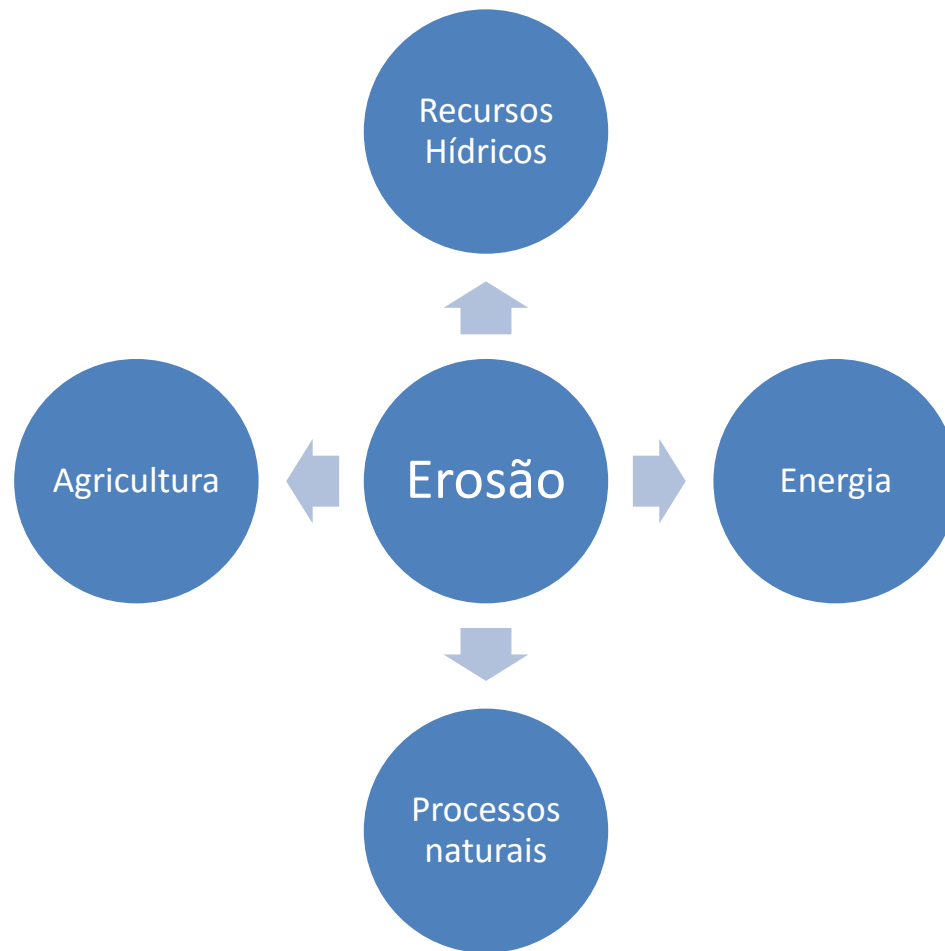


Índice de Erosão Bacia do Curuá- Una-PA

SER 300 – Introdução ao Geoprocessamento
São José dos Campos, 2016

Introdução



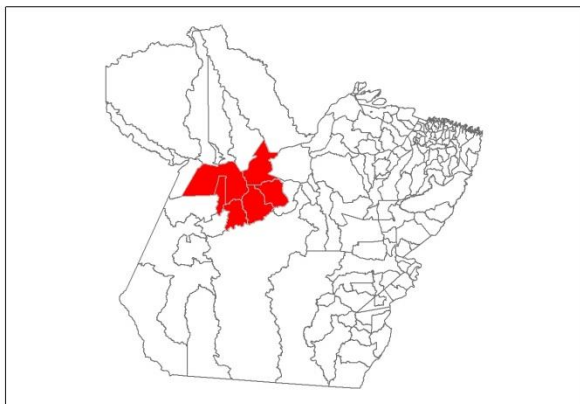
Objetivo

- Estimar a perda de solo (USLE) na bacia do Curuá-Una
- Índice de susceptibilidade a erosão

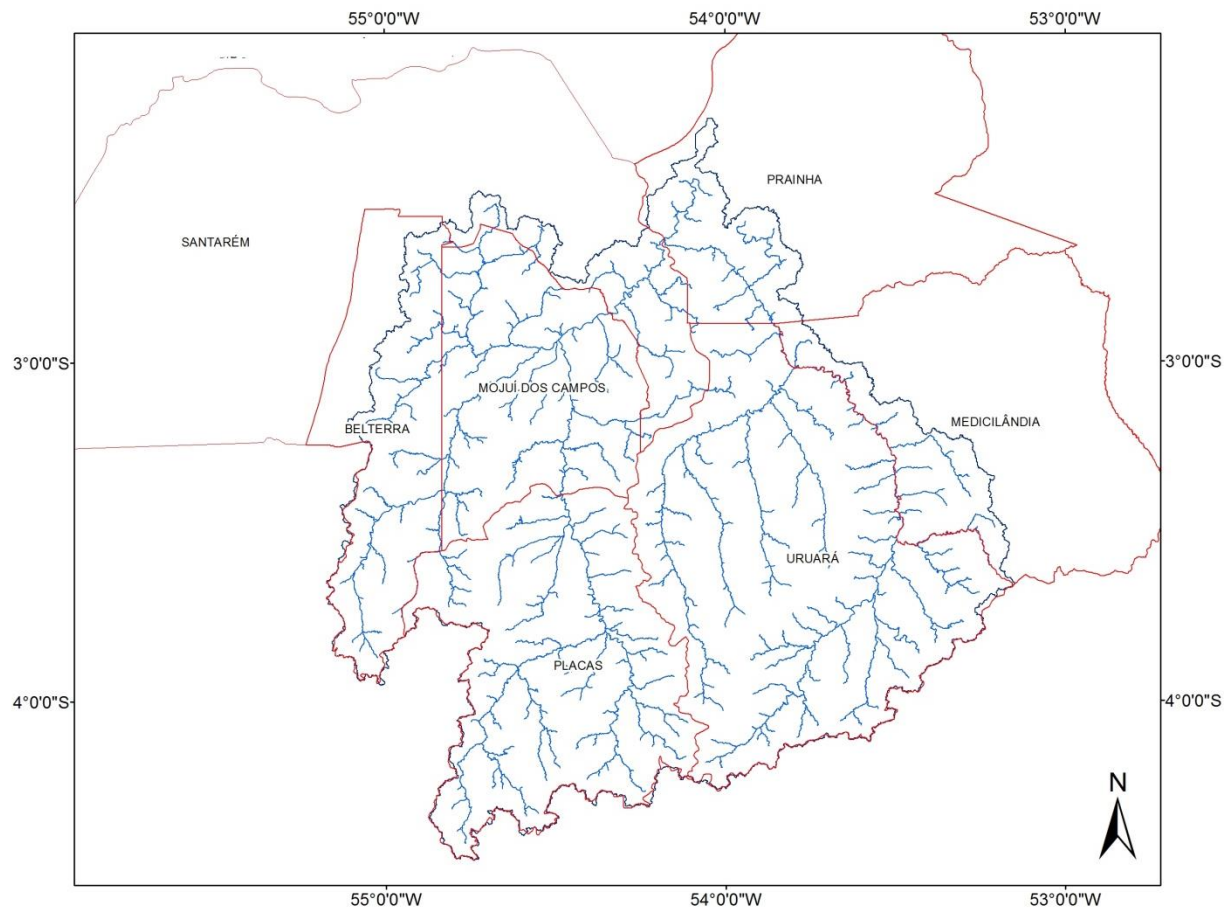
Área de Estudo



Limites Estaduais



Pará - Limites Municipais



Bacia Curuá-Una

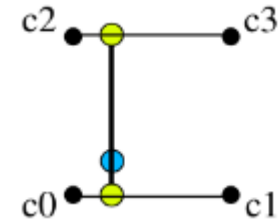
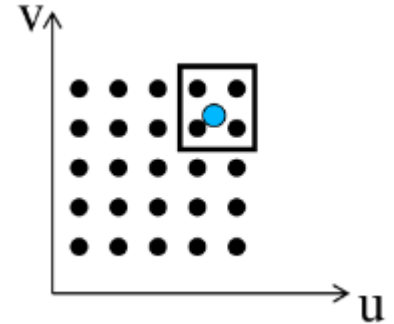
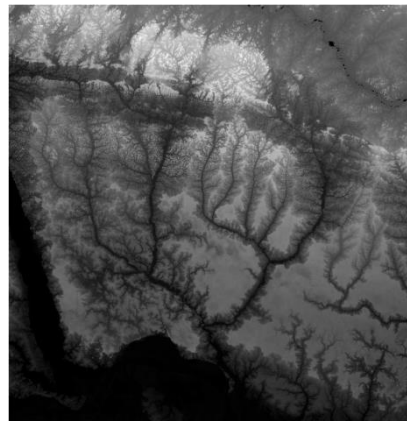
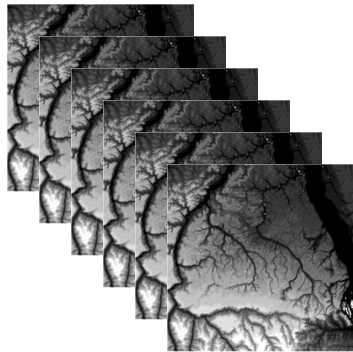
Base de dados

Descrição	Fonte
SRTM	USGS
SRTM	CGIAR
Mapa de Solos	IBGE
TerraClass	INPE/EMBRAPA
Isoietas	CPRM
Unidades de Conservação	ICMBIO
Projetos de Assentamento	IBGE
Terras Indígenas	FUNAI
Rodovias	DNIT

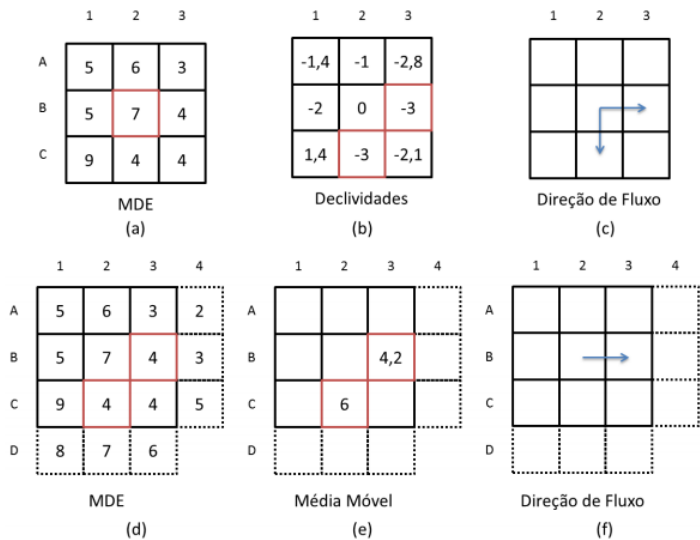
Metodologia



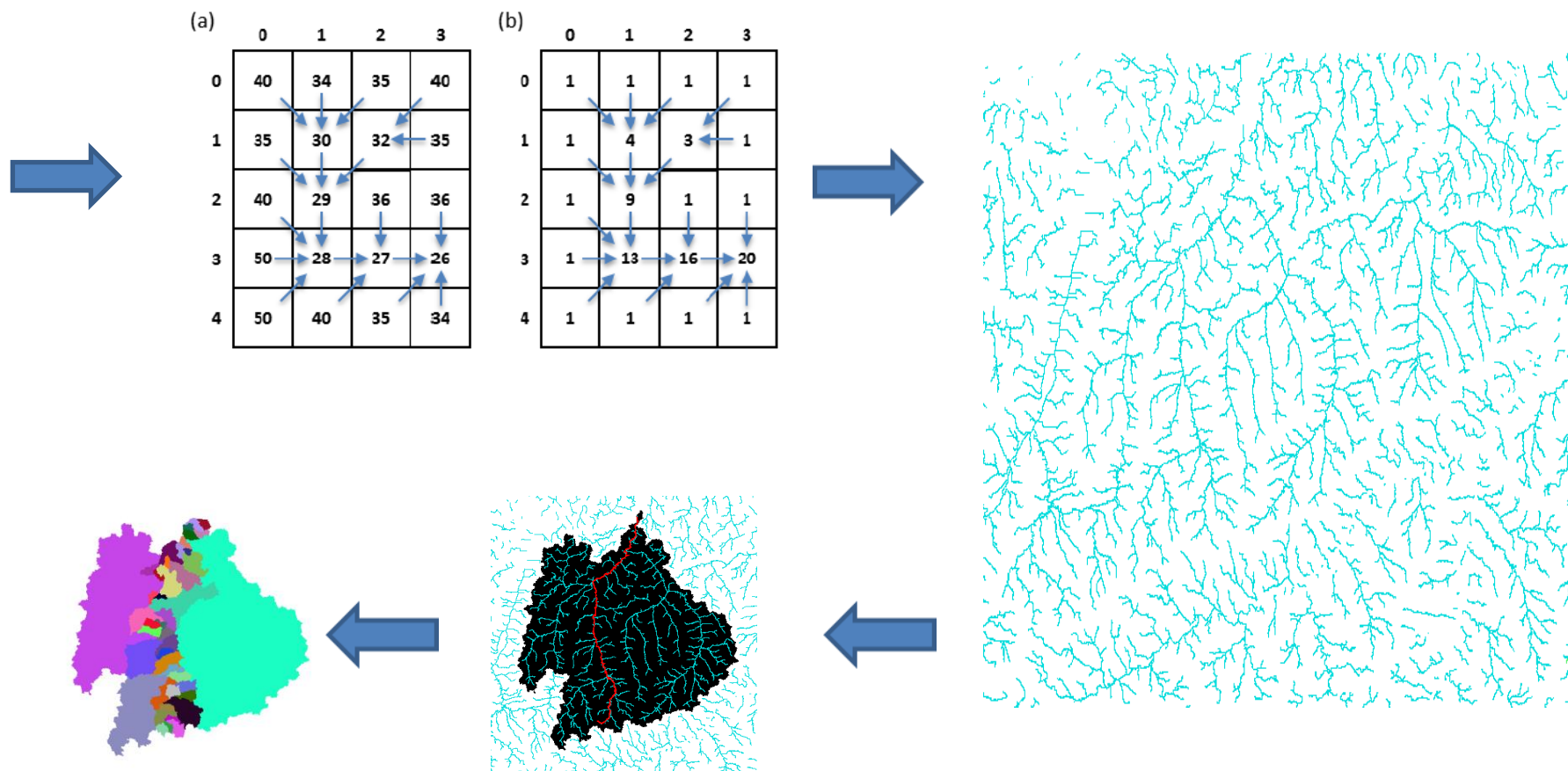
Delimitação da área de estudo



Mínimos locais
Áreas plana



Delimitação da área de estudo



Equação de perda de solo

$$PS = R * K * LS * CP$$

R – Fator de erosividade da chuva

K – Fator de erodibilidade do solo

L – Fator de comprimento da encosta

S – Fator de declividade

C – Fator de uso e manejo do solo

P – Fator de práticas conservacionistas

Fator R



Equação de estimativa de chuva

$$R_x = 36,849 \cdot \left(\frac{M_x^2}{P} \right)^{1,0852}$$

Morais et. al (1991),
apud Pruski, 2009

R_x = erosividade para cada mês
 M_x = precipitação média mensal
P = precipitação média anual

Divisão do Brasil em regiões homogêneas, em termos de características da precipitação. Fonte: Silva, 2004 apud Pruski, 2009.

Fator R

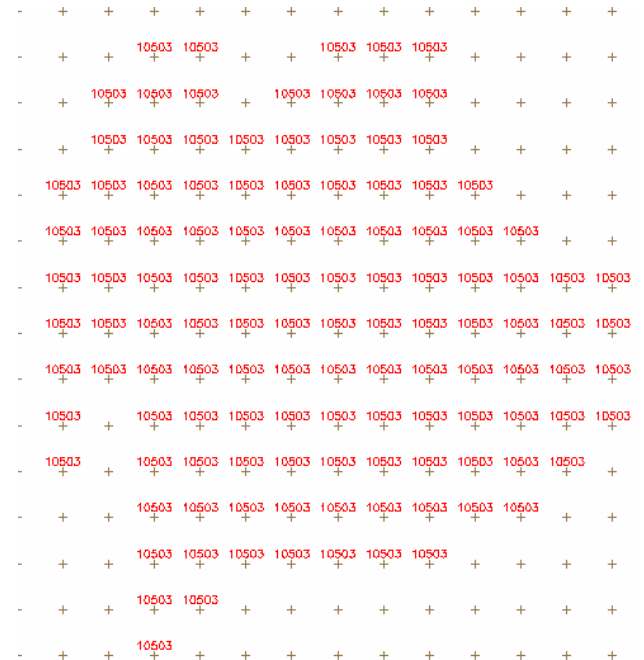
	Precipitação Média Mensal [mm]	Erosividade Mensal (R) [MJ.mm/ha.h]
Janeiro	225	1228.36
Fevereiro	275	1898.78
Março	325	2728.60
Abril	293.75	2191.02
Maio	230	1288.37
Junho	110	259.89
Julho	62.5	76.19
Agosto	50	46.95
Setembro	62.5	76.19
Outubro	62.5	76.19
Novembro	100	211.32
Dezembro	137.5	421.81

Precipitação Média Anual

11.600 MJ.mm /ha.ano
(Martorano, 2013.)

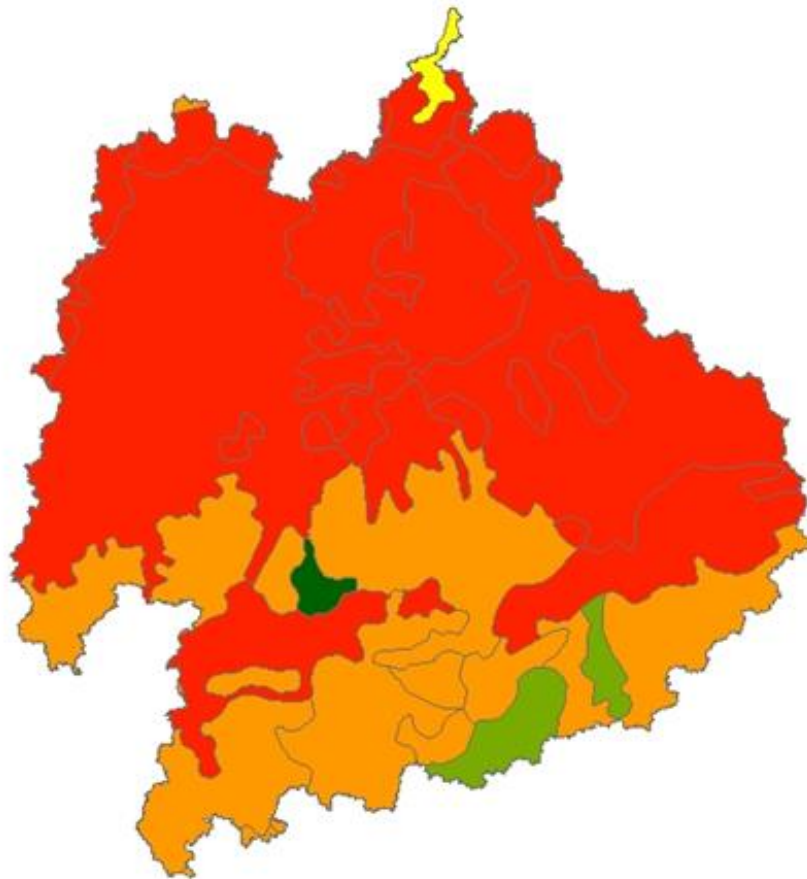
Precipitação Média Anual

10.503 MJ.mm /ha.ano
(Produção do autor)



Fator K

Mapa Pedológico da Bacia do Curuá-Una



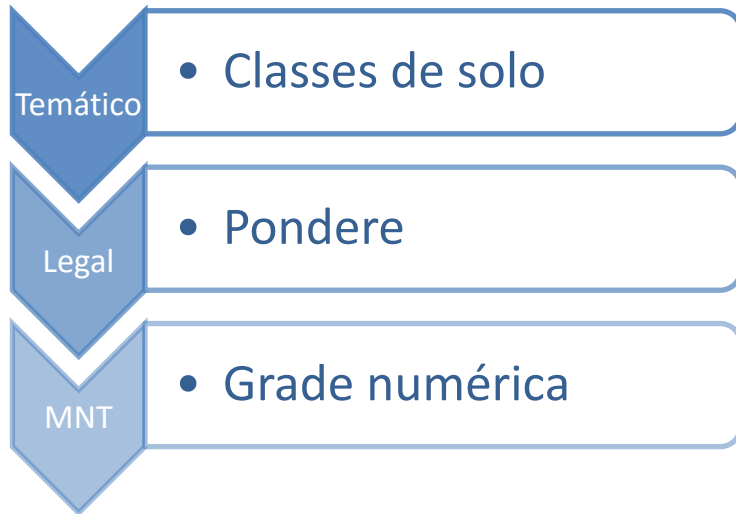
Legenda

- Argissolo Vermelho Amarelo
- Gleissolo Háptico
- Latossolo Amarelo
- Latossolo Vermelho Amarelo
- Neossolos Litólicos

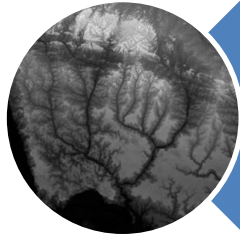
Fonte: IBGE
Escala: 1:250.000

CLASSE	SIGLA	K	FONTE
Argissolo Vermelho Amarelo	PVA	0.034	Barros, 2012
Gleissolo Háptico	GX	0.035	Barros, 2012
Latossolo Amarelo	LA	0.034	Barros, 2016
Latossolo Vermelho Amarelo	LVA	0.035	Barros, 2016
Neossolos Litólicos	RL	0.04	Barros, 2016; Barros, 2012

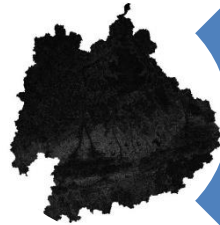
Fator K



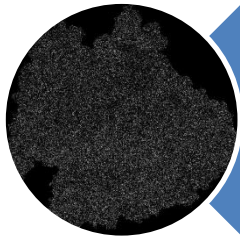
Fator LS



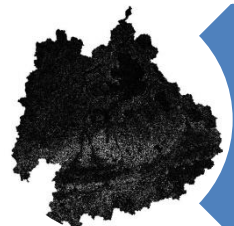
SRTM



Declividade (S)



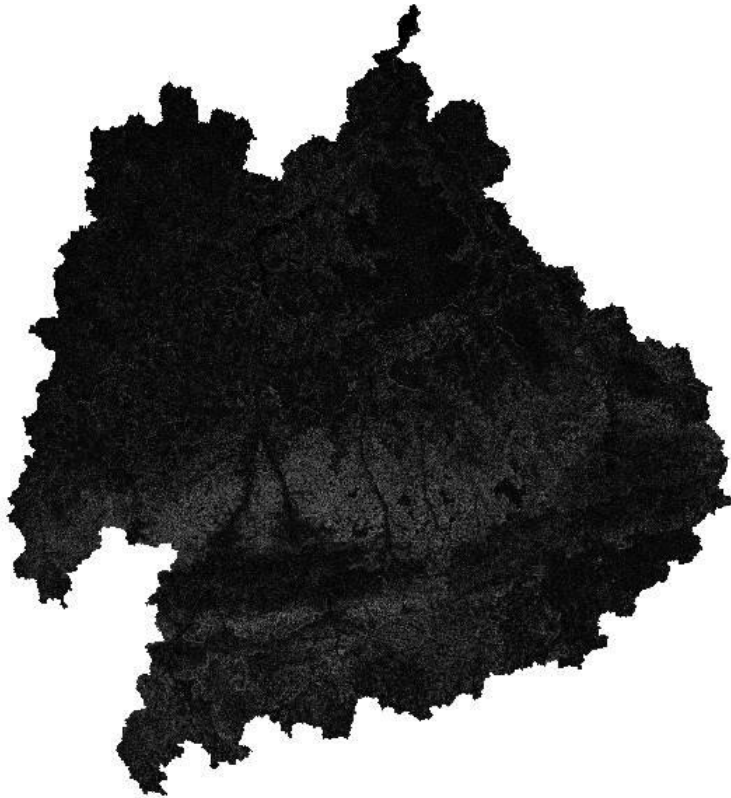
Comprimento de
Encosta (L)



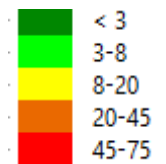
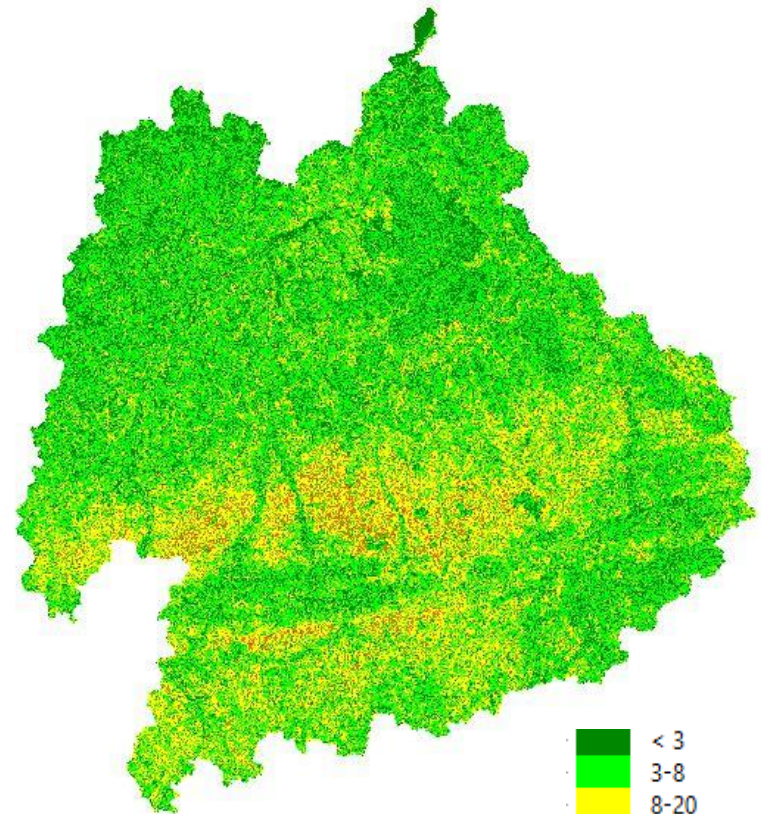
Fator LS

Fator LS

Declividade (Percentual)

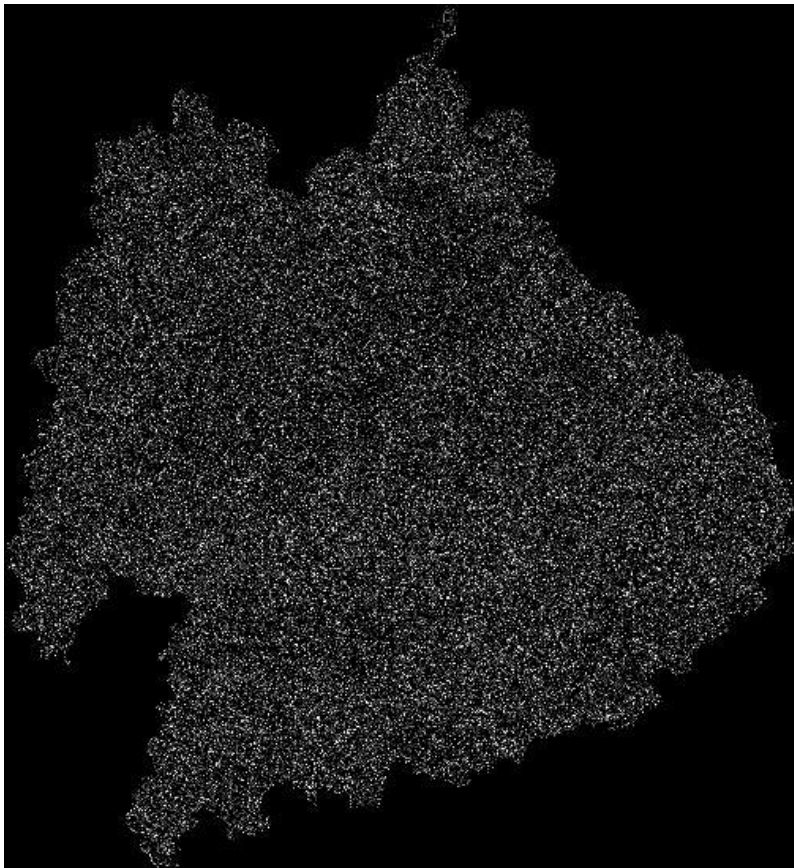


Declividade (Fatiamento)

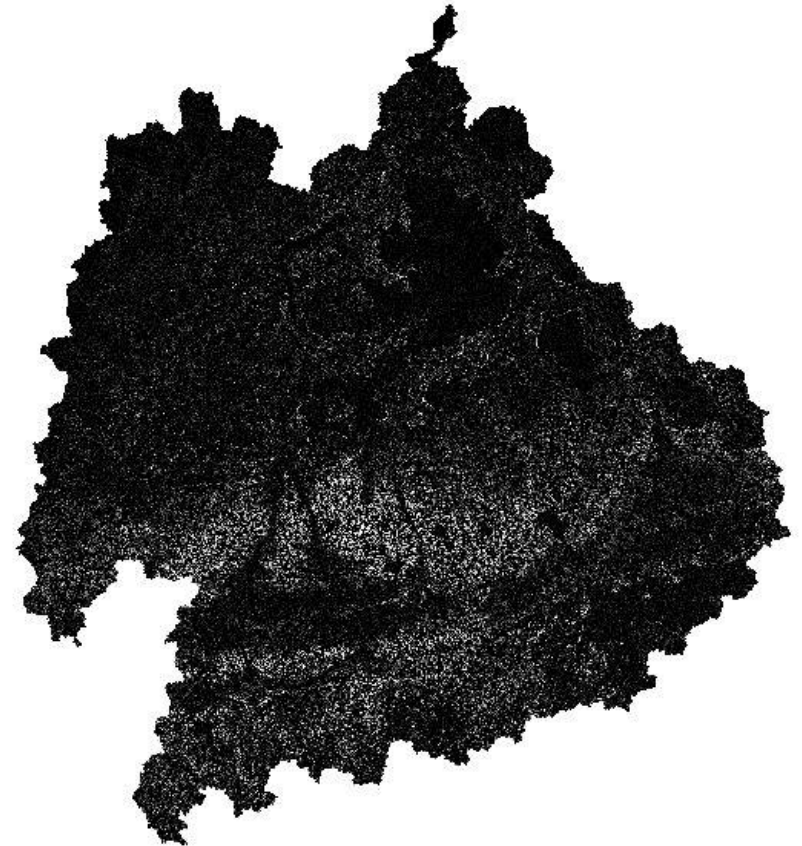


Fator LS

Comprimento de Encosta

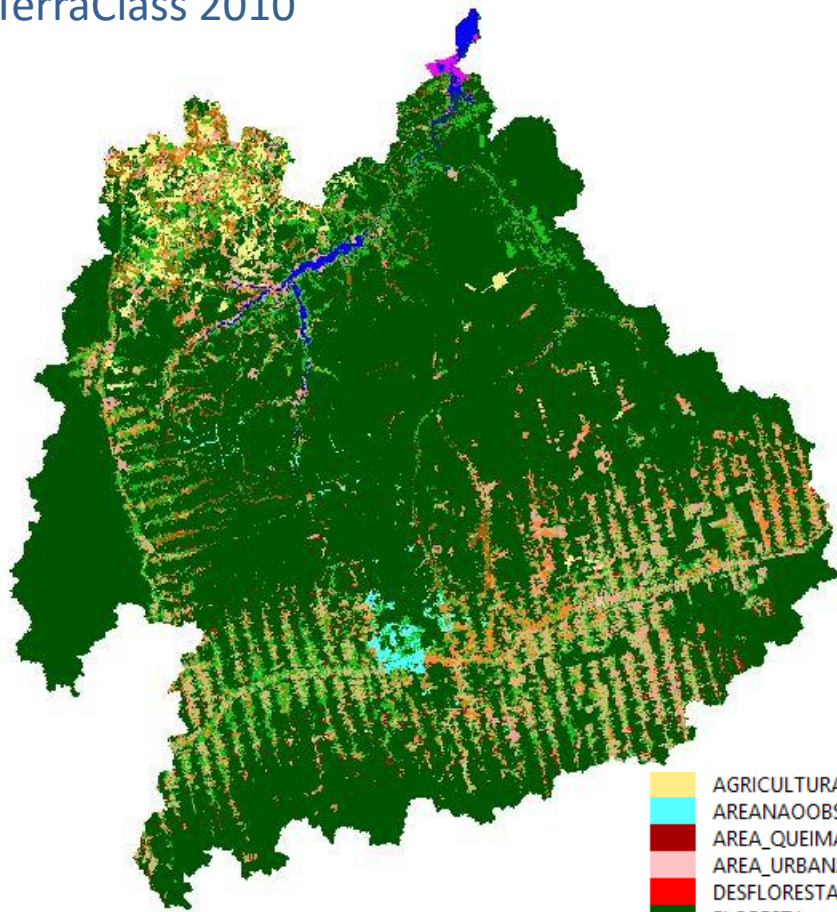


$$LS = 0,00984 * L^{0,63} * S^{1,18}$$

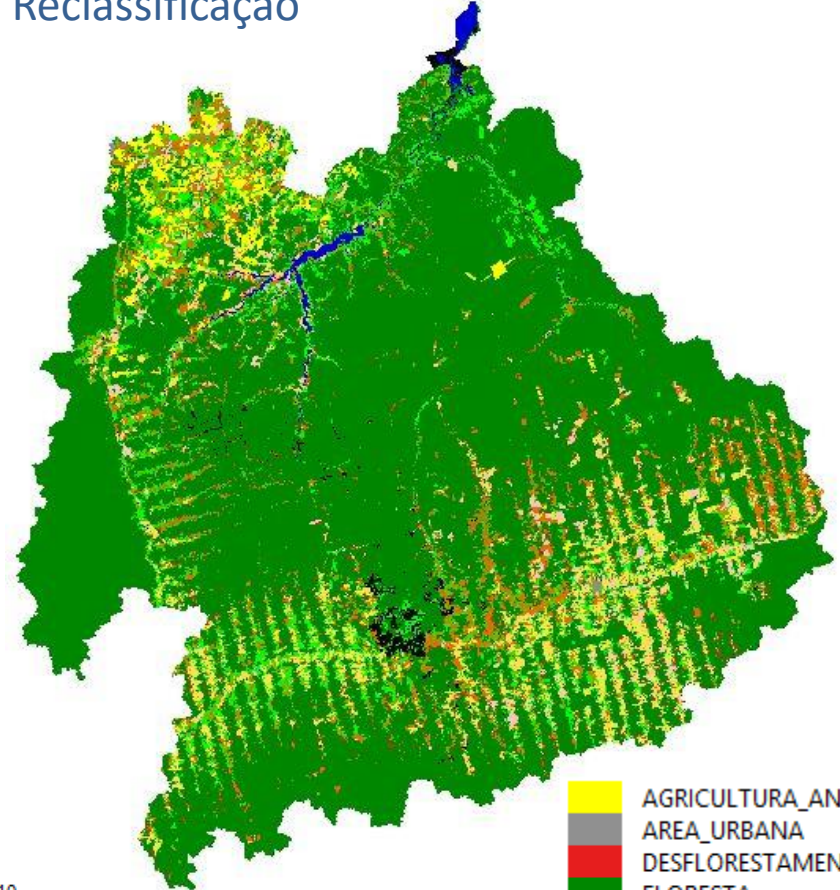


Fator CP

TerraClass 2010



Reclassificação



Fator CP

- Não foram observadas práticas conservacionistas (P) para a Bacia Curuá-Uma

CLASSE	C
Hidrografia	0
Área urbana	0
Mascara	0
Floresta	0.001
Vegetação Secundária	0.005
Pasto Sujo	0.05
Regeneração com Pasto	0.05
Desflorestamento	0.07
Agricultura Anual	0.082
Pasto Limpo	0.2
Mosaico de Ocupações	0.25

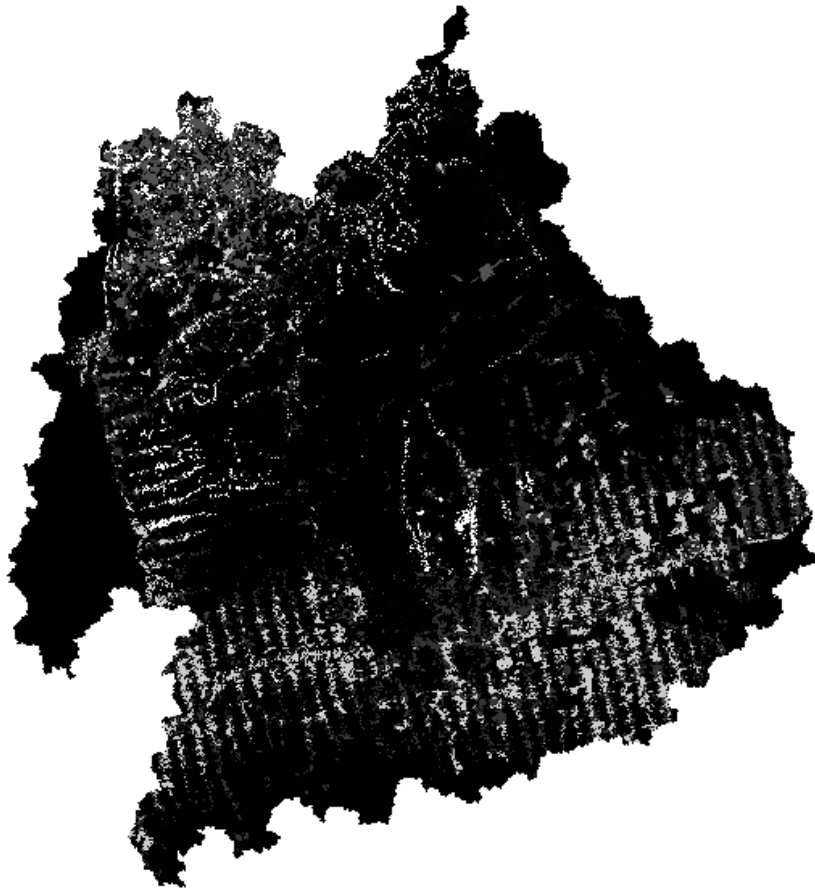
CLASSE	C
Hidrografia	0
Área urbana	0
Mascara	0
Floresta	0.001
Vegetação Secundária	0.008
Regeneração com Pasto	0.2
Pasto Sujo	0.4
Agricultura Anual	0.5
Mosaico de Ocupações	0.6
Pasto Limpo	0.7
Desflorestamento	0.8

Fonte: Rocha, 2015 e Silva, 2015

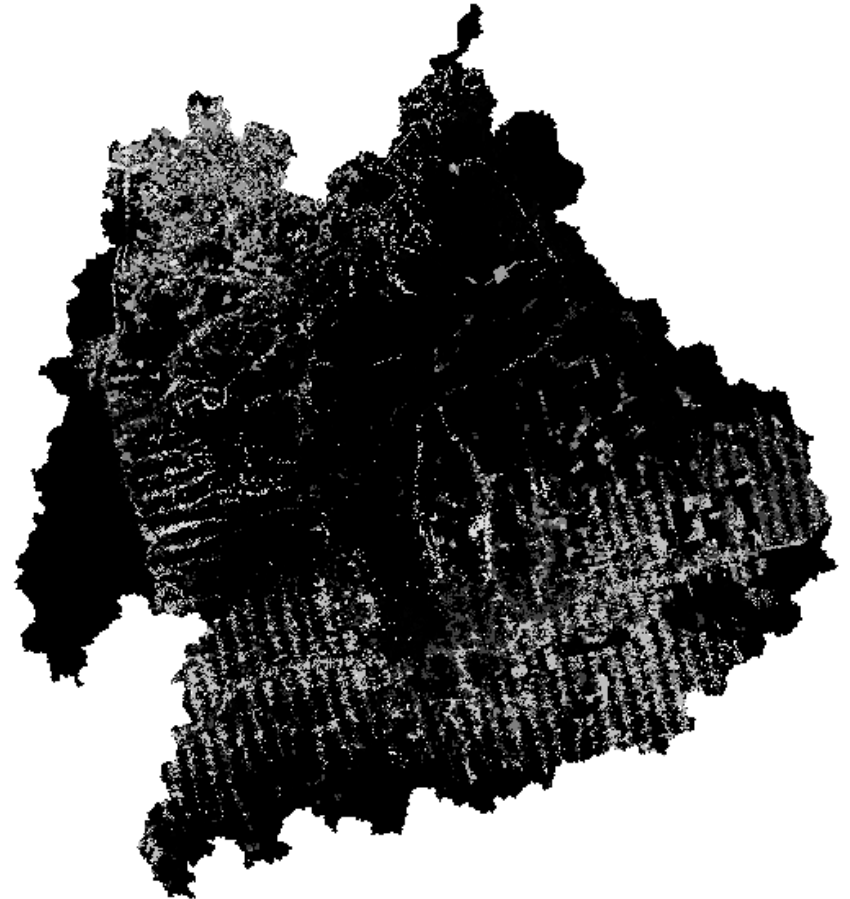
Fonte: Produção do autor

Fator CP

Referência



Novos valores



Fonte: Rocha, 2015 e Silva, 2015.

Fonte: Produção do autor.

Fuzzy gamma

Normalização

$$\frac{(\text{Valor da célula} - \text{Mínimo})}{(\text{Máximo} - \text{Mínimo})}$$

Fator LS

Fator CP

Fator K

Equação fuzzy gamma

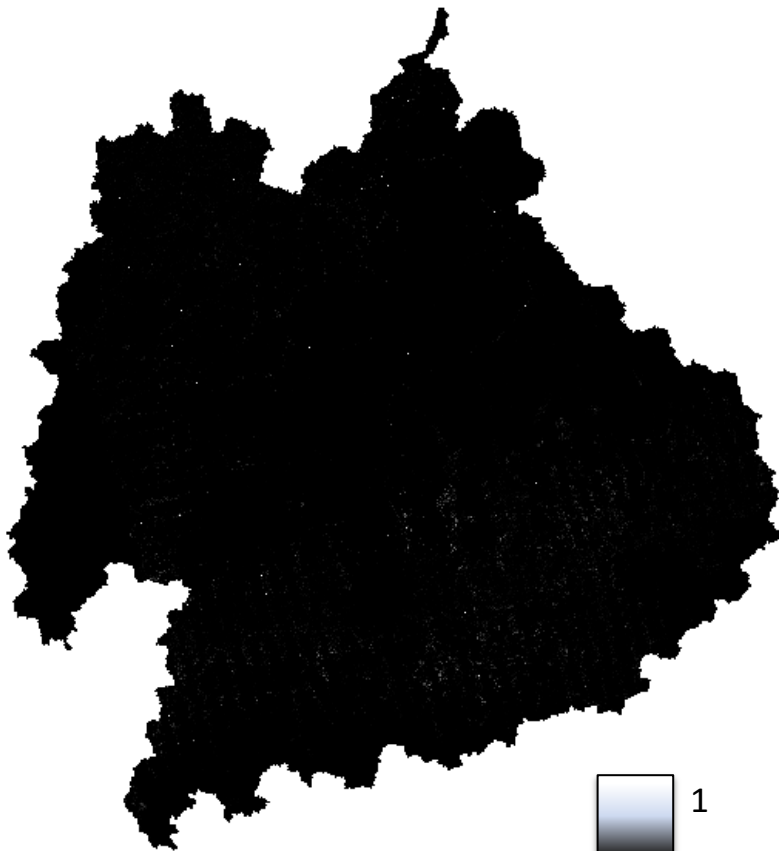
Fuzzy gamma = (((((1 - ((LS)*(1-uso)*(1-solos))) ^ γ)*((LS*uso*solos)^ (1- γ))*100);

Valores Gamma

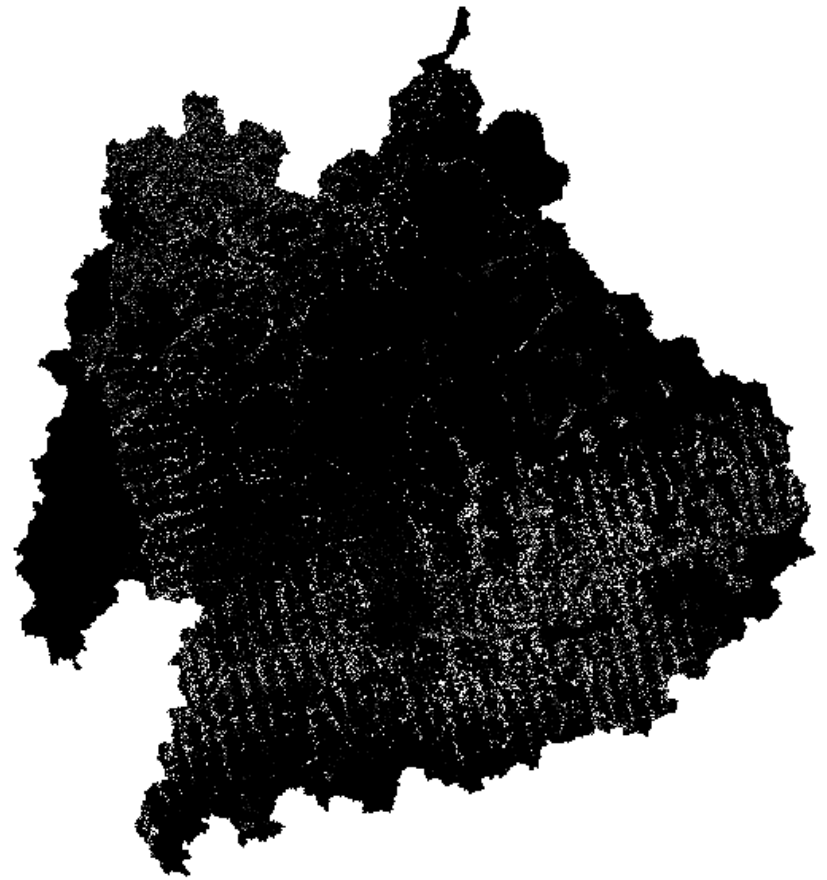


Resultados USLE

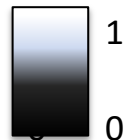
Sem contraste



Com contraste

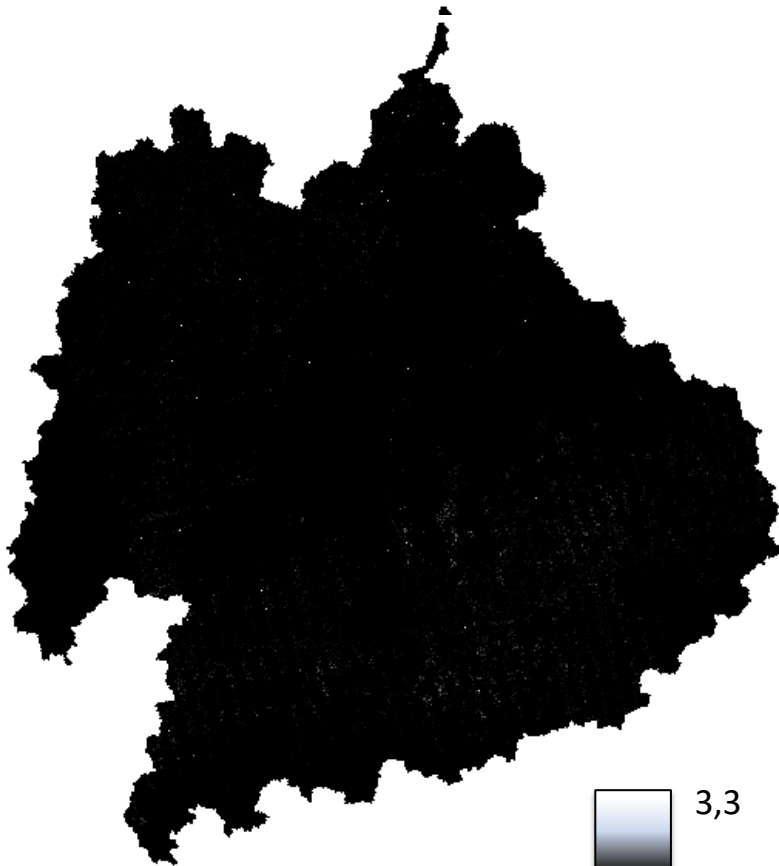


Fonte: Rocha, 2015 e Silva, 2015

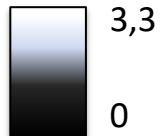
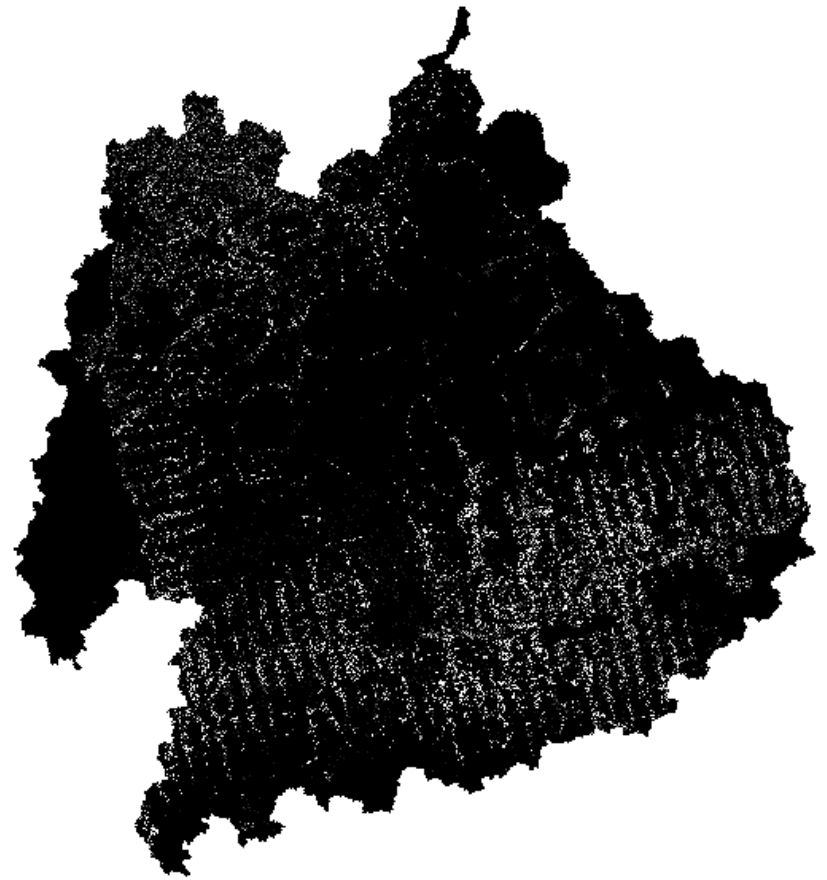


Resultados USLE

Sem contraste



Com contraste

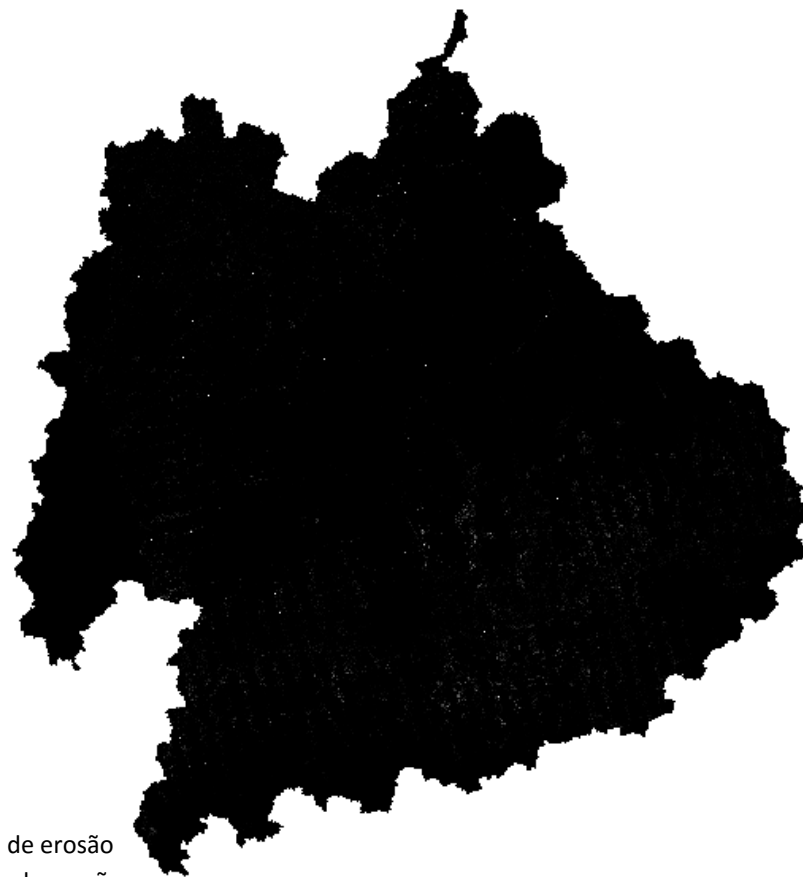
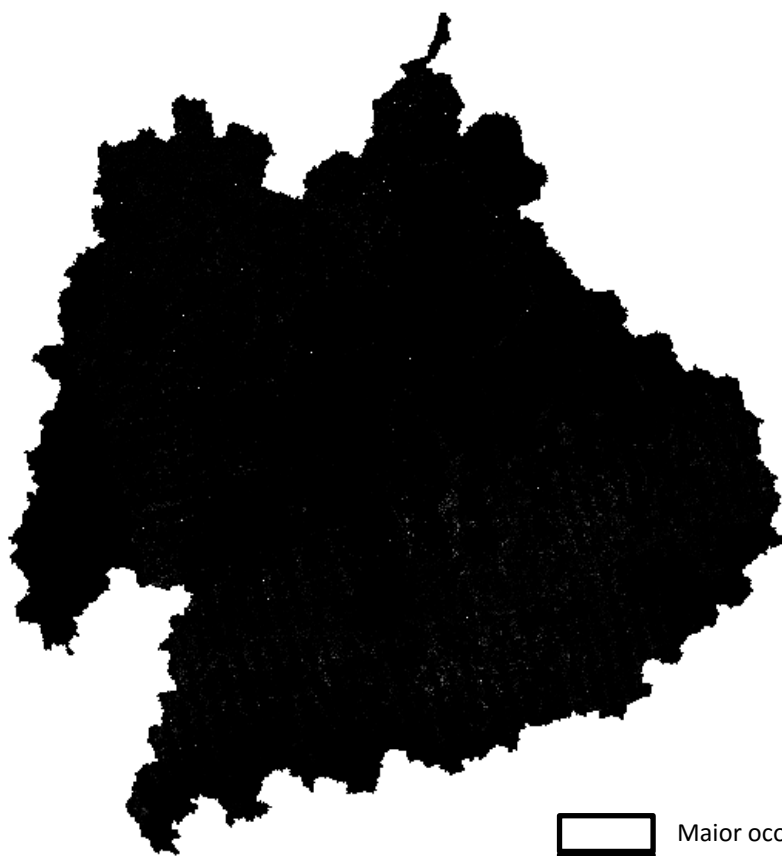


Fonte: Produção do autor.

Resultados

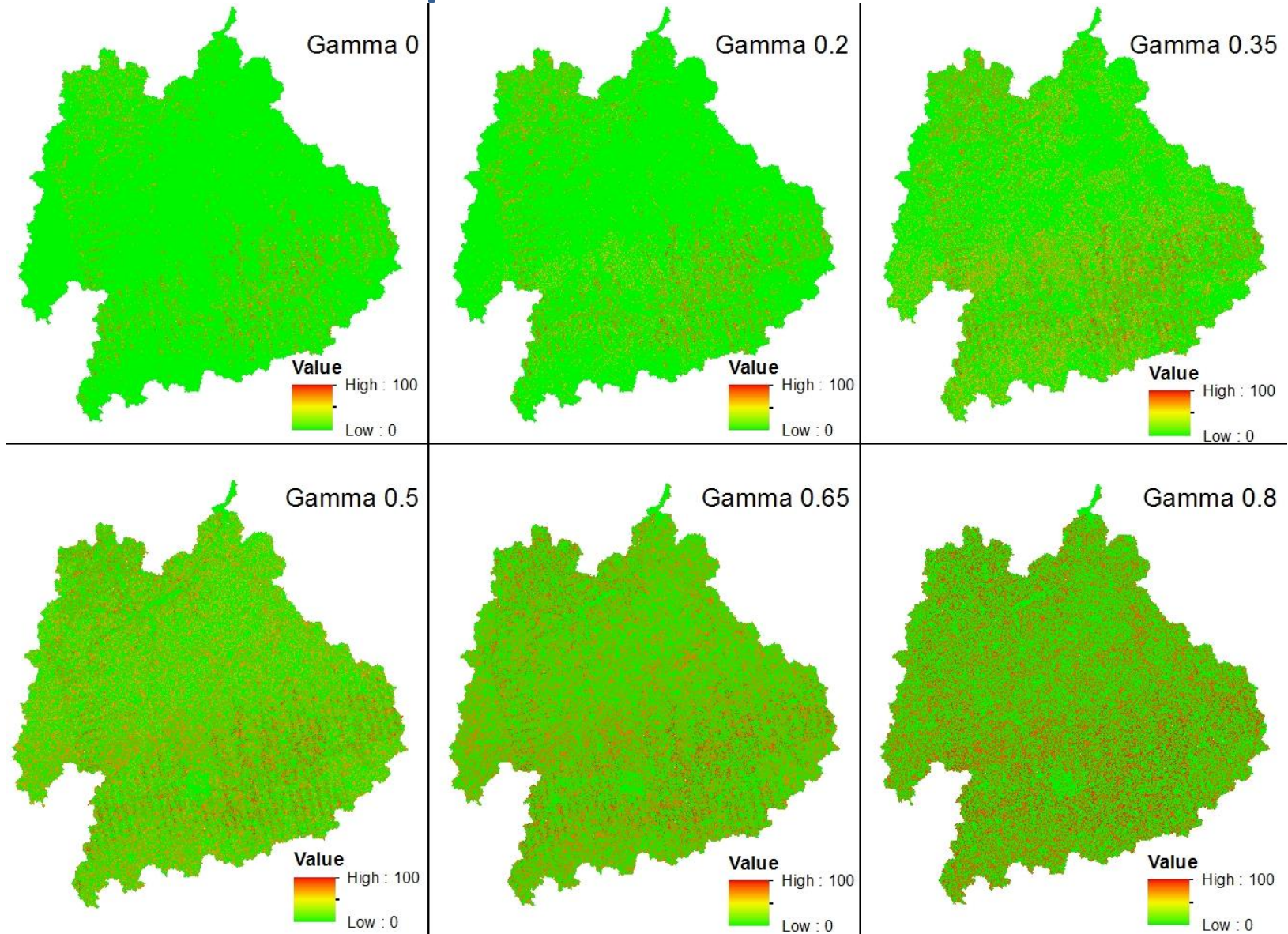
USLE

Fuzzy gamma (0)

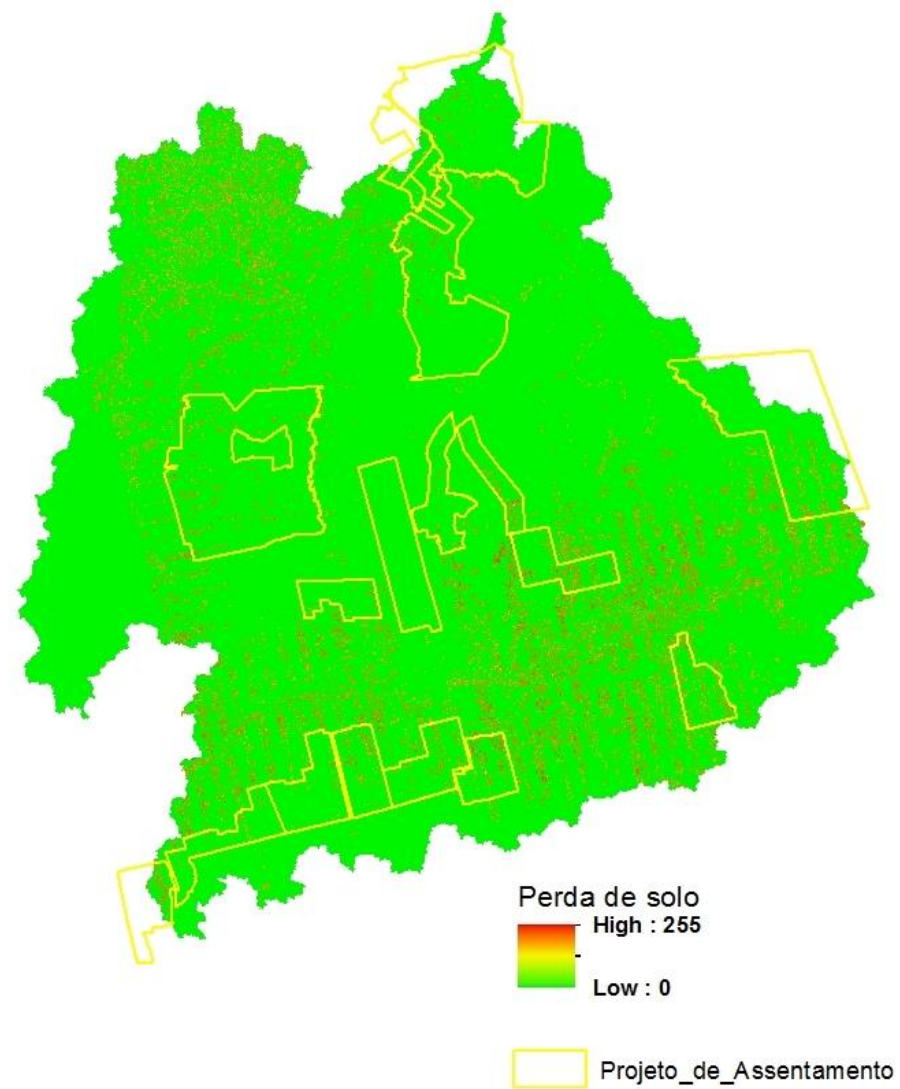
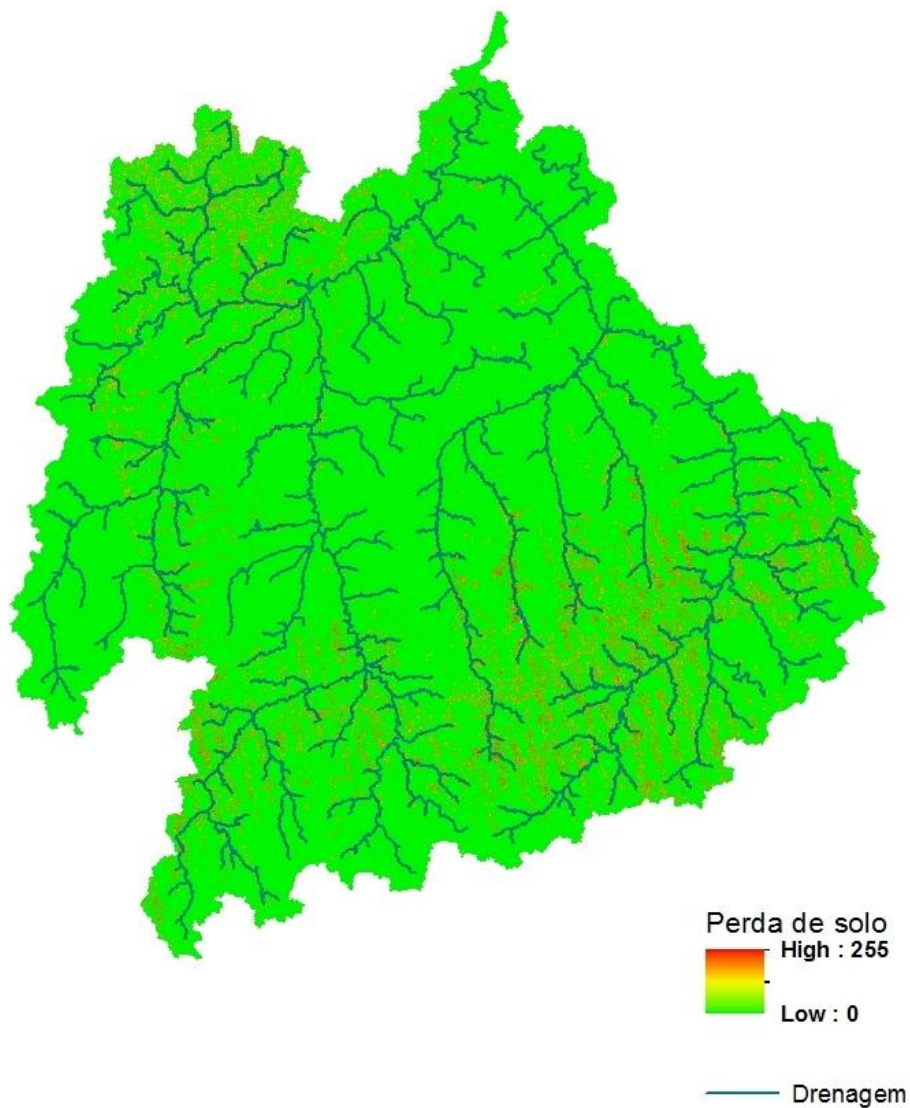


Maior ocorrência de erosão
Menor ocorrência de erosão

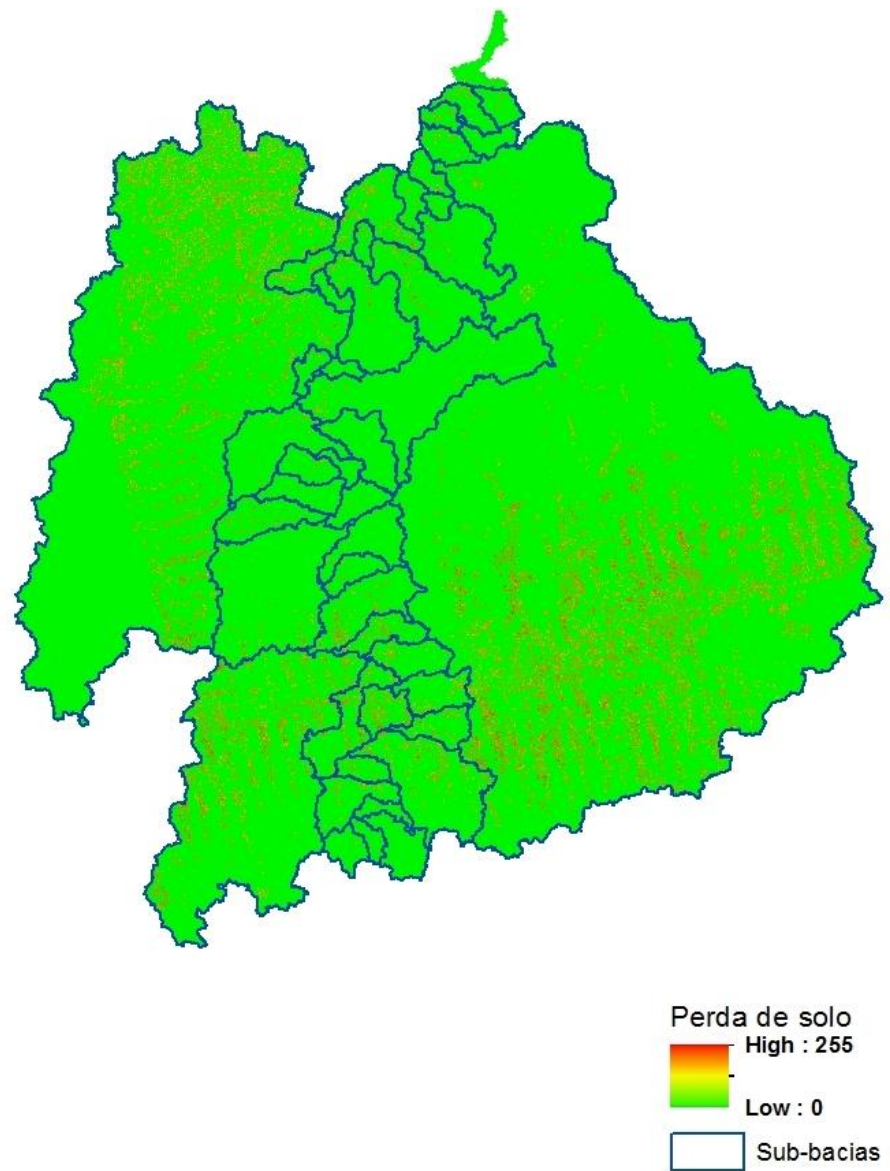
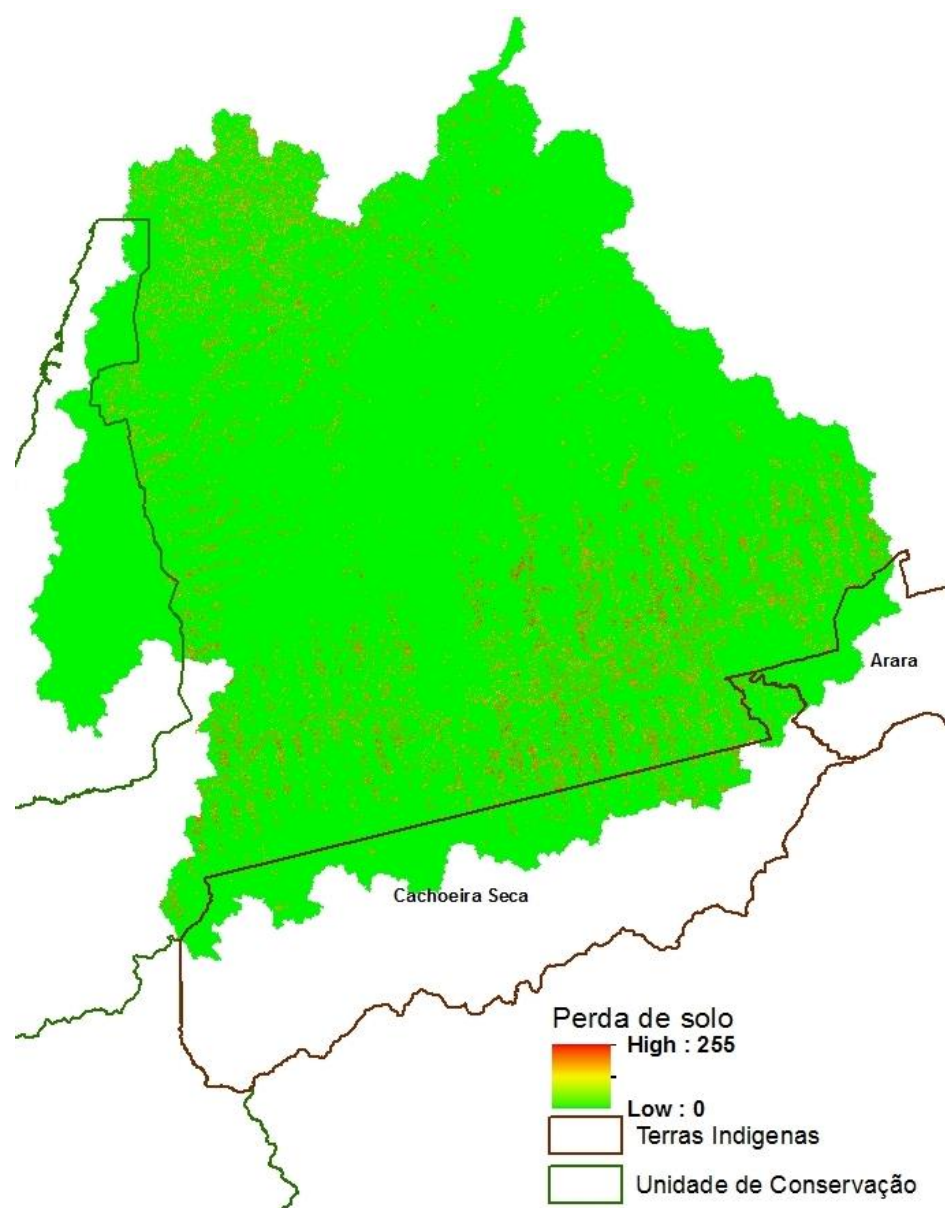
Fuzzy gamma – Índice de susceptibilidade a erosão



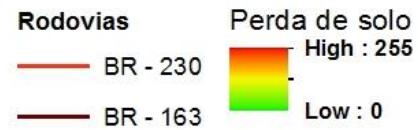
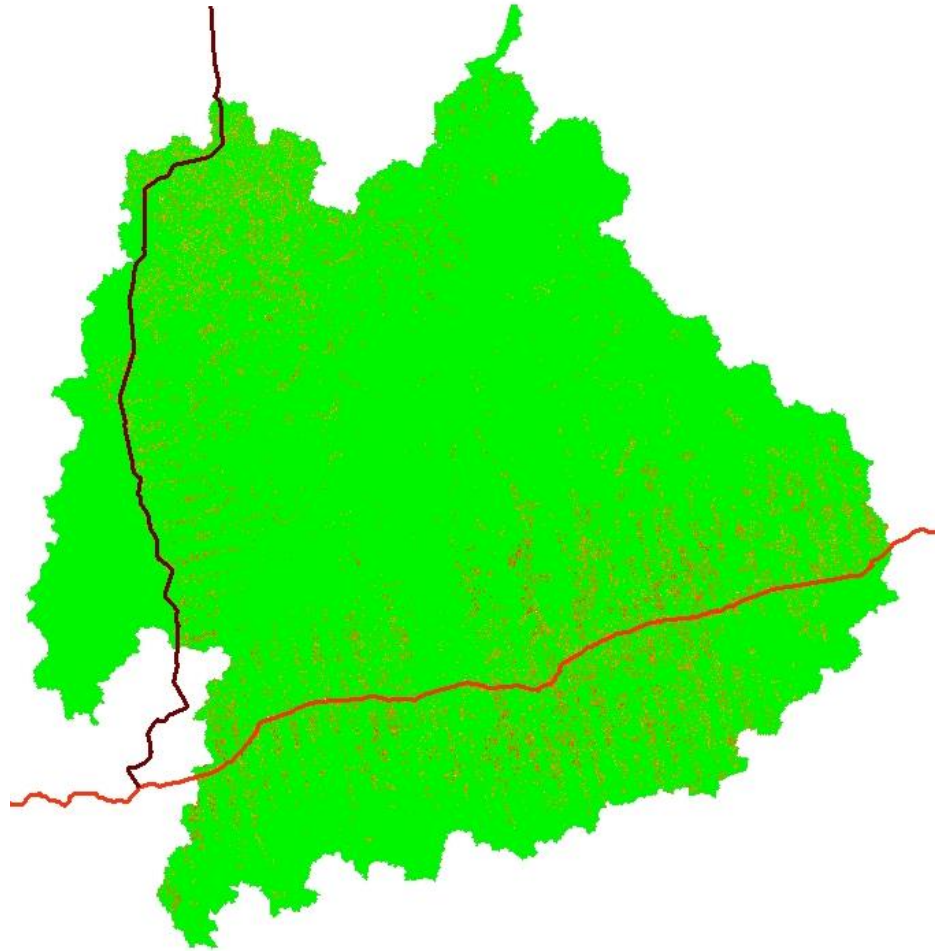
Análise - Resultados USLE



Análise - Resultados USLE



Análise - Resultados USLE



Conclusões

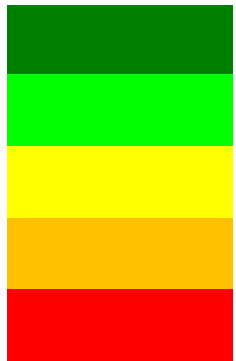
- Dados de solo
- Comprimento de encosta
- Influência uso da terra
- Fuzzy Gama

Obrigada!

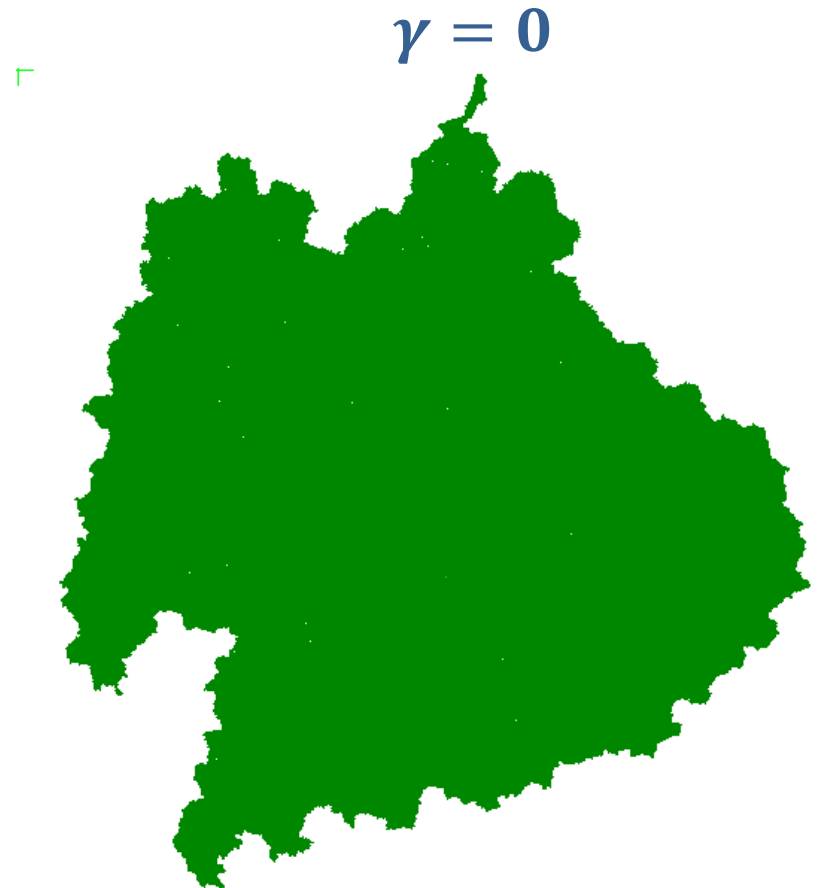
Lidiane Costa
lidiane.costa@inpe.br

Fuzzy-gama

Fatiamento



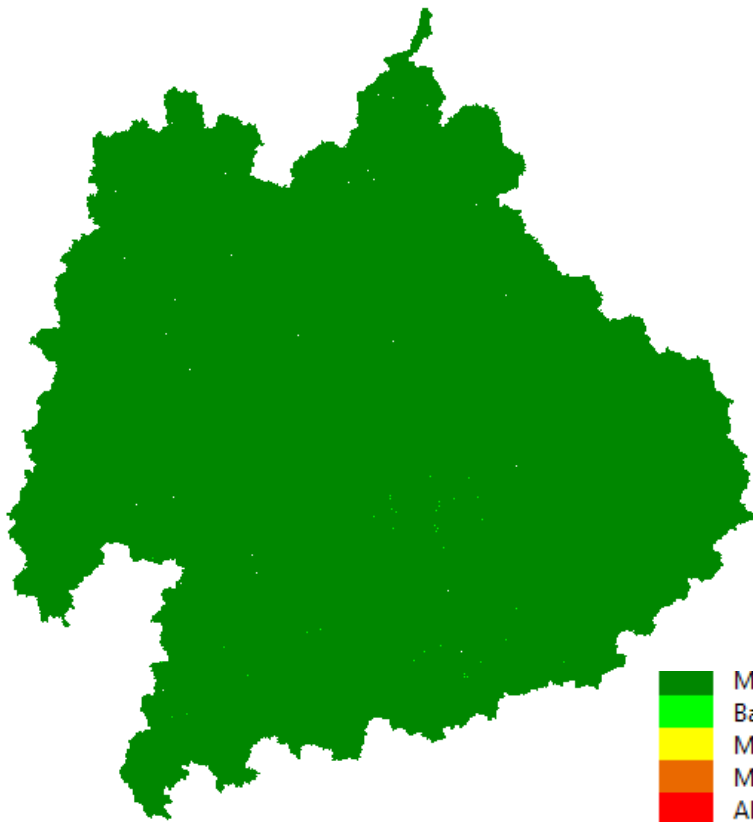
0 - 10	Muito Baixa
10 - 20	Baixa
20 - 30	Moderada
30 - 40	Moderada-Alta
> 40	Alta



Fuzzy-gama

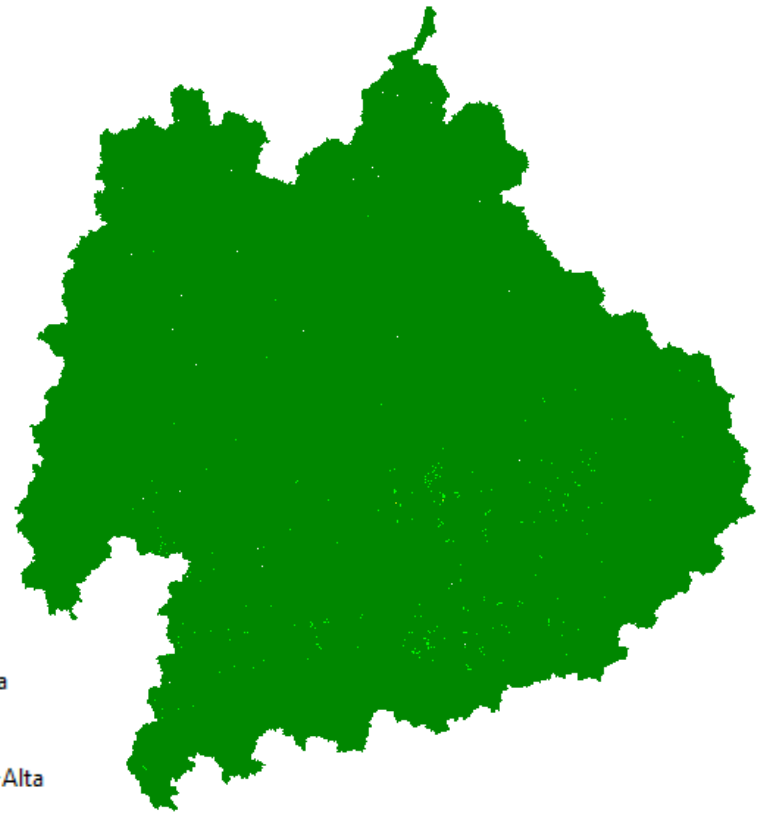
$\gamma = 0.2$

□



$\gamma = 0.35$

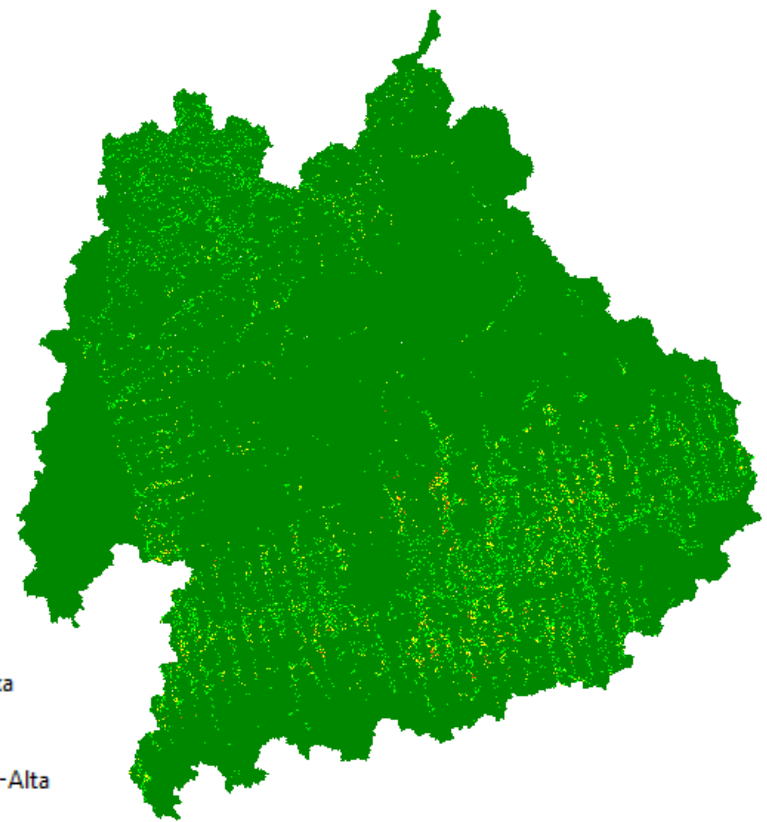
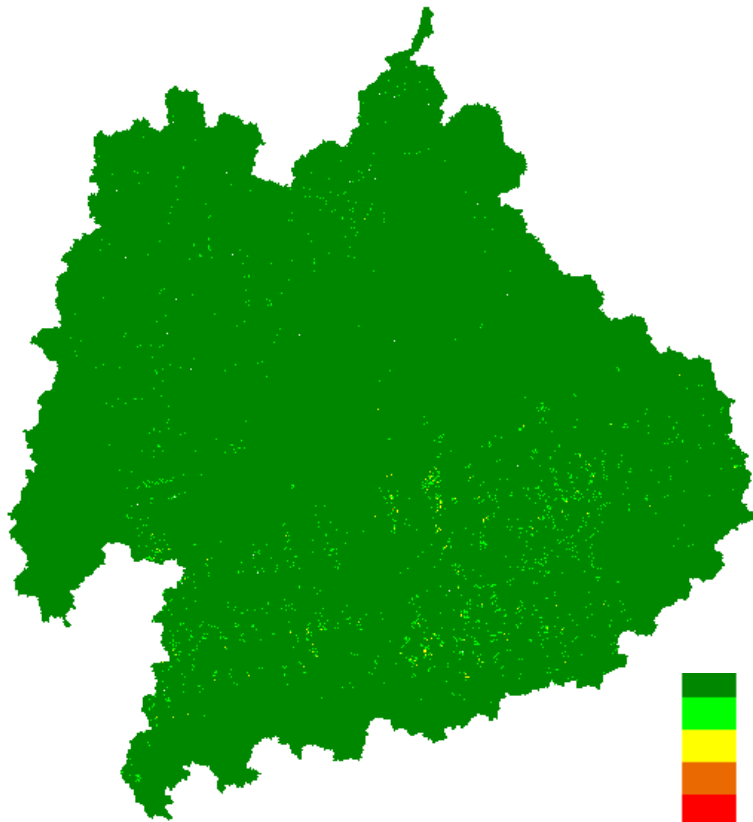
□



Fuzzy-gama

$\gamma = 0.5$

$\gamma = 0.65$



Fuzzy-gama

$\gamma = 0.8$

$\gamma = 1$

