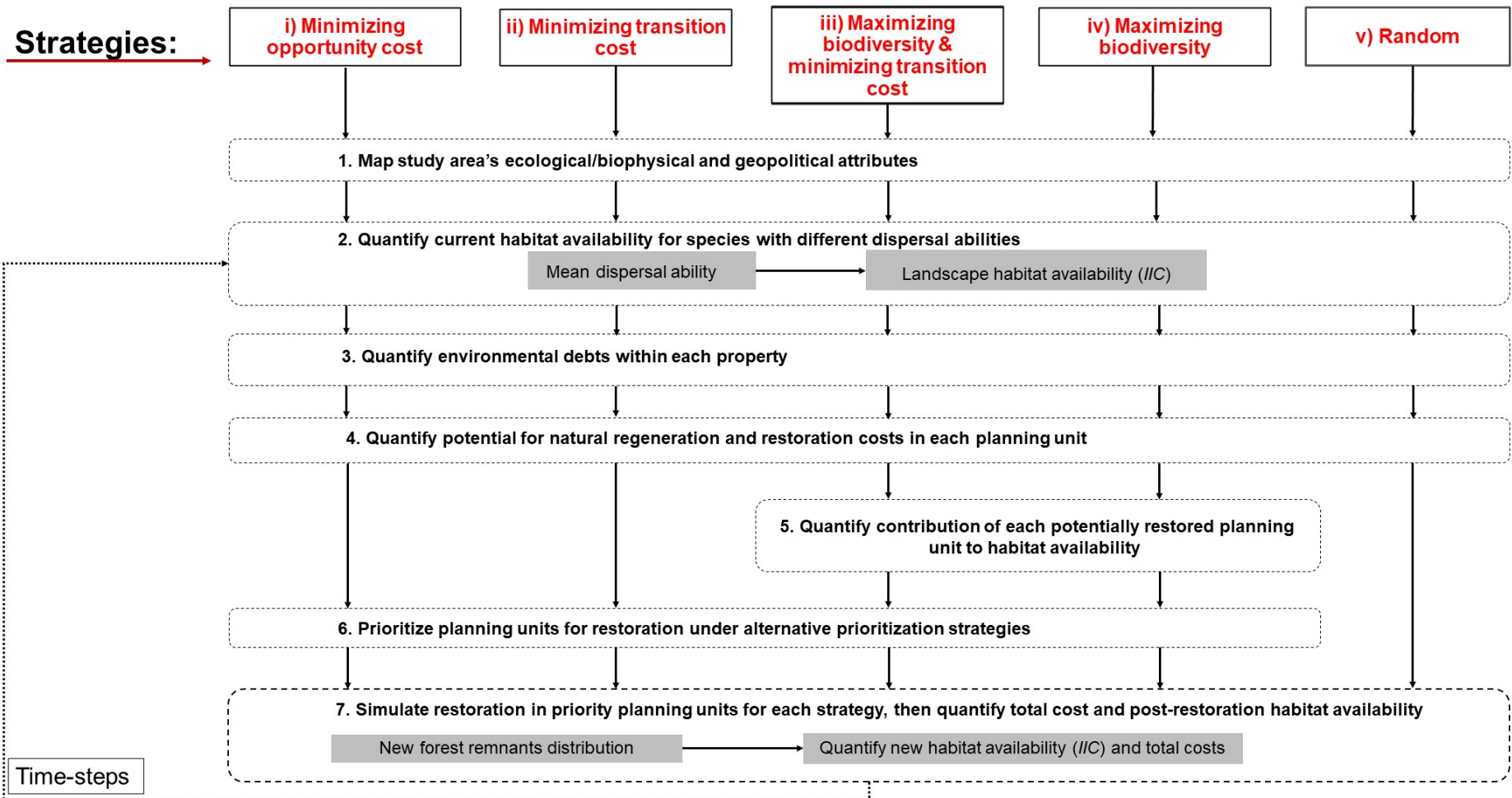
Renato Crouzeilles^{1,2*}, Hawthorne L. Beyer³, Morena Mills^{3,4}, Carlos E. V. Grelle¹ and Hugh P. Possingham^{3,5}



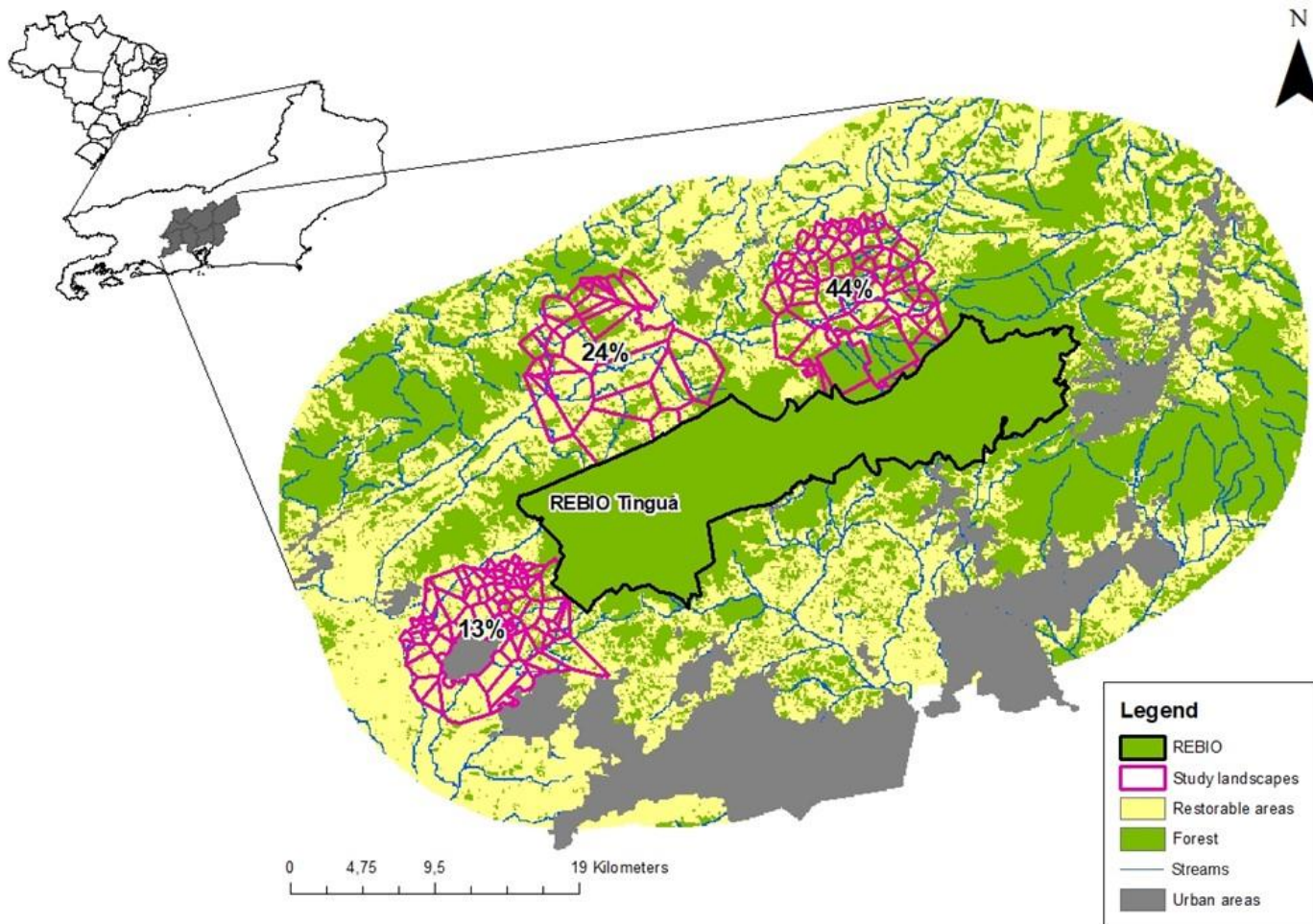
Restoration strategies	Improvement in habitat availability (%)	Cost (billion US\$)	Cost-effectiveness
<i>Caluromys philander</i>			
Minimum cost	2725	17.5	1.56
DWA	1825	17.6	1.04
sumΔPC	3075	17.6	1.75
DWA&sumΔPC	4100	17.5	2.34
<i>Leopardus pardalis</i>			
Minimum cost	4576	19.7	2.32
DWA	4694	20.4	2.30
sumΔPC	5518	19.9	2.77
DWA&sumΔPC	4606	20.5	2.25



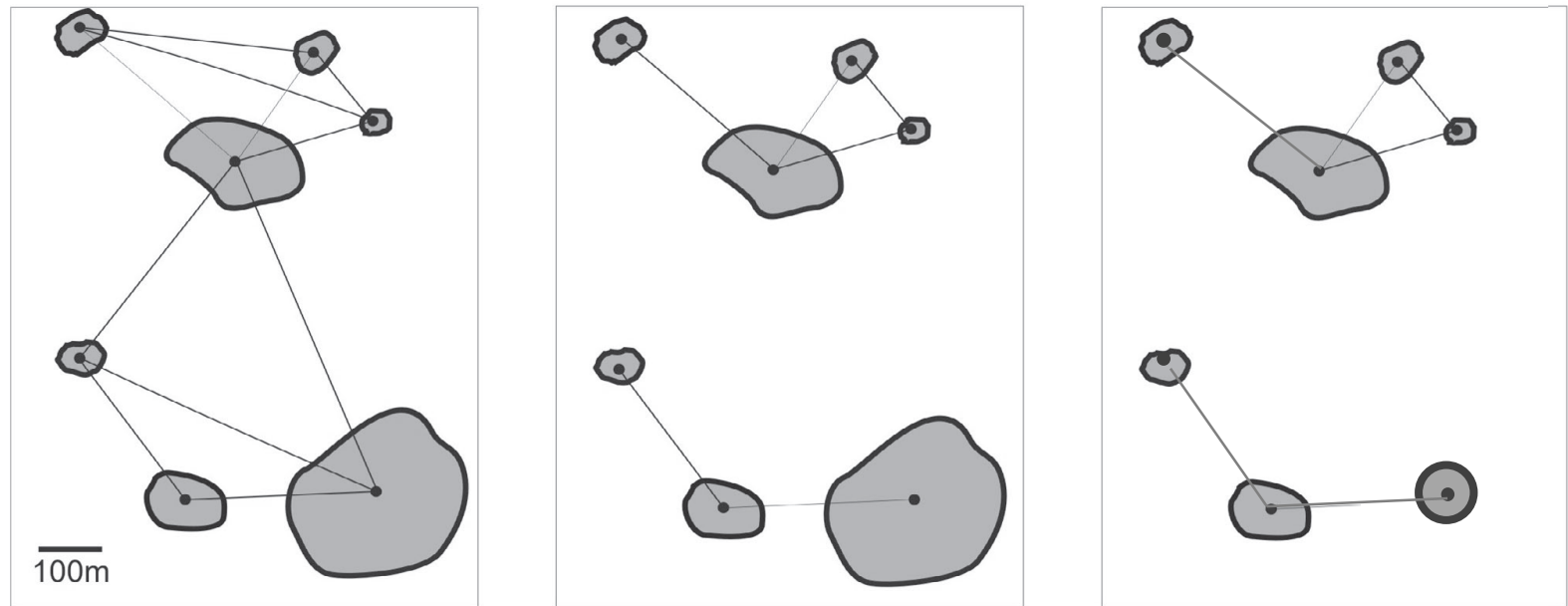
Incorporando a decisão do proprietário na priorização da restauração florestal



Passo 1. Área de estudo



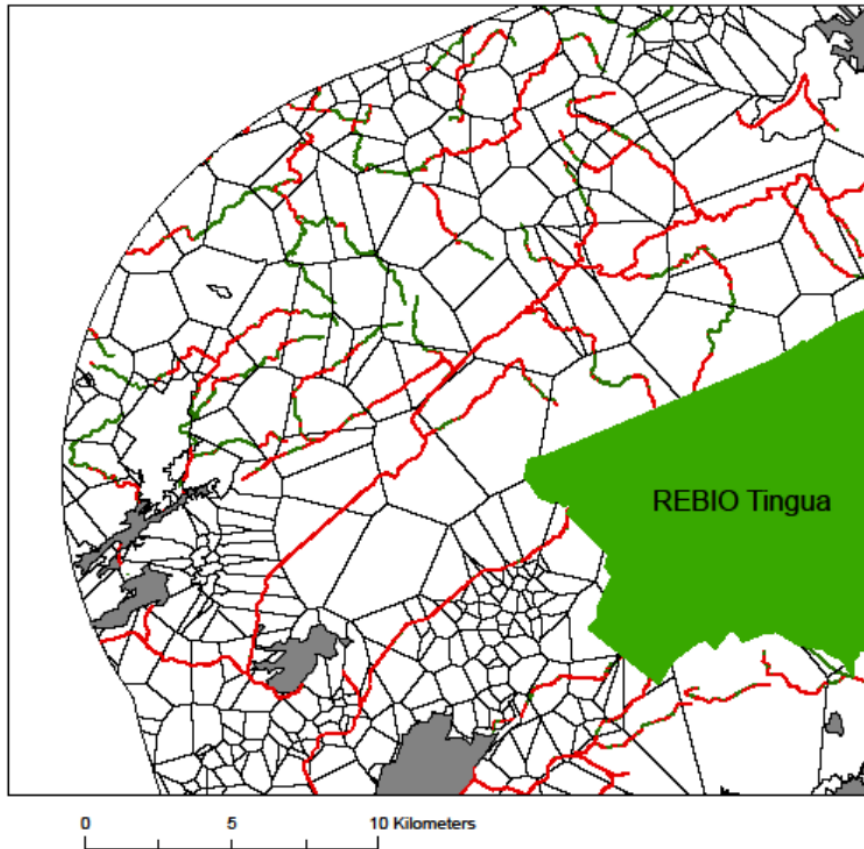
Passos 2 e 5. Como medir conectividade?



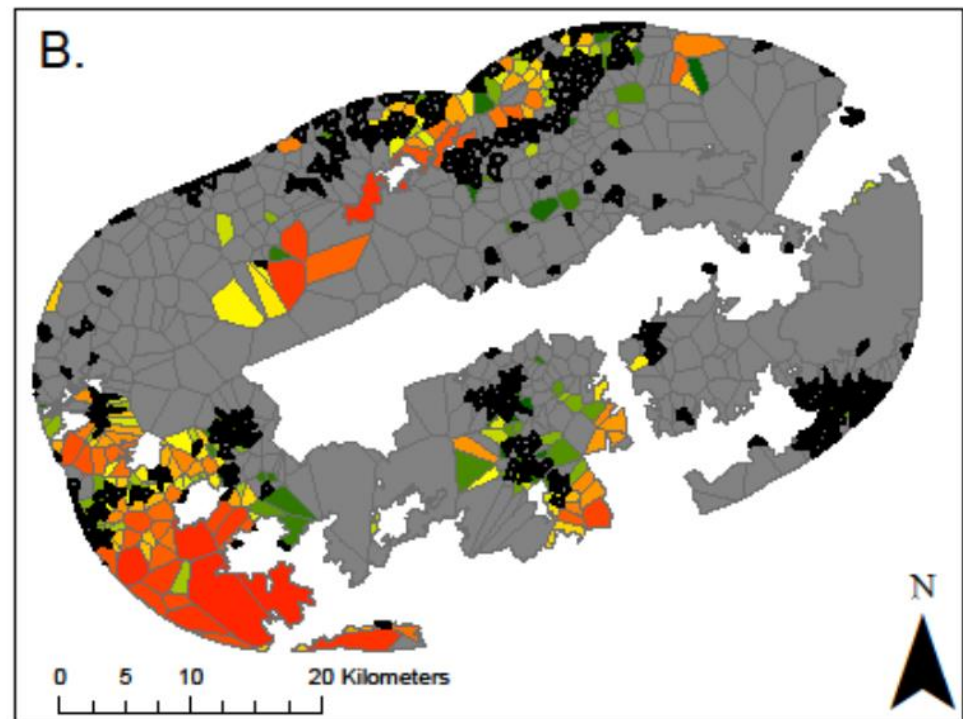
Adaptado de Forero-Medina & Vieira 2007

Passo 3. Quantificando os débitos

Área de Preservação Permanente



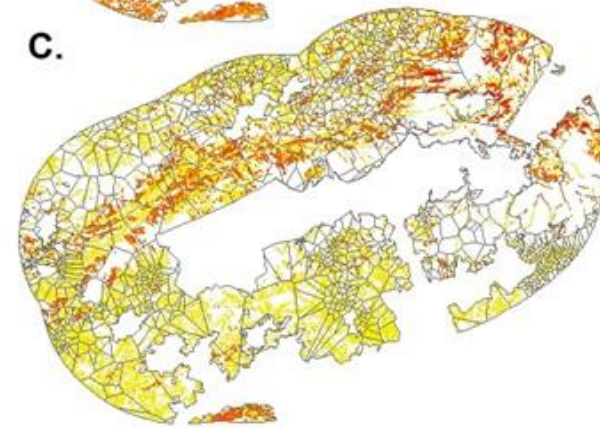
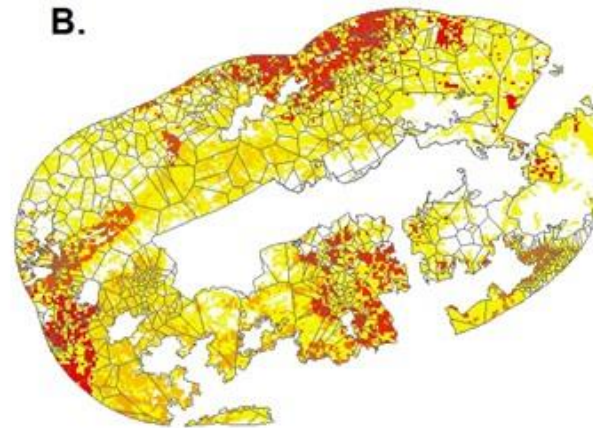
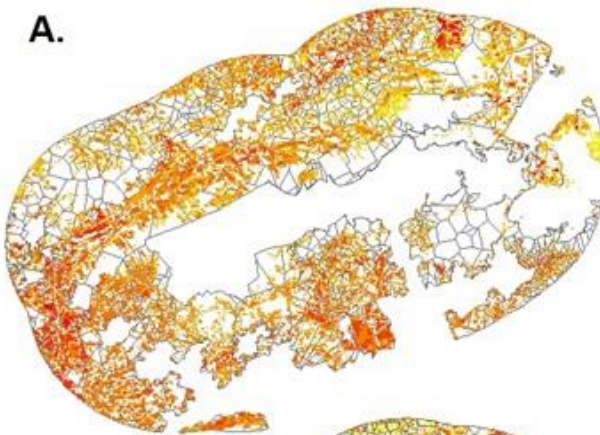
Reserva Legal



Passo 4. Quantificando os custos de transição

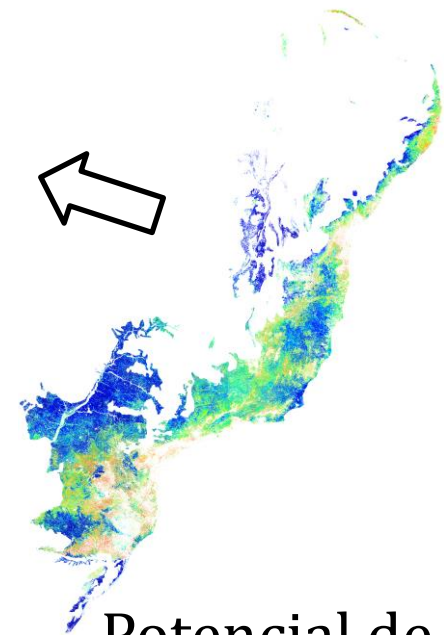
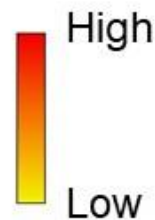
Oportunidade

Implementação



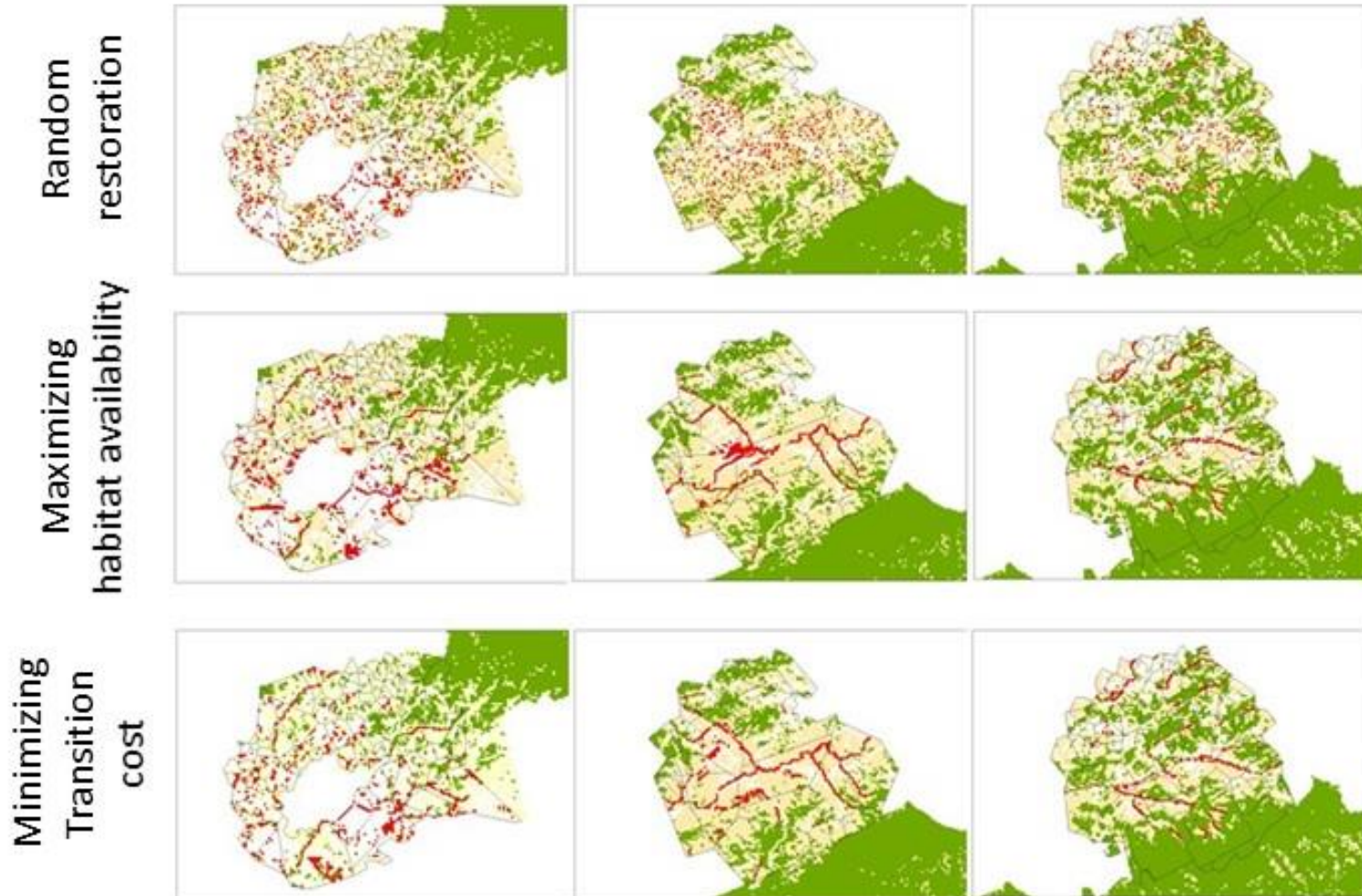
Transição

0 4,75 9,5 19 Kilometers



Potencial de regeneração natural

Passos 6 e 7. Priorização e simulação

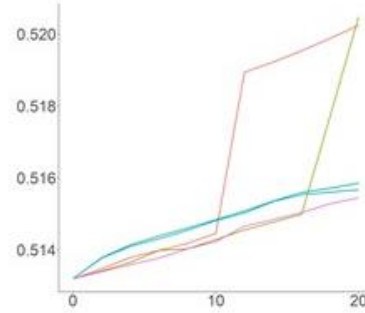
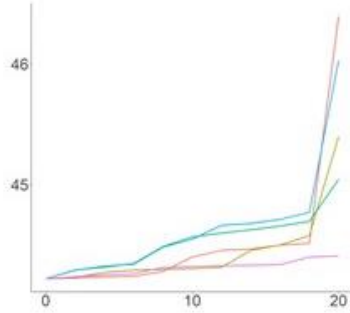
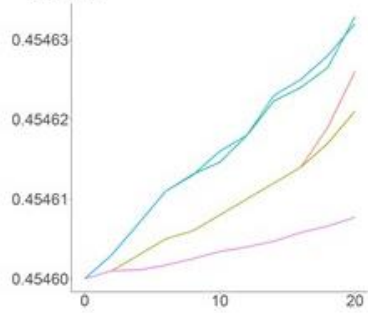


13%

24%

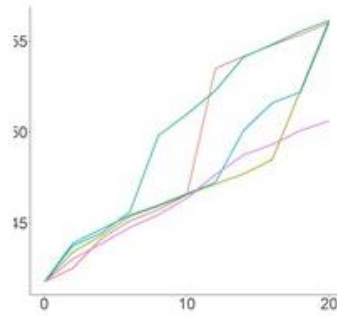
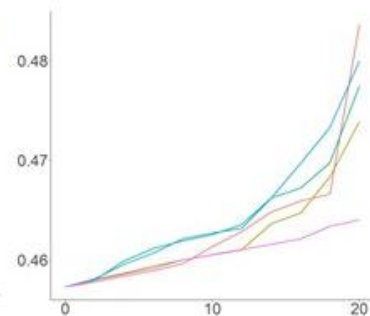
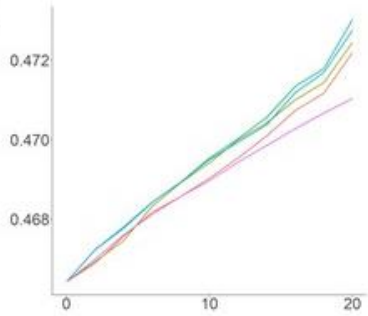
44%

10m



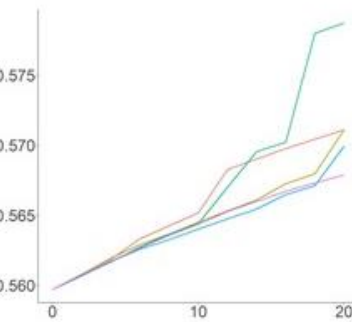
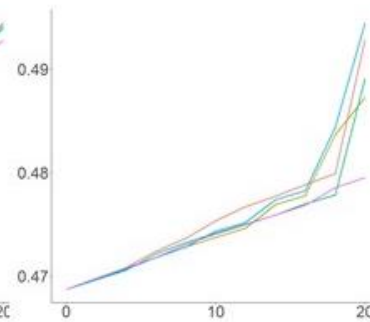
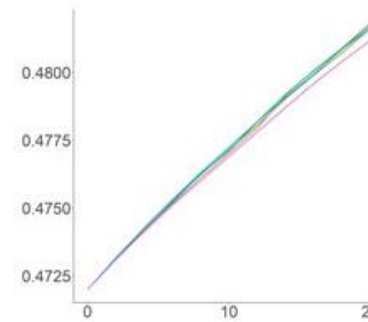
Habitat availability (I/C)

700m



- Minimizing opportunity cost (—)
- Minimizing transition cost (—)
- Maximizing habitat availability (—)
- Maximizing habitat availability while minimizing cost (—)
- Random restoration (—)

3000m



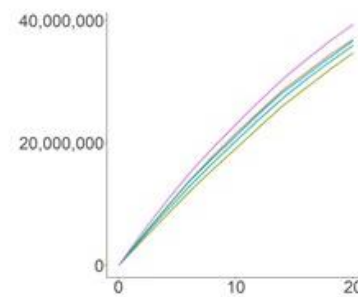
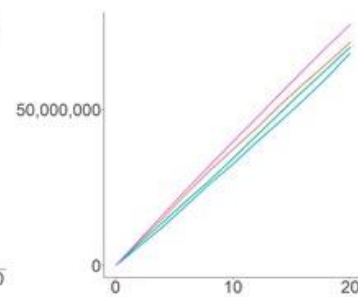
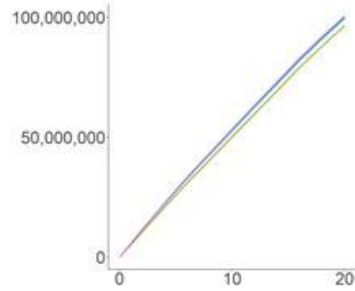
Time (years)

13%

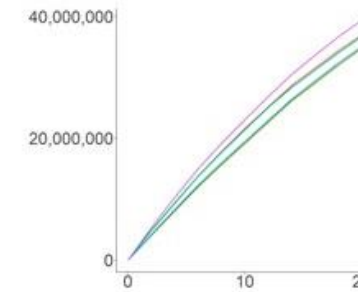
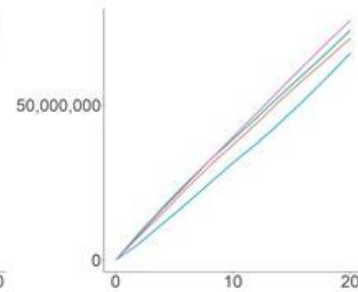
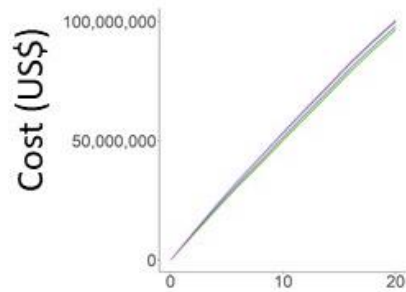
24%

44%

10m

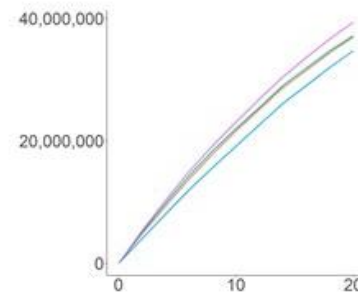
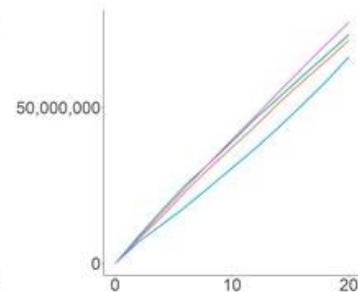
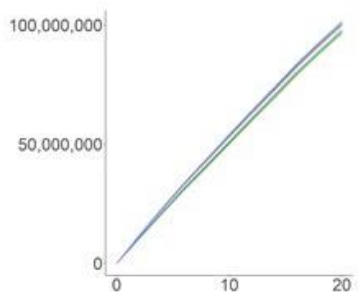


700m

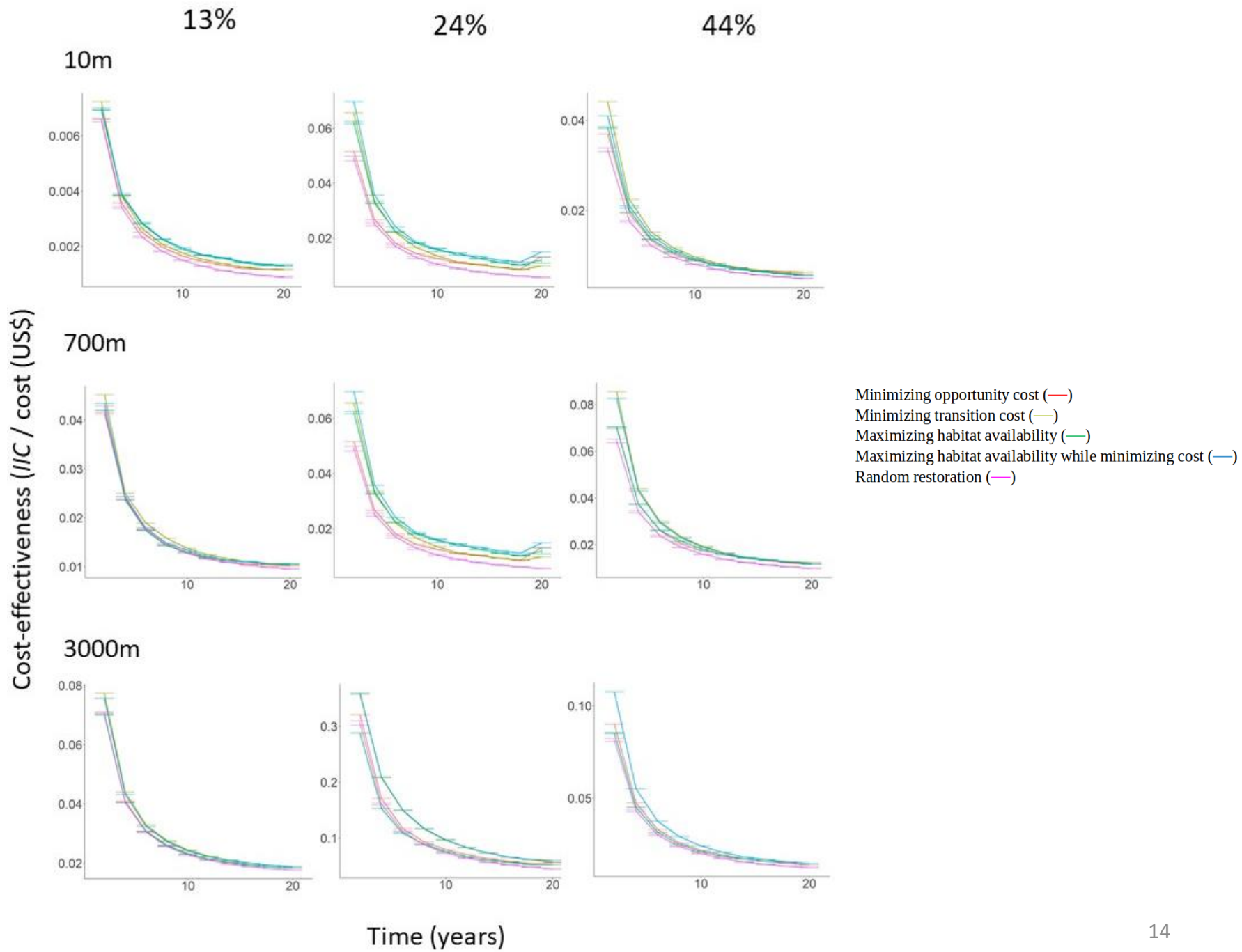


- Minimizing opportunity cost (—)
- Minimizing transition cost (—)
- Maximizing habitat availability (—)
- Maximizing habitat availability while minimizing cost (—)
- Random restoration (—)

3000m



Time (years)



	Increment in habitat availability			Cost-effectiveness (IIS/Cost)		
A. Landscape with 13% of forest cover	10m	700m	3000m	10m	700m	3000m
Min. Opp. Cost	60.09	132.26	155.78	.00120	.01012	.01841
Min. Trans. Cost	48.51	129.32	153.64	.00115	.01033	.01887
Max. Hab.	76.96	145.59	159.52	.00131	.01060	.01850
Max. Hab./Min. Trans. Cost	75.60	134.93	155.61	.00133	.01039	.01868
Random	18.31	120.39	147.83	.00088	.00957	.01777
B. Landscape with 24% of forest cover						
Min. Opp. Cost	141.78	98.23	66.65	.01324	.04174	.05586
Min. Trans. Cost	71.65	72.78	59.24	.01070	.04099	.06003
Max. Hab.	119.49	99.27	59.77	.01186	.04096	.05219
Max. Hab./Min. Trans. Cost	159.82	90.03	67.46	.01519	.04227	.05919
Random	12.97	42.11	47.23	.00572	.02740	.04511
C. Landscape with 44% of forest cover						
Min. Opp. Cost	21.37	26.86	18.88	.15317	.30318	.36199
Min. Trans. Cost	22.62	26.87	18.89	.16467	.32263	.38521
Max. Hab.	16.46	27.03	26.61	.14743	.30452	.38671
Max. Hab./Min. Trans. Cost	12.80	26.48	18.66	.14931	.31702	.37895
Random	8.93	16.82	14.34	.12903	.26203	.32677

Principais resultados

- Estratégias que buscam aumentar a conectividade antecipam os benefícios para biodiversidade, mesmo com altas restrições
- A estratégia mais custo efetiva depende de ambos - quantidade de floresta na paisagem e espécie de interesse
- Priorização espacial podem aumentar a custo-efetividade das iniciativas de restauração
- A custo-efetividade diminui ao longo do tempo

GEF – Áreas privadas (IIS/MMA)

- Metas de Aichi para a Biodiversidade (1, 5, 7, 11, 14, 15)
- *Other effective area-based conservation measures*
- SNUC e Terras Indígenas
- 53% de vegetação nativa em áreas privadas
- Código Florestal (Lei 12.651/2012)
- CAR, SiCAR e CRA

Terceiro pilar para conservação

Como dar escala a essas ações?



Plataforma

- amigável e fácil
- livaria geoespacial
- todos os processos automatizados
- módulos customizados
- poderosos algoritmos de otimização
- robusta infra-estrutura computacional livre acesso ou restrita

Treinamentos

- princípios
- uso da plataforma
- como transformar mapas em ações

DISCIPLINES & APPLICATIONS

Terrestrial & Marine Ecology
Restoration & Fire Ecology
Urban Ecology
Conservation Science

Social science
Planning
Resilience

DECISION SUPPORT TOOLS

Systematic conservation planning (SCP)
Multi-objective optimization (MOO)
Multi-criteria decision analysis (MCDA)
Structured decision making (SDM)
Project prioritization protocol (PPP)
Scenario analysis
Alternative futures
Expert elicitation

POLICY & ECONOMICS

Threatened species management
Offsetting
International trade
Markets
Ecosystem service valuation

ENVIRONMENTAL DECISION SUPPORT

RISK REDUCTION

Modern portfolio theory (MPT)
Robust optimization

SOCIAL SCIENCE

Obstacles to institutional uptake
Cooperation
Human behavior
Communicating science effectively

OPTIMISATION METHODS

Linear programming (LP, ILP, MILP, MIQLP)
Markov decision processes (MDP, POMDP)
Stochastic dynamic programming (SDP)
Heuristics

MONITORING

Value of information (VOI, EVOPI)
Optimising effort in space and time

MODELLING

Systems modelling
Species distribution modelling (SDM)
Population viability analysis
Climate change modelling

Oportunidades

- Inserção da conectividade no CAR medida de forma espacialmente explícita e dinâmica
- Inserção da consideração de custos – cenário custo-efetivo
- Inserção de outros benefícios, por exemplo, sequestro de carbono, polinização – cenário de múltiplos benefícios
- Priorização Adaptativa da Recuperação Ambiental (PARA)