



With funding from

Austrian
Development
Cooperation

GIS techniques in forest planning with relation to water regulation, innovative practices and tools

Assoc. Prof. d-r Ivan Minchev

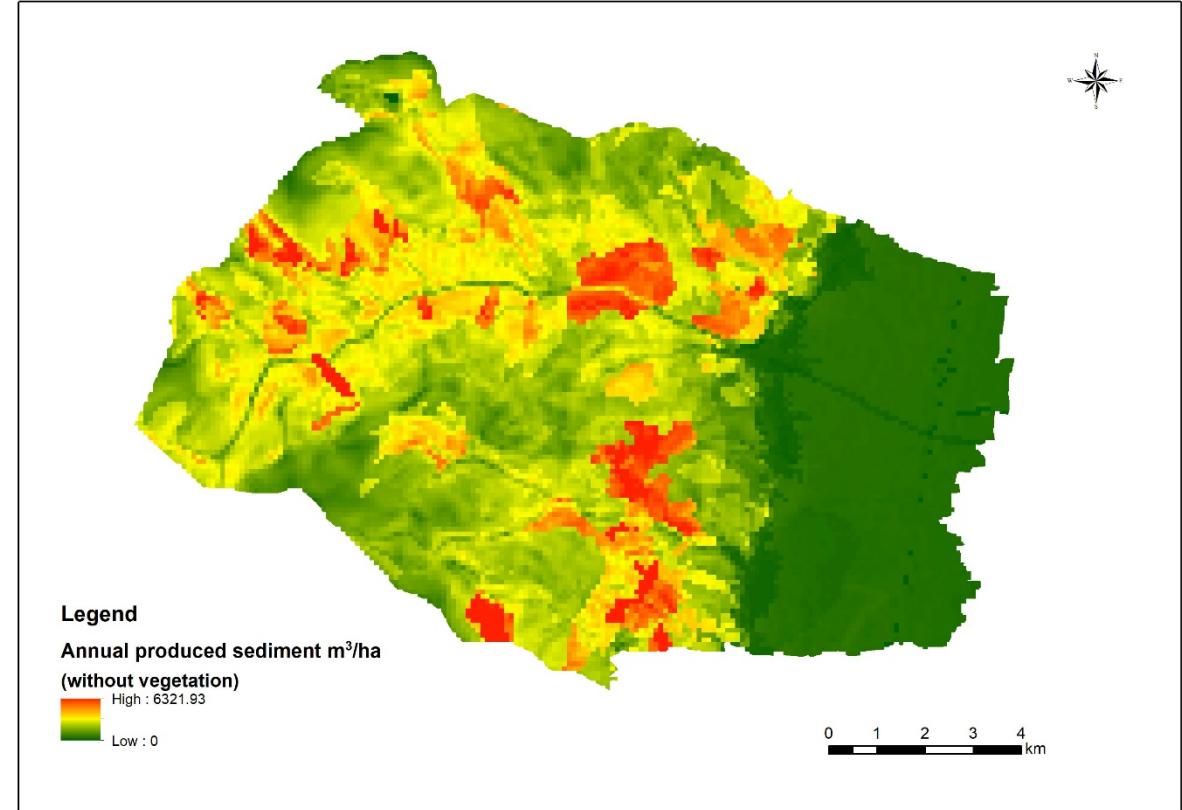
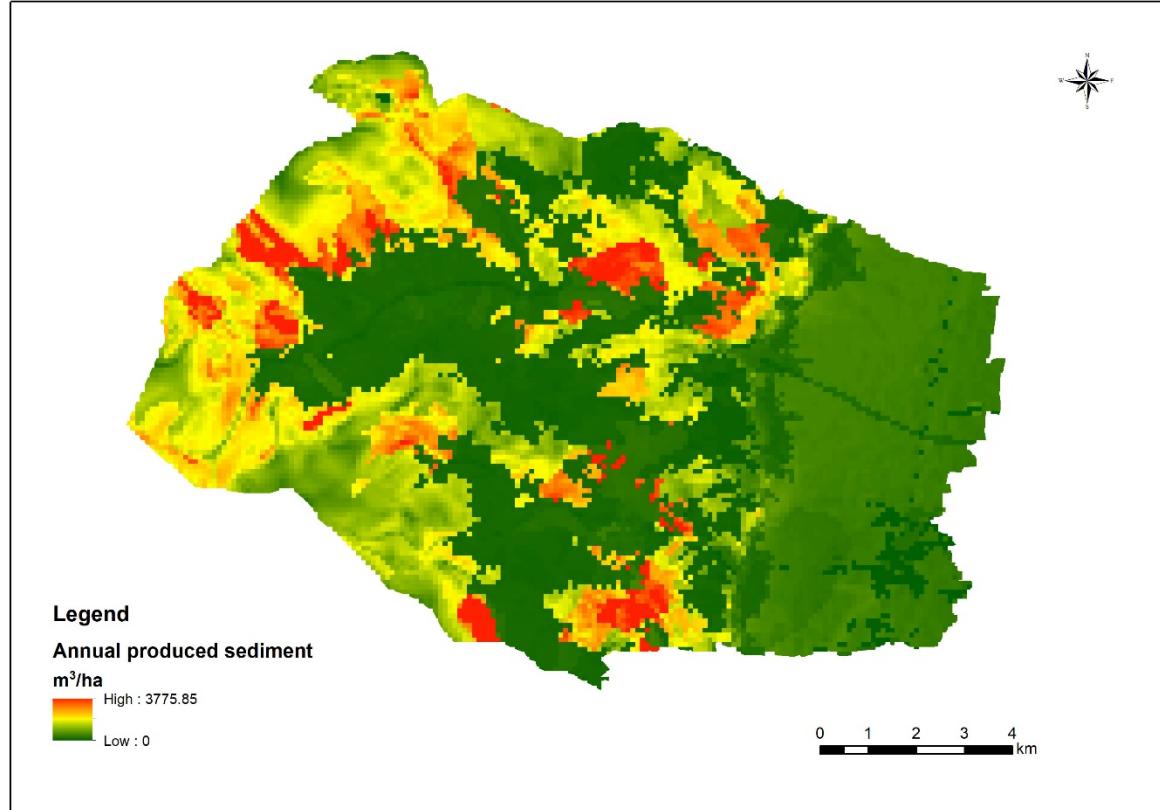
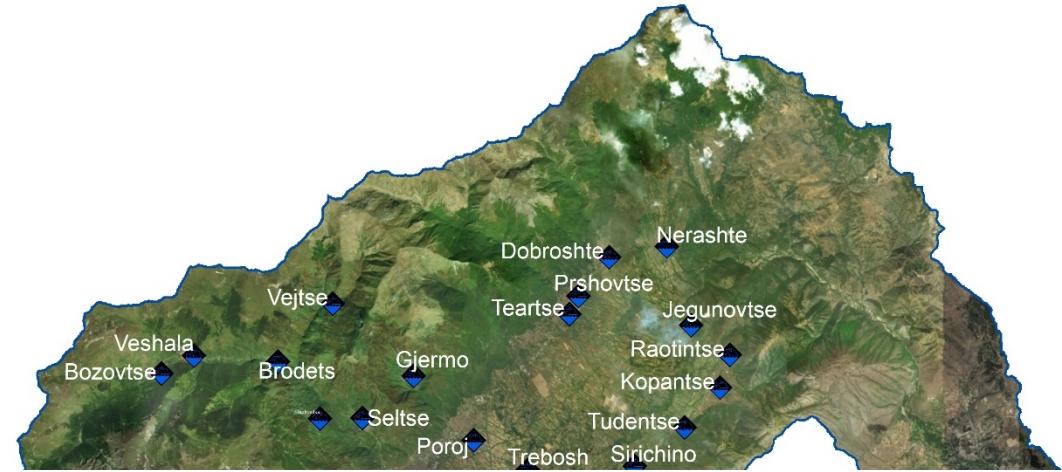
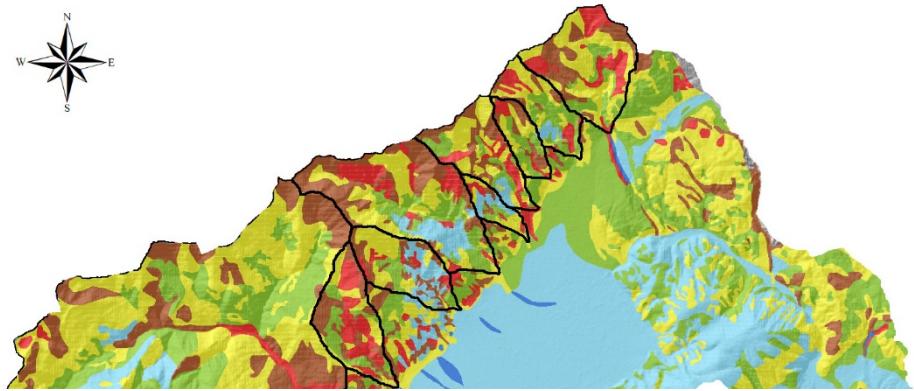
Capacity Building Workshop on
Forest Management and Water Regulation in the Drin river basin

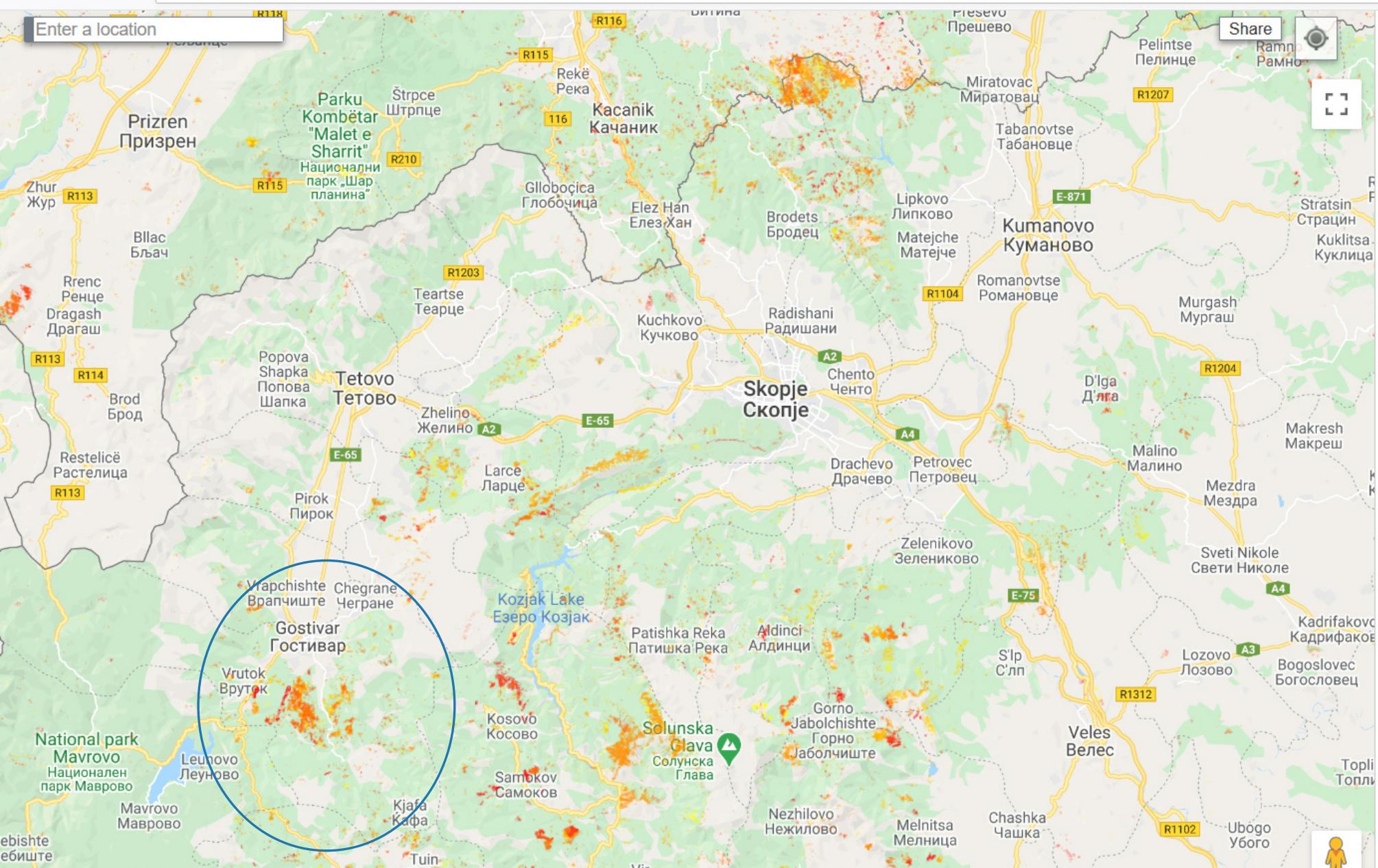
16 – 17 .12 2020

“SUSTAINABLE FOREST MANAGEMENT AND WATER IN THE DRIN RIVER BASIN”

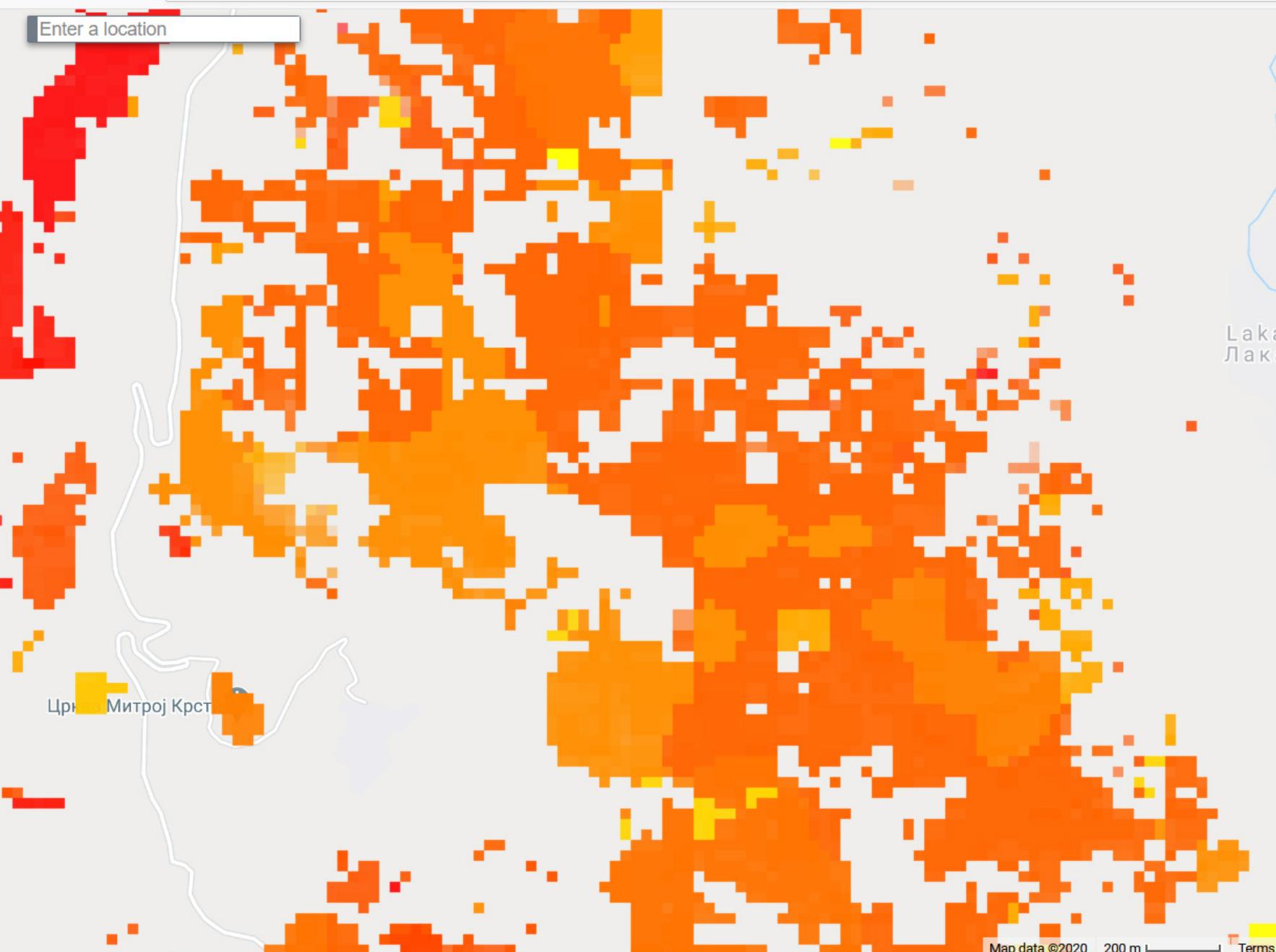
MONITORING OF FOREST COVER LOSS FOR THE PURPOSE OF WATER AND SOIL MANAGEMENT

- GLOBAL DATABASES FOR FOREST MONITORING
 - GLOBAL FOREST CHANGE – UNIVERSITY OF MARYLAND
 - COPERNICUS TREE COVER DENSITY
- GOOGLE EARTH IMAGERY





Enter a location



Share



Global Forest Change

Published by Hansen, Potapov, Moore, Hancher et al.



UNIVERSITY OF
MARYLAND
DEPARTMENT OF GEOGRAPHICAL SCIENCES

Results from time-series analysis of Landsat images characterizing forest extent and change.

Trees are defined as vegetation taller than 5m in height and are expressed as a percentage per output grid cell as '2000 Percent Tree Cover'. 'Forest Cover Loss' is defined as a stand-replacement disturbance, or a change from a forest to non-forest state, during the period 2000–2019. 'Forest Cover Gain' is defined as the inverse of loss, or a non-forest to forest change entirely within the period 2000–2012. 'Forest Loss Year' is a disaggregation of total 'Forest Loss' to annual time scales.

Reference 2000 and 2019 imagery are median observations from a set of quality assessment-passed growing season observations.

[Download the data.](#)

[Reset to default view](#)

Data Products

Forest Loss Year (Transparent)

Legend
2019
2000

Other Data Layers

Pan-tropical Forest Fragments

Background Imagery

Year 2000 Bands 5/4/3

Example Locations

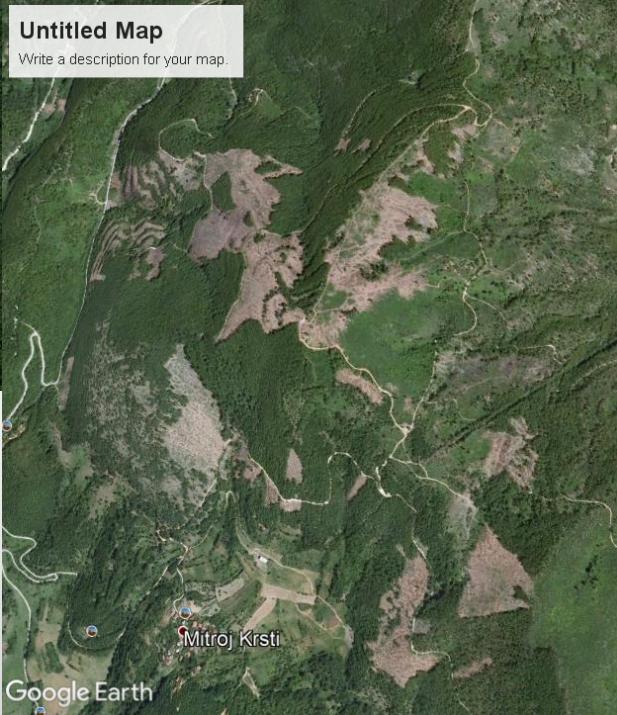
Forestry and Tornado in Alabama

Untitled Map

Write a description for your map.



2002



2009



2019



Google Earth

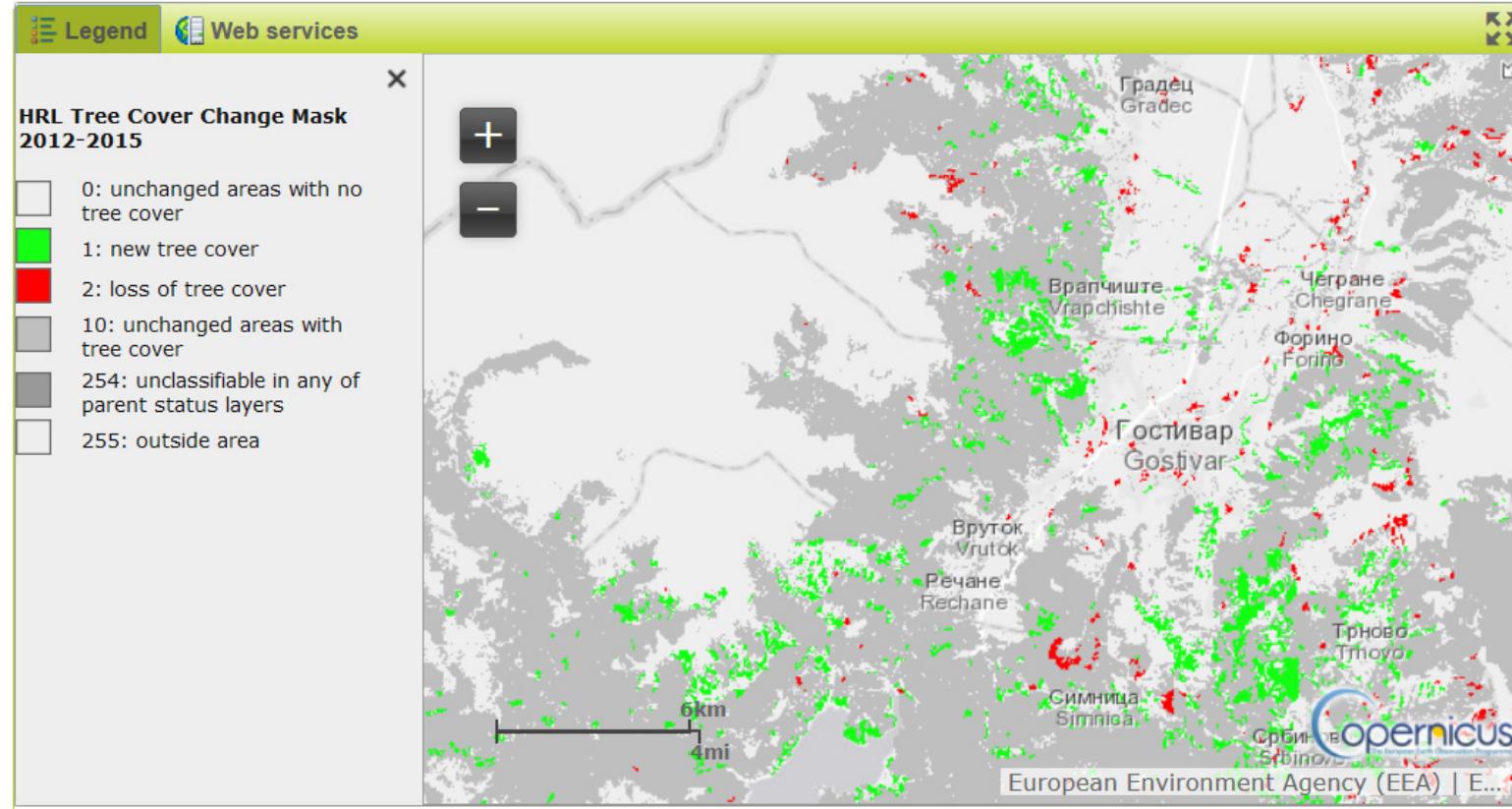
Image © 2020 Maxar Technologies
Image NASA

Tree Cover Change Mask 2012 - 2015

Print

Internal validation completed. External validation pending

Map View Metadata Download



User corner

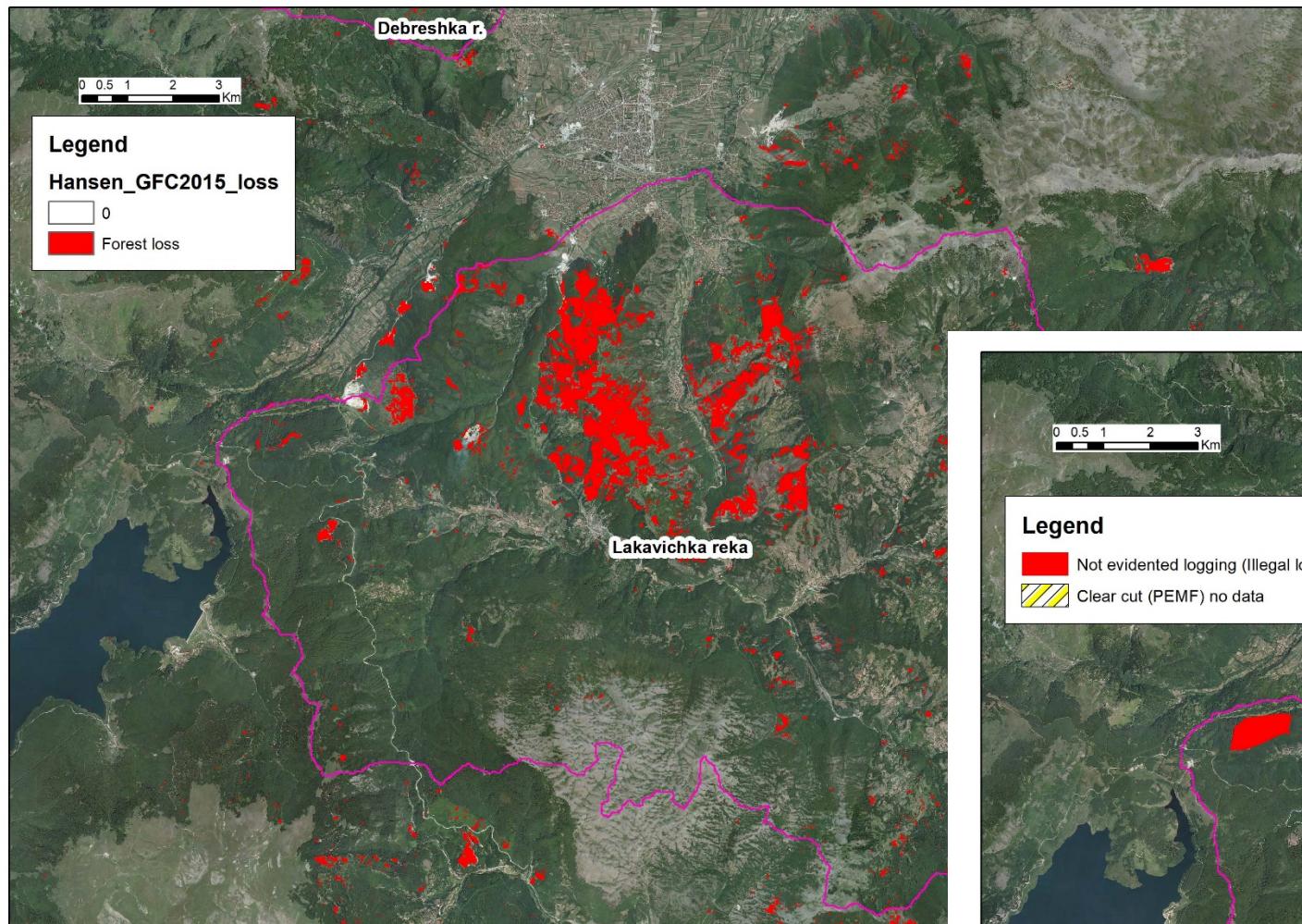
How to access our data

Technical library

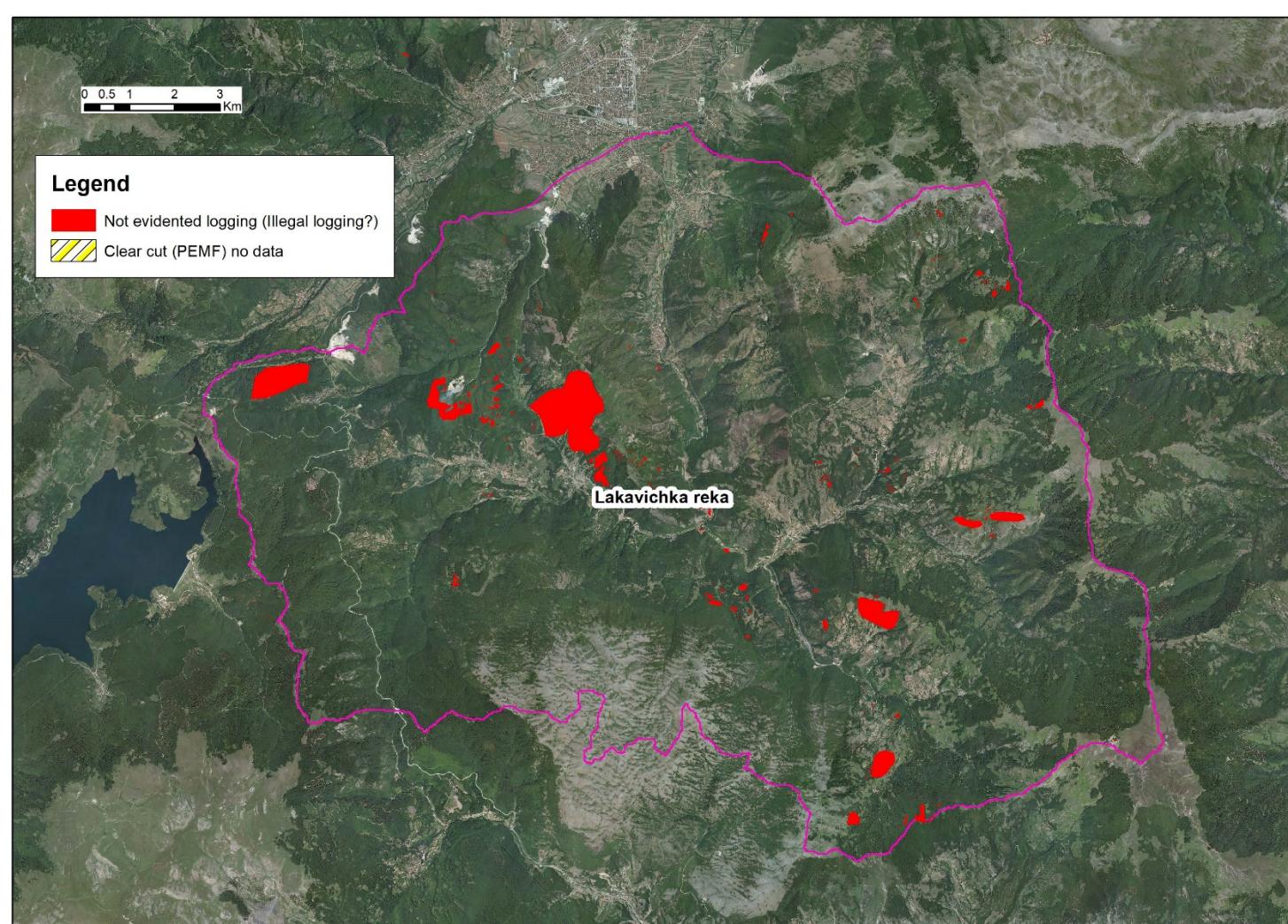
Factsheets

Use cases

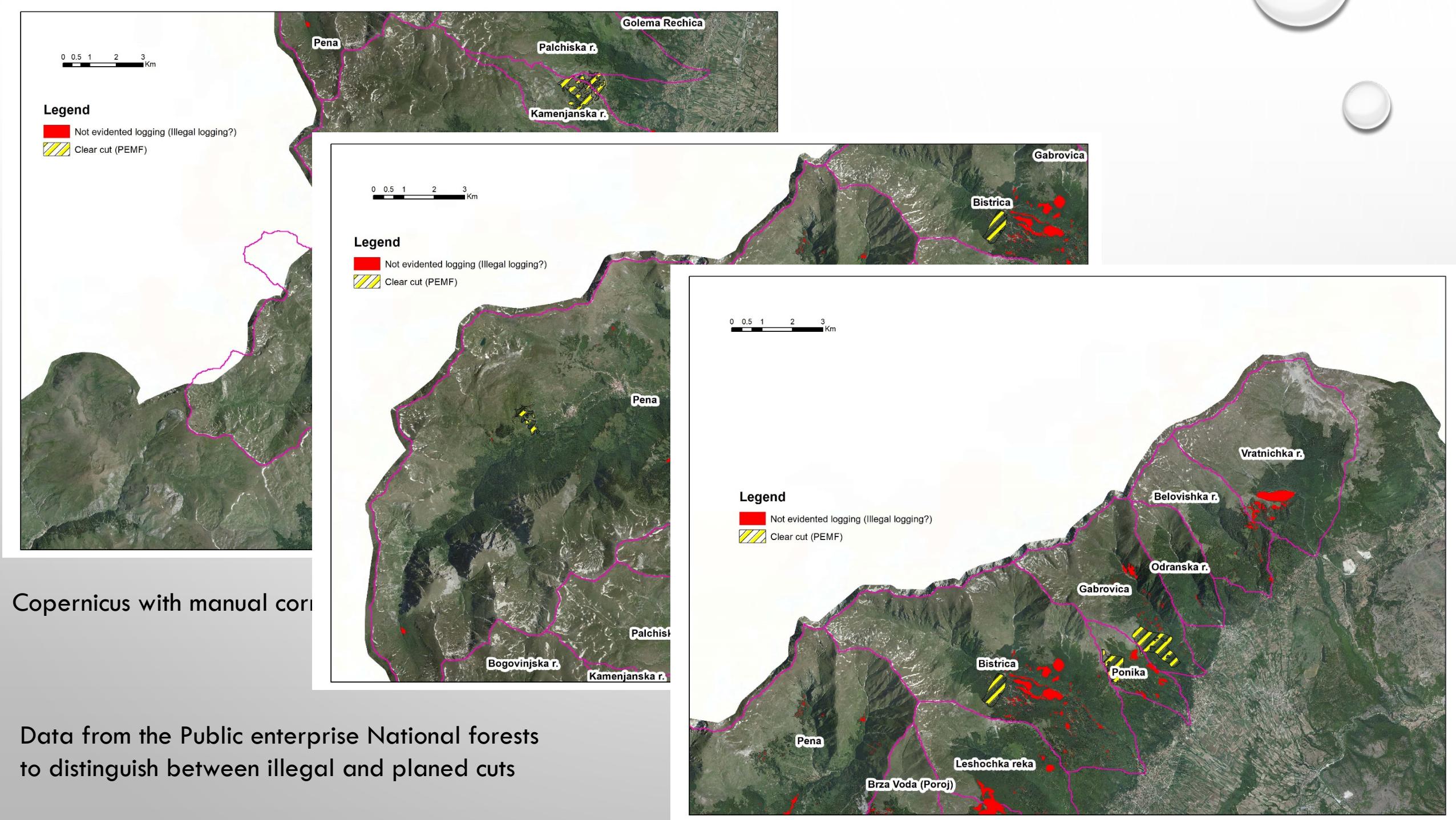
Looking for National projection & Expert products?



GFC raw data



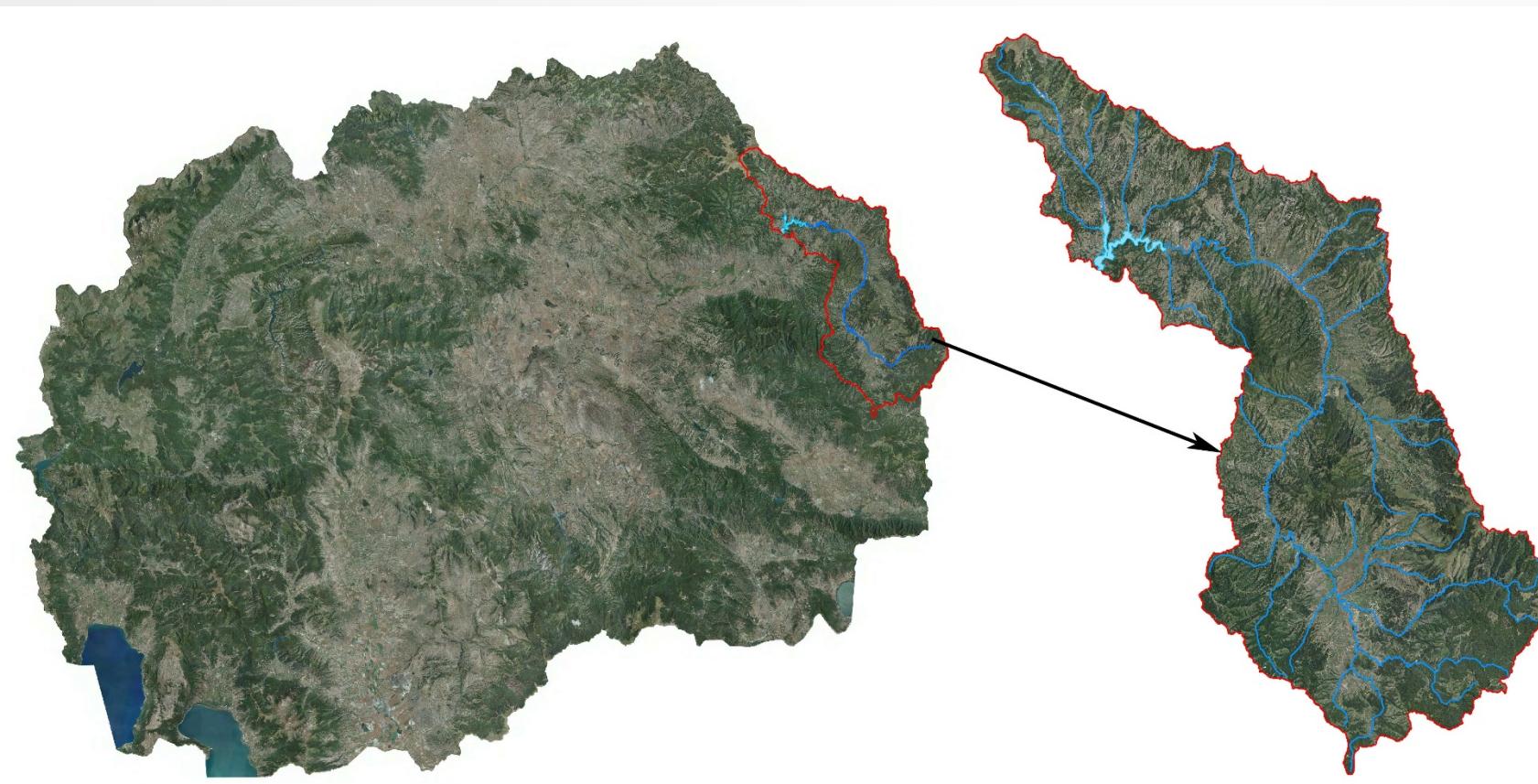
Copernicus with manual corrections



Name	Forest (ha)	Non- forest	Forest (%)	Cut 2012-15 (illegal) ha	Cut 2012- 15(PEMF) ha	Annual cut	% Annual cut
Belovishka r.	543.3	530.9	50.6	7.31		2.44	0.45
Bistrica	1555.1	2084.6	42.7	87.45	46	44.48	2.86
Bogovinjska r.	1113.4	4836.9	18.7	48.39	130	59.46	5.34
Brza Voda (Poroj)	773.0	811.3	48.8	33.19		11.06	1.43
Debreshka r.	538.3	532.0	50.3	119.40		39.80	7.39
Gabrovica	536.5	979.7	35.4	17.23	96	37.74	7.03
Golema Rechica	308.5	895.1	25.6	4.62		1.54	0.50
Kamenjanska r.	296.4	732.5	28.8	6.16	65	23.72	8.00
Lakavichka reka	13594.4	8608.7	61.2	450.06		150.02	1.10
Leshochka reka	830.8	553.3	60.0	25.53		8.51	1.02
Mazdracha	2290.0	5424.2	29.7	58.38		19.46	0.85
Odranska r.	383.1	275.7	58.2	1.35		0.45	0.12
Palchiska r.	433.4	2024.2	17.6	0.25		0.08	0.02
Pena	5488.3	11601.9	32.1	89.25	25	38.08	0.69
Ponika	302.5	122.0	71.3	25.30	47	24.10	7.97
Sveta L	656.0	2137.6	23.5	10.76		3.59	0.55
Vrapchishka r.	1048.9	1182.8	47.0	22.77		7.59	0.72
Vratnichka r.	877.3	1354.7	39.3	50.13		16.71	1.90

- FROM THE DATA PRESENTED IN THE TABLE AND IN THE MAPS IT CAN BE CONCLUDED THAT THE PROPORTION OF ANNUAL CUTS ARE OF A LARGE EXTENT, WHICH CAN LARGELY AFFECT THE ECOSYSTEM AS A WHOLE. THERE ARE SEVERAL SUB-CATCHMENTS IN WHICH THE ANNUAL CUT IS MORE THAN 7% OF THE FOREST COVER (DEBRESHKA, GABROVICA, KAMENJANSKA AND PONIKA), WHICH IS MOSTLY USED AS FIREWOOD. THIS EXTENT OF THE FOREST CUTS MEANS THAT IN 14 YEARS THE WHOLE FOREST COVER WILL BE GONE. IT SHOULD BE KEPT IN MIND THAT THESE NUMBERS INDICATE ONLY THE AREAS WHICH CAN BE CONFIRMED AS CUT FROM A SATELLITE IMAGE, SO THERE IS A LARGE PROPORTION WHICH IS NOT ACCOUNTED FOR, BECAUSE MUCH OF THE ILLEGAL CUTS ARE HANDPICKED OF THE BEST QUALITY WOOD AND THEY CANNOT BE DETECTED WITHOUT A FIELD SURVEY.

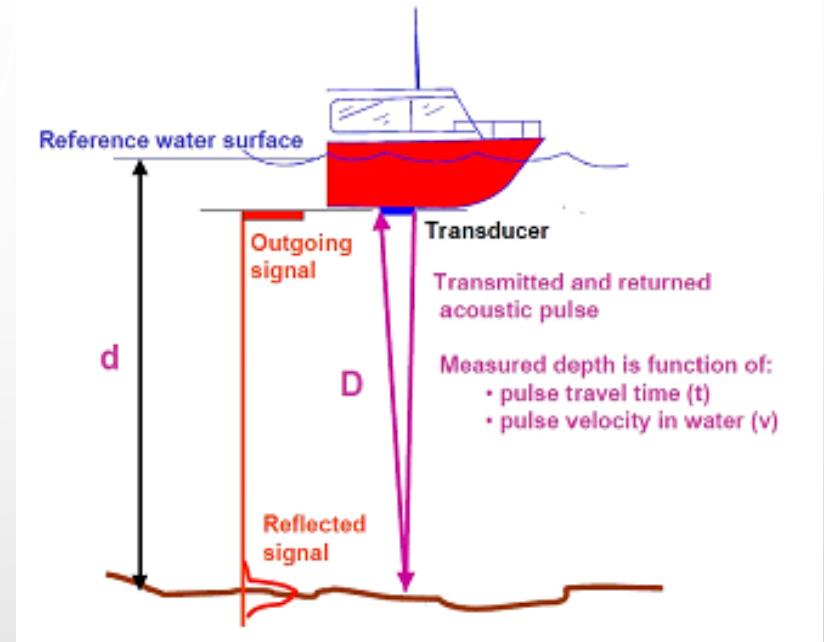
FOREST MANAGEMENT PRACTICES IN THE VICINITY OF WATER RESERVOIRS – CASE STUDY KALIMANCI RESEVOIR



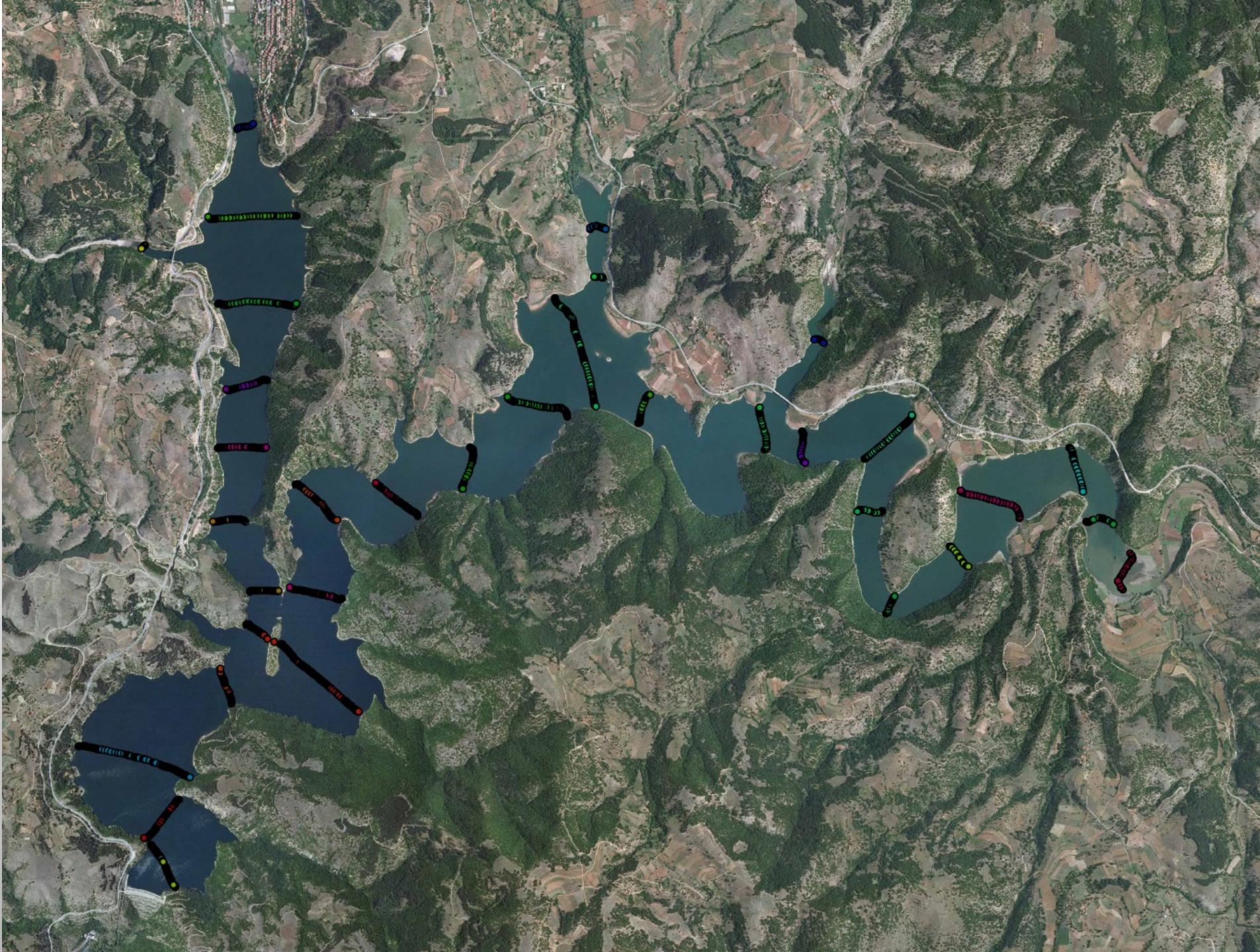
CATCHMENT AREA OF THE RESERVOIR
KALIMANCI ($1,135.3 \text{ KM}^2$)



Echo-sounder GPSMAP 421s

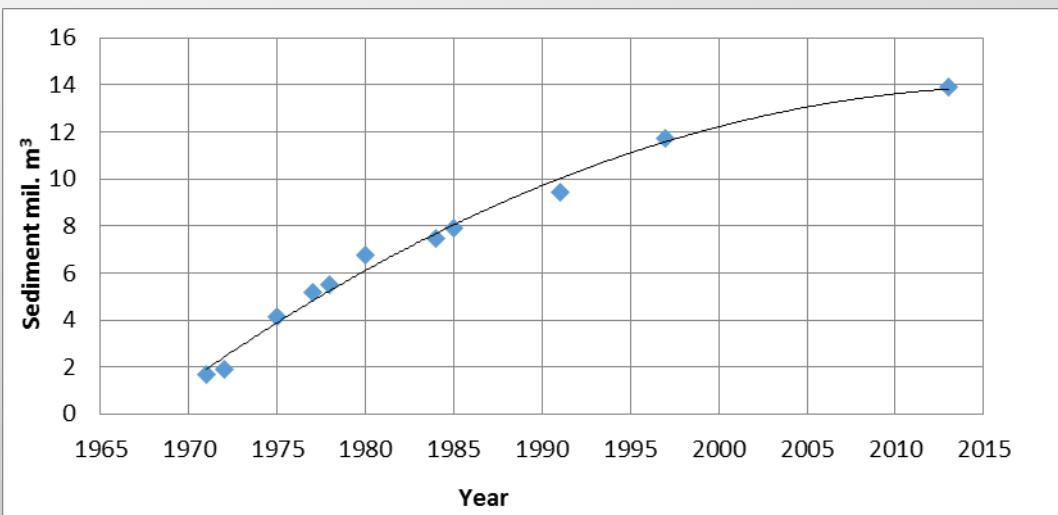


BATHYMETRIC MEASUREMENTS OF THE “KALIMANCI” RESERVOIR



No.	Year	Between two measurements	Cumulative	Annually
		m ³	m ³	m ³ /year
0	1969	/	/	/
1	1971	1,661,225	1,661,225	830,612.5
2	1972	258,075	1,919,300	258,075.0
3	1973	147,625	2,066,925	147,625.0
4	1975	2,210,590	4,129,890	736,863.3
5	1977	1,046,775	5,176,565	523,387.5
6	1978	323,225	5,499,790	323,225.0
7	1980	1,233,190	6,732,908	616,595.0
8	1984	749,900	7,482,880	187,475.0
9	1985	406,010	7,888,890	406,010.0
10	1988	/	/	/
11	1991	1,514,690	9,403,580	252,448.3
12	1997	2,305,308	11,708,888	384,218.0

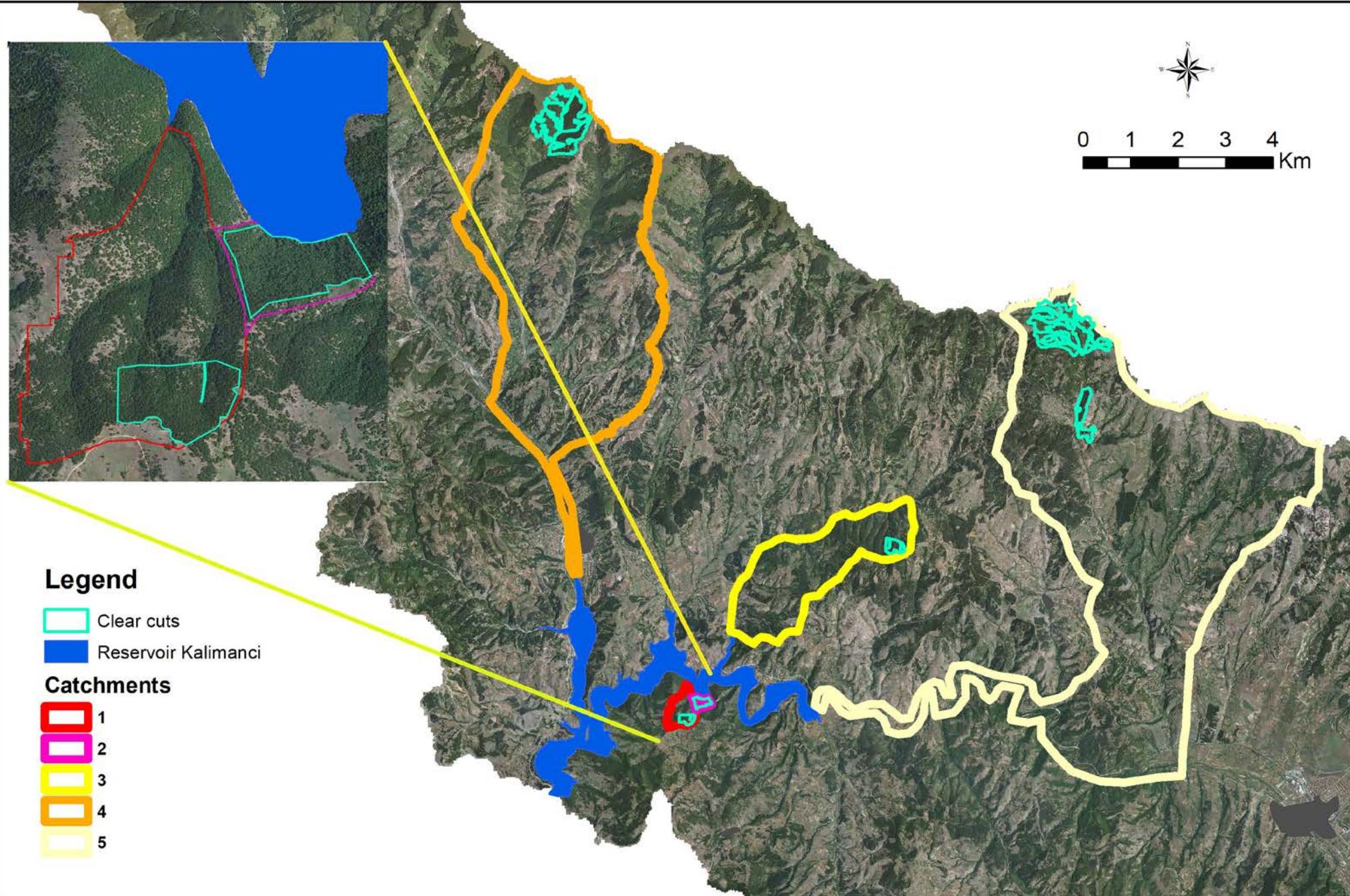
No.	Year	Between two measurements	Cumulative	Annually
		m ³	m ³	m ³ /year
12	1997	2.305.308	11.708.888	384.218,0
13	2013	2.181.112	13.890.000	136.319,5



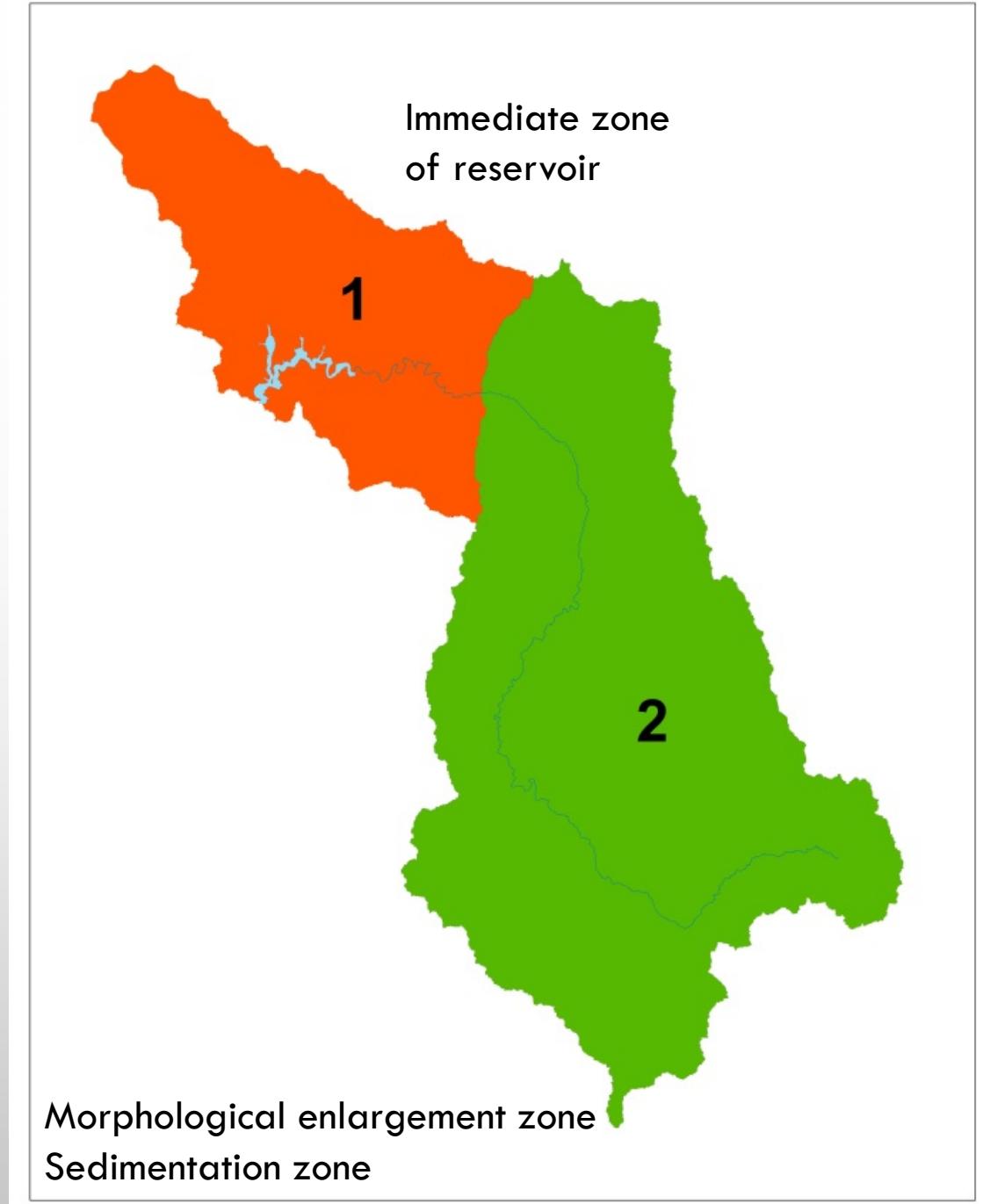
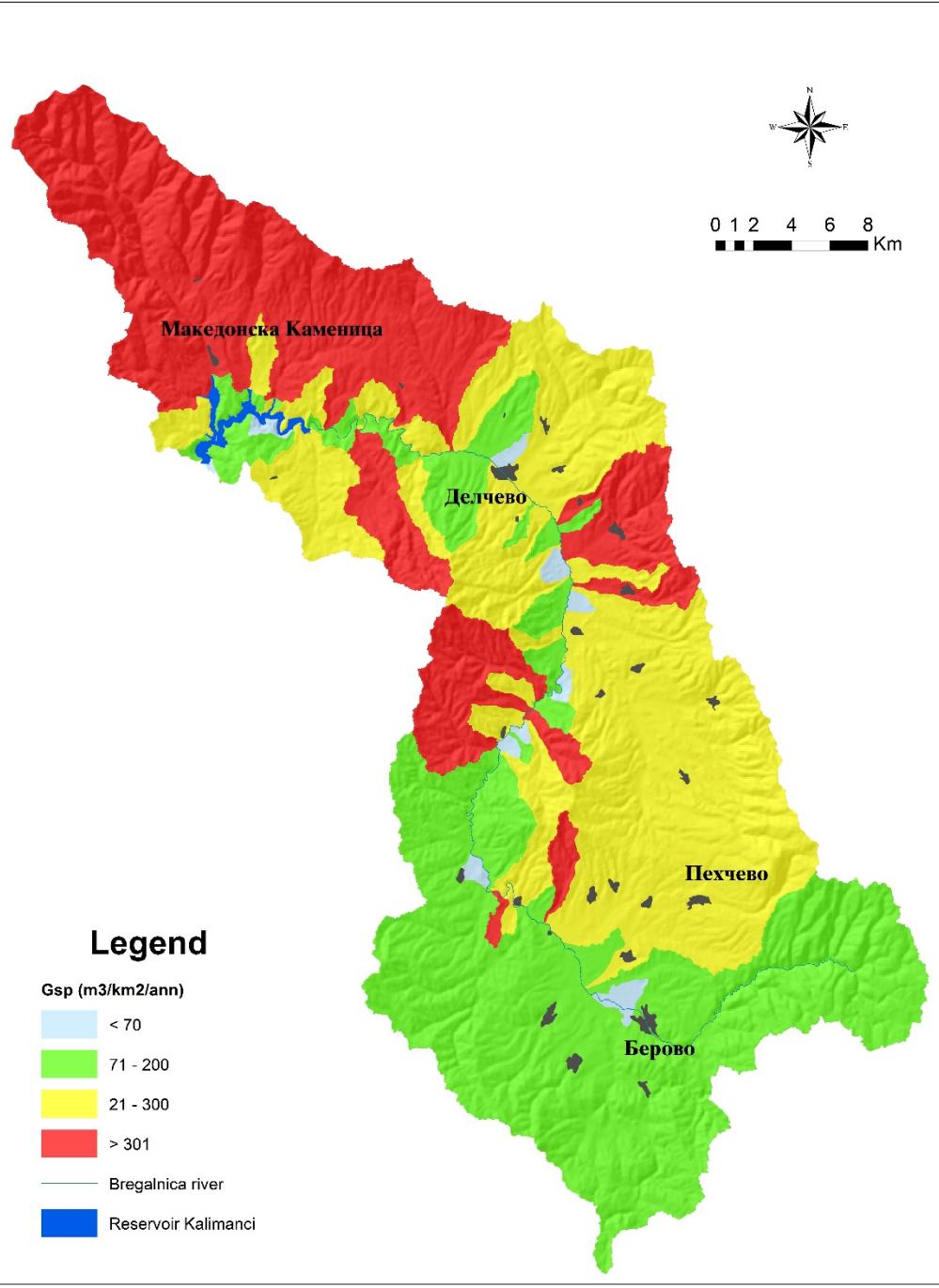
$$Z = \gamma * Xa * (\varphi + \sqrt{I_{sr}})$$

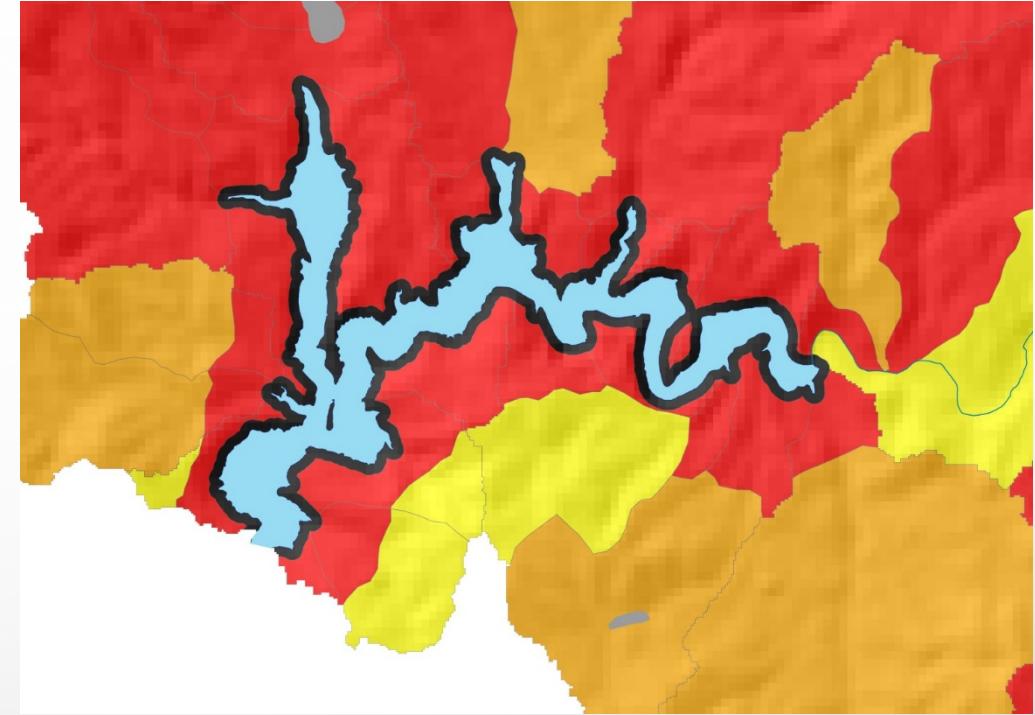
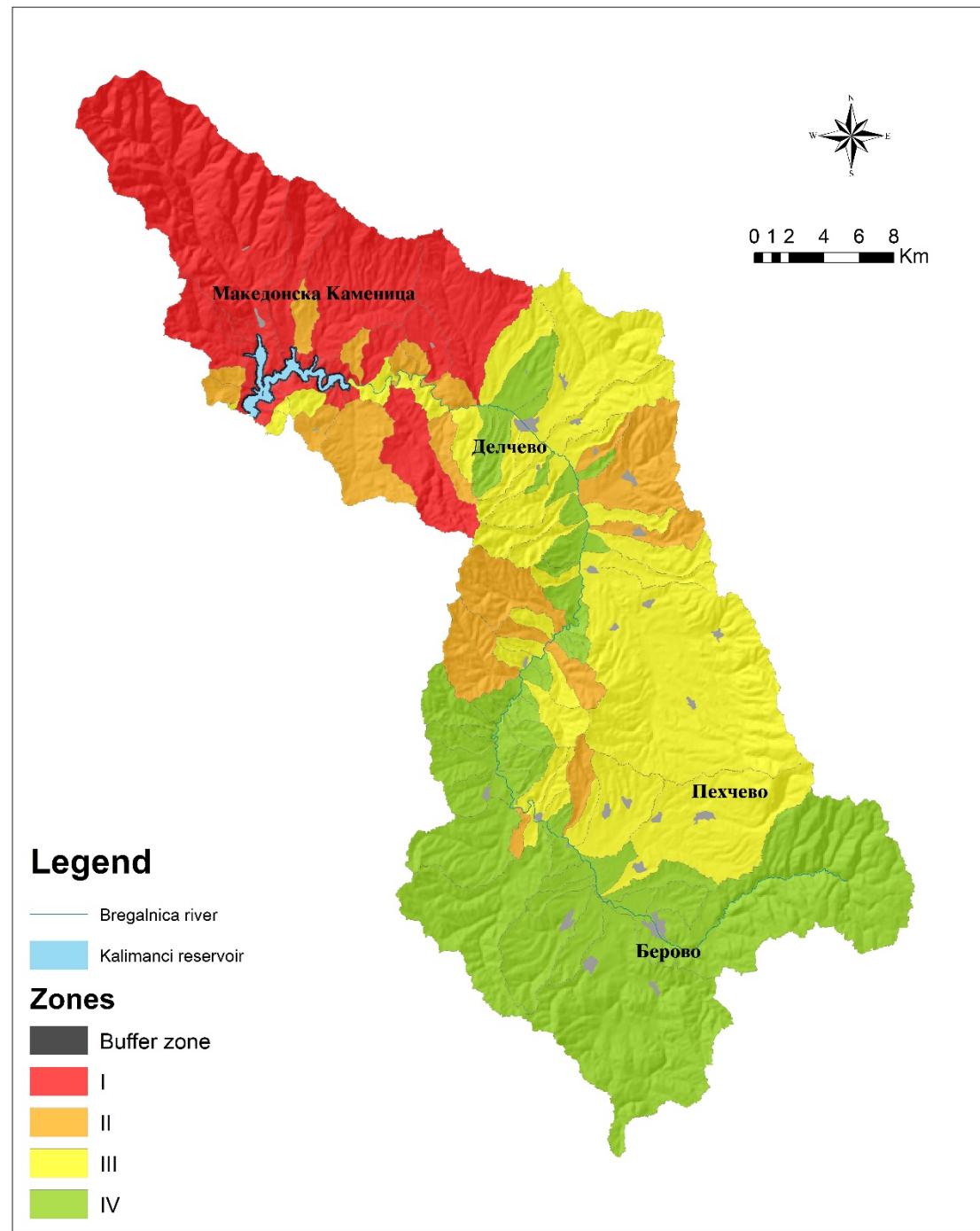
$$G_{year} = T * H_{year} * \pi * \sqrt{Z^3} * F * R_u$$

MODELING TRANSPORTED SEDIMENT IN THE RESERVOIR “KALIMANCI” WITH THE EROSION POTENTIAL METHOD (EPM)



No.	Lkm	F	Ru	xa	xa_sc3	Z	z_sc3	Cut (ha)
1	1,0	0,4	0,2	0,16	0,26	0,12	0,21	5,4
2	0,2	0,1	0,1	0,13	0,68	0,13	0,67	5,5
3	6,0	5,2	0,3	0,34	0,35	0,33	0,34	9,3
4	11,7	25,0	0,8	0,43	0,46	0,39	0,42	94
5	15,6	36,6	0,6	0,46	0,48	0,42	0,44	103
No.	G	G_sc3	difference	G_sp	Gsp_sc3	difference	G_sc3/G	
1	7,5	16,5	9,1	21,3	47,1	25,8	2,2	
2	0,8	9,8	9,0	11,7	140,5	128,7	12,0	
3	727,4	769,2	41,8	140,7	148,8	8,1	1,06	
4	10.378,6	11.362,8	984,2	415,9	455,3	39,4	1,09	
5	12.188,6	12.991,0	802,4	333,4	355,4	21,9	1,07	





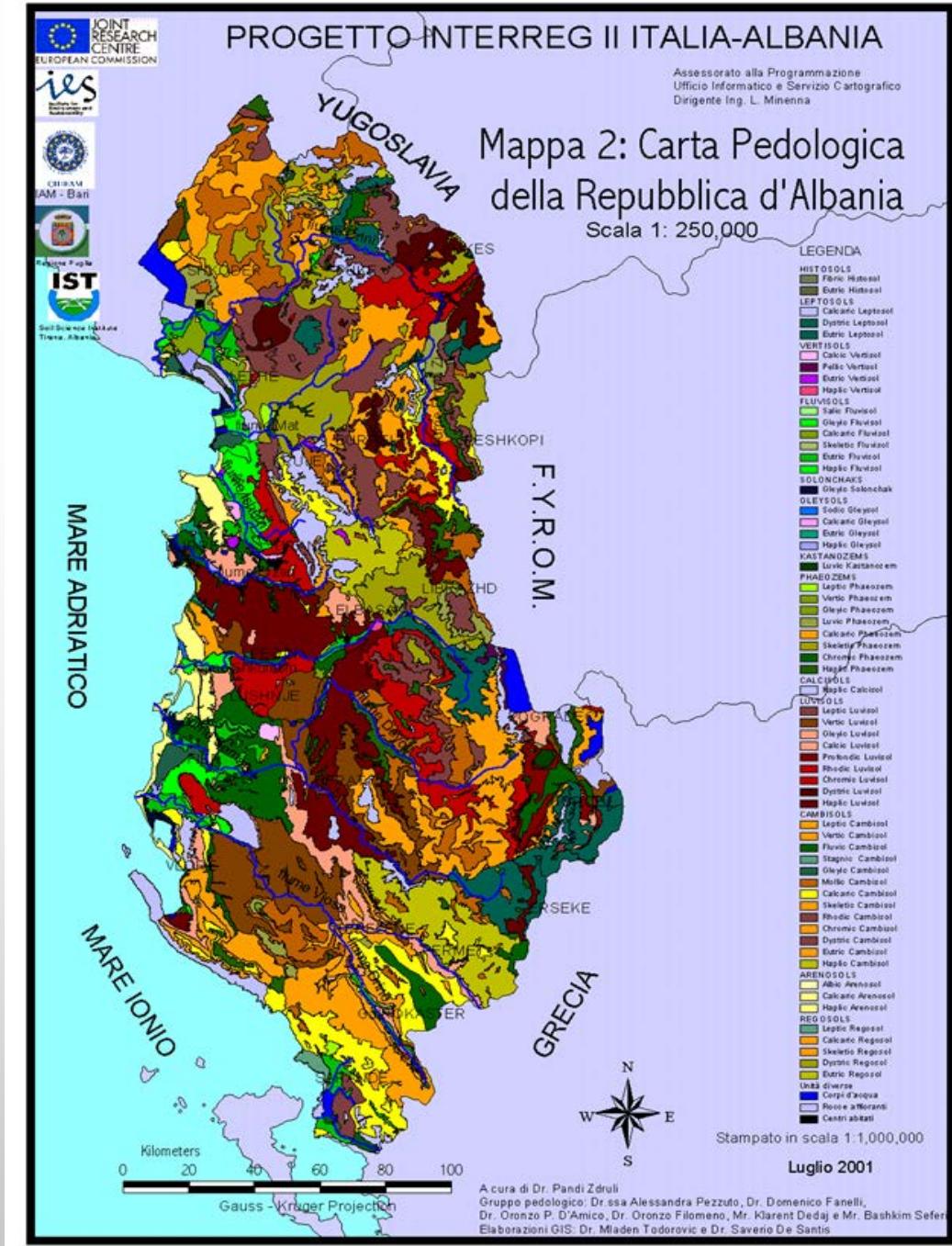
- IN THE FIRST ZONE IS RECOMMENDED TO IMPLEMENT CONTINUOUS COVER FORESTRY MANAGEMENT WITHOUT MAYOR DISTURBANCES

DECISION TREE INTEGRATION IN GIS FOR ESTIMATION OF RUNOFF TYPES

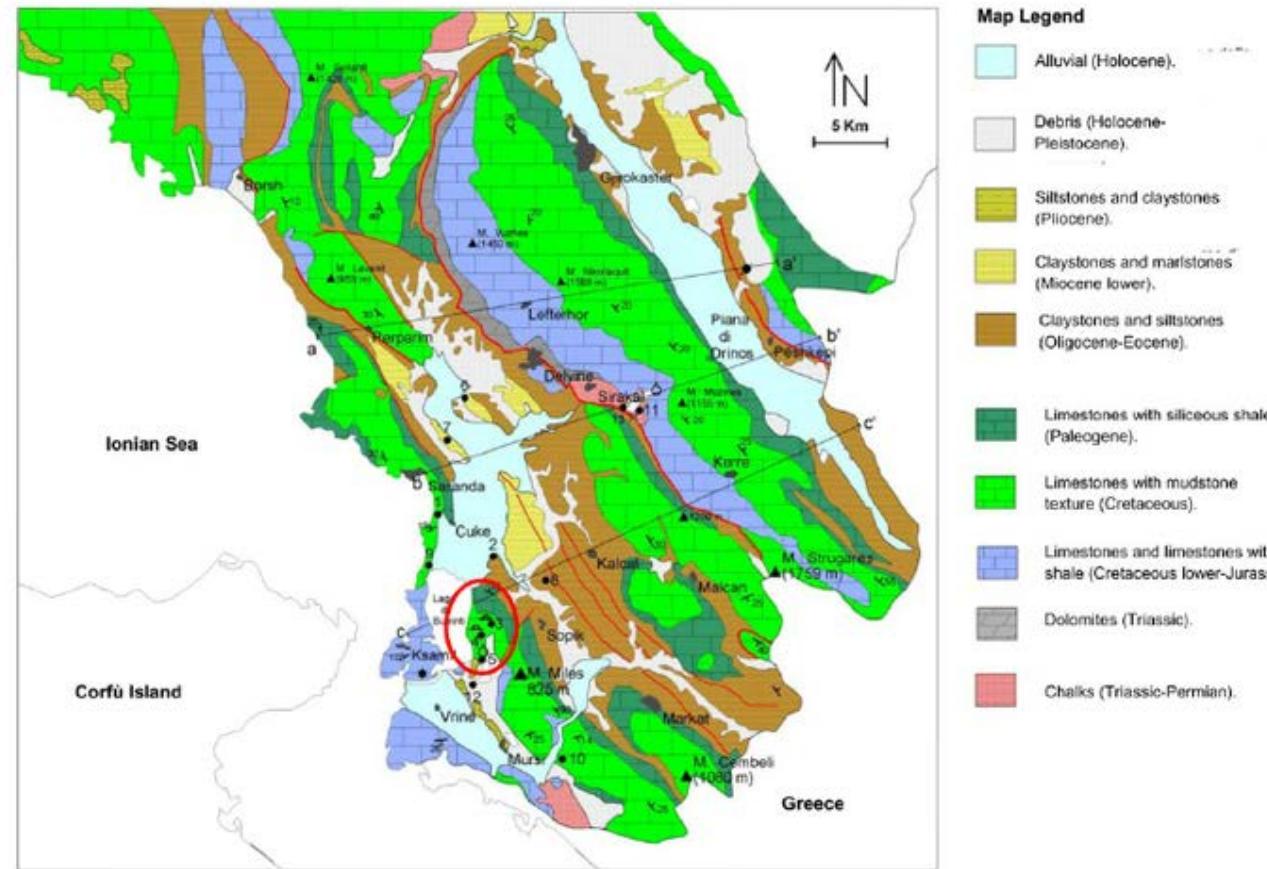
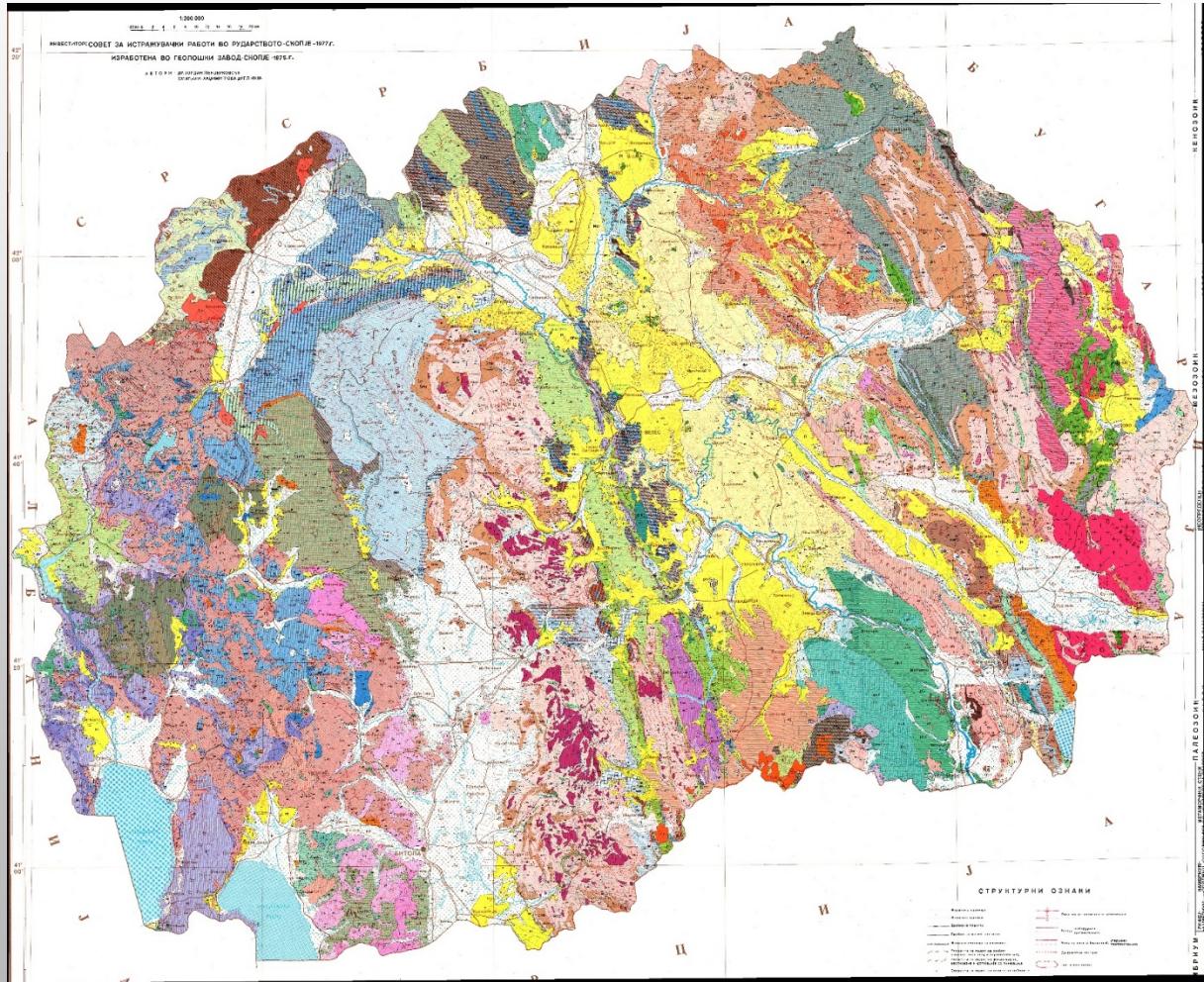
EXISTING GIS DATABASES

- SOIL MAP
- GEOLOGY MAP
- FOREST MANAGEMENT MAPS; MAP OF FOREST ROADS
- SATELLITE / AERIAL IMAGERY
- DIGITAL ELEVATION MODEL (DEM) / CONTOURS
- EROSION MAP
- HYDROGRAPHIC NETWORK
- SETTLEMENTS

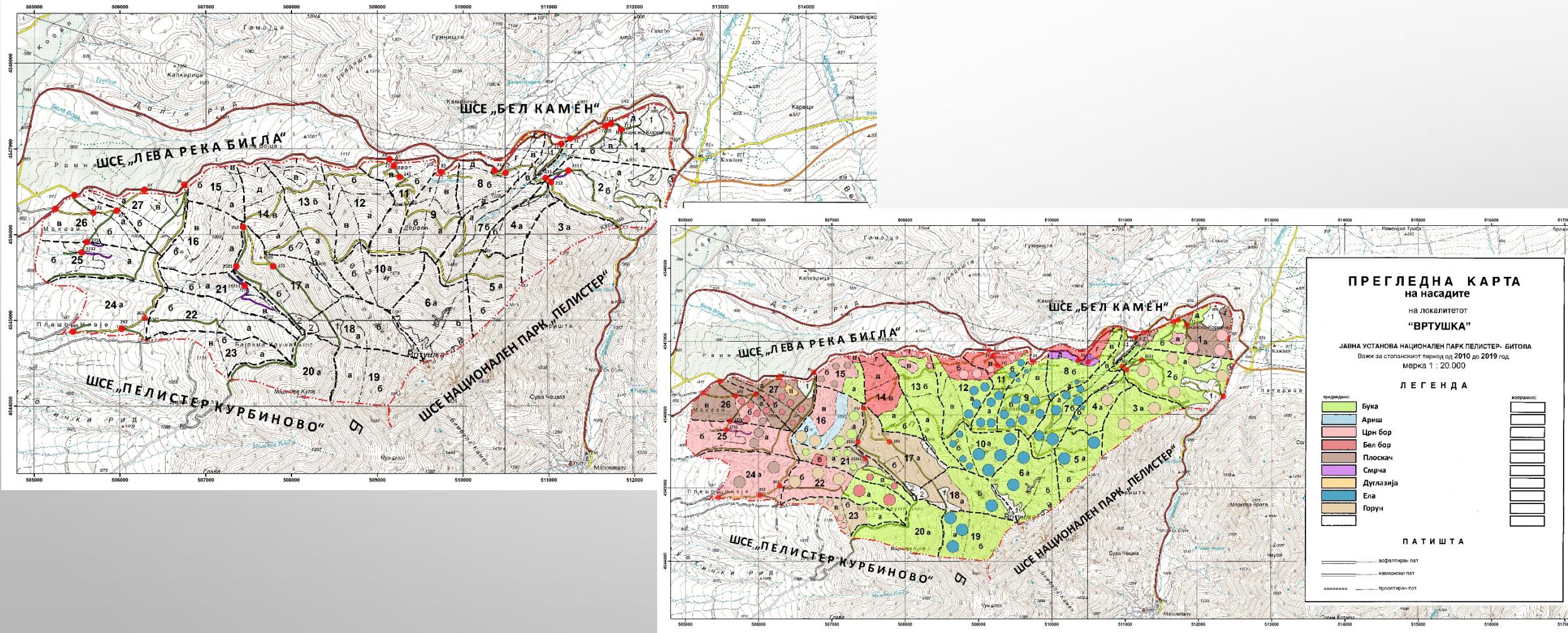
SOIL MAP



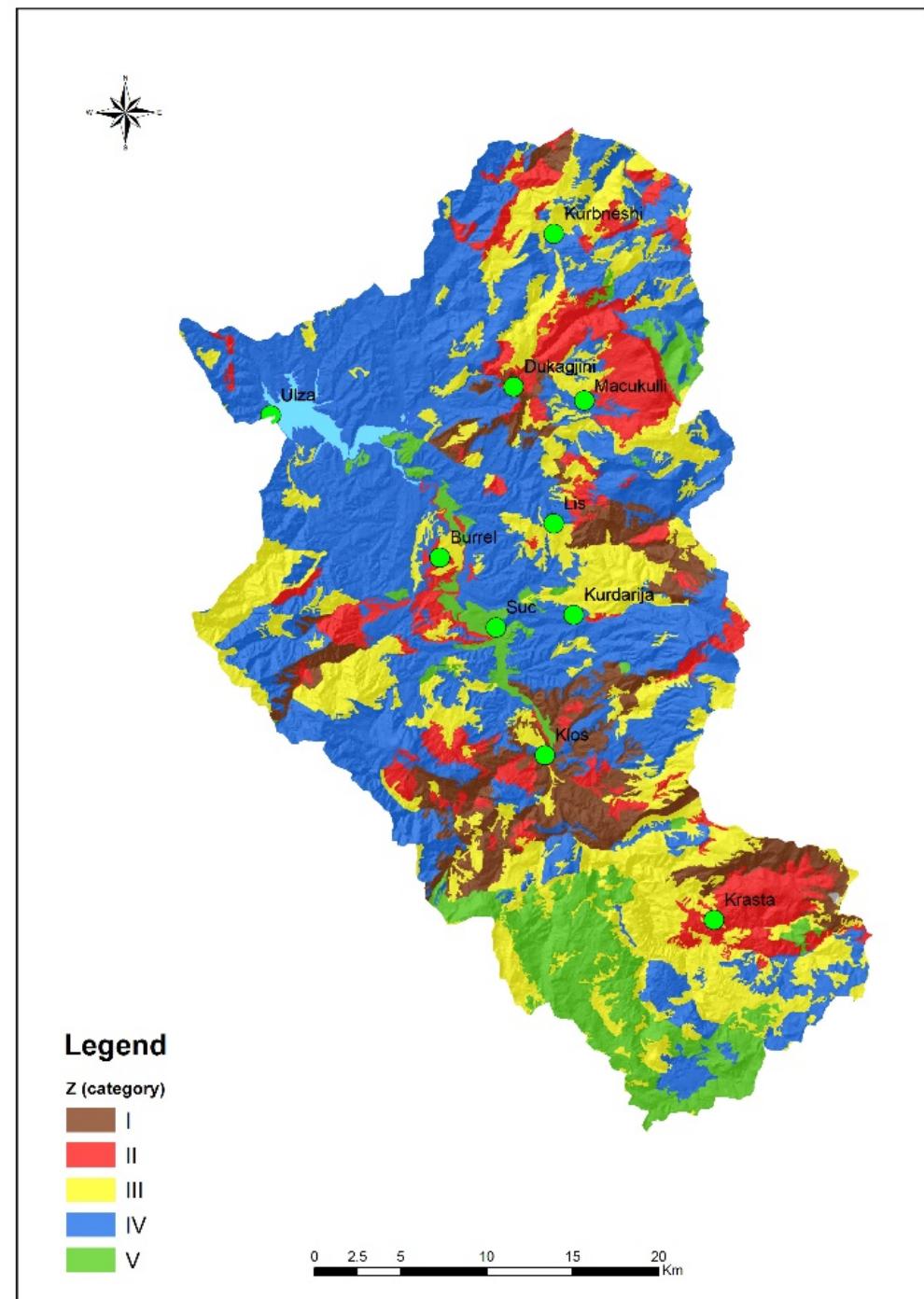
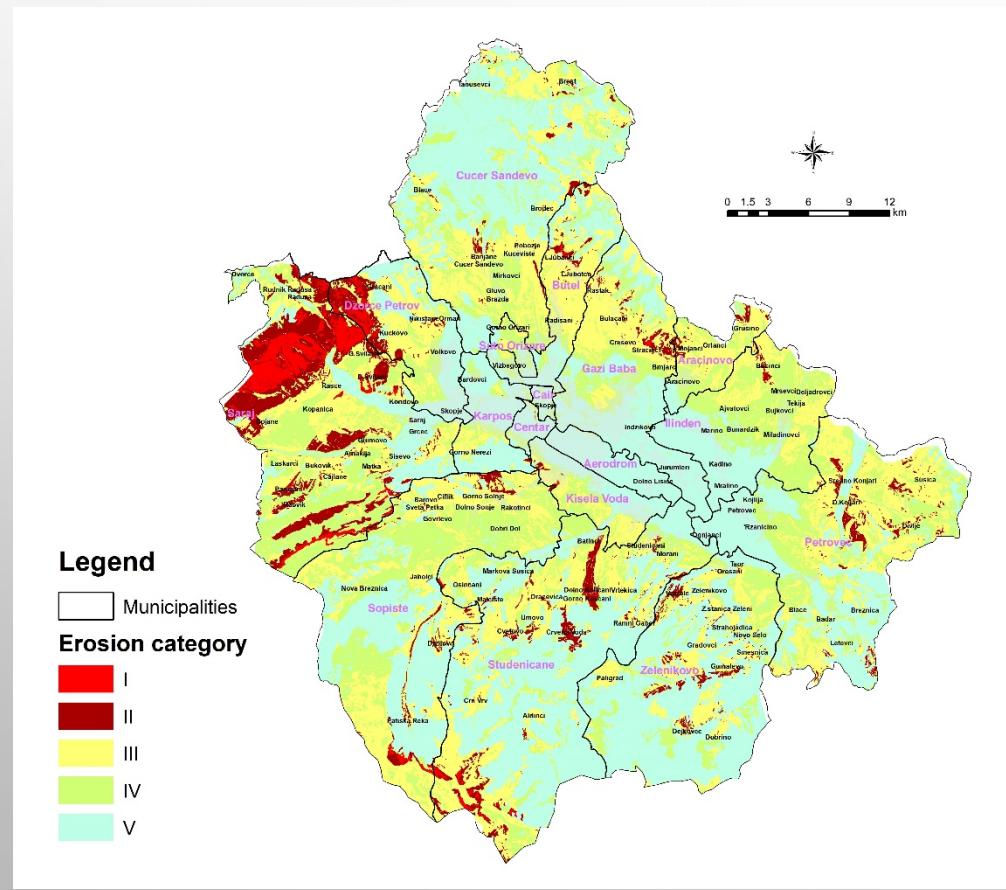
GEOLOGY MAP



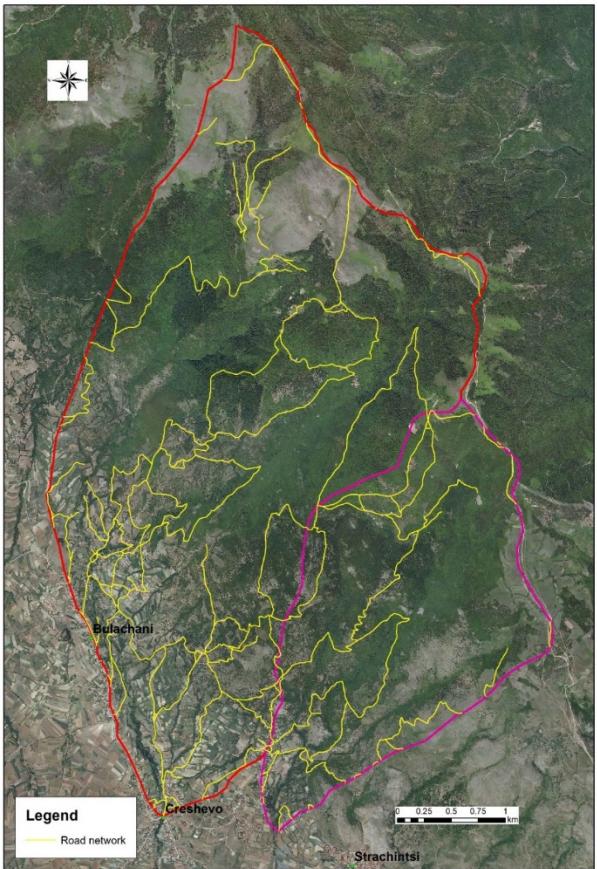
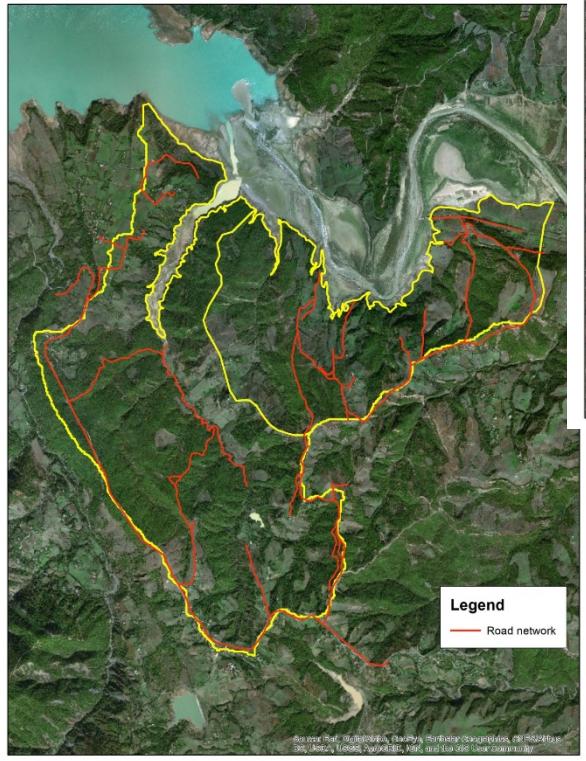
FOREST MANAGEMENT MAPS



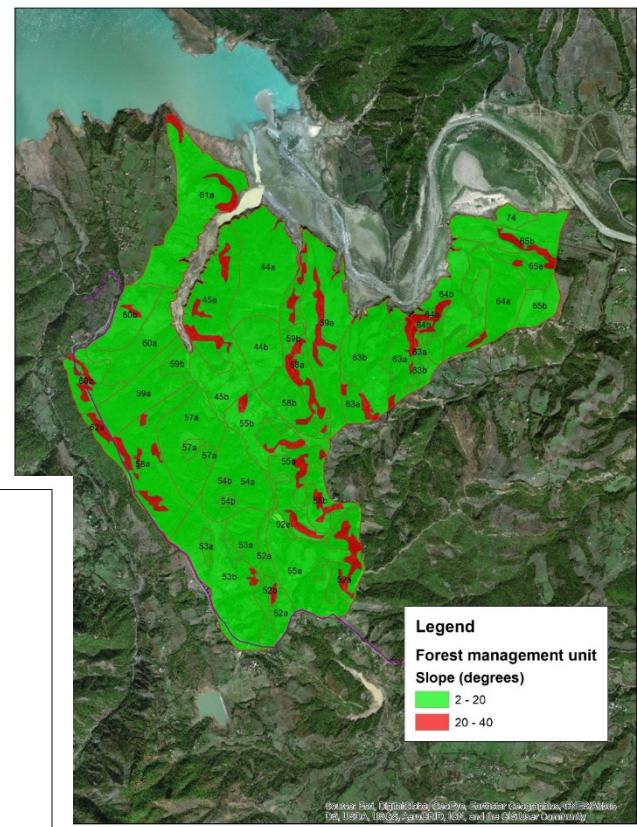
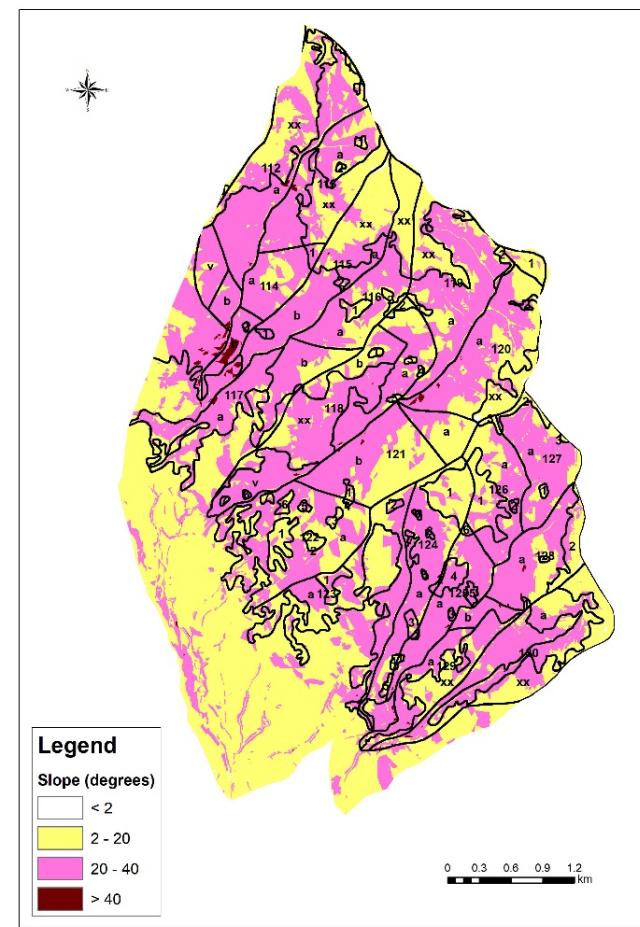
EROSION MAP



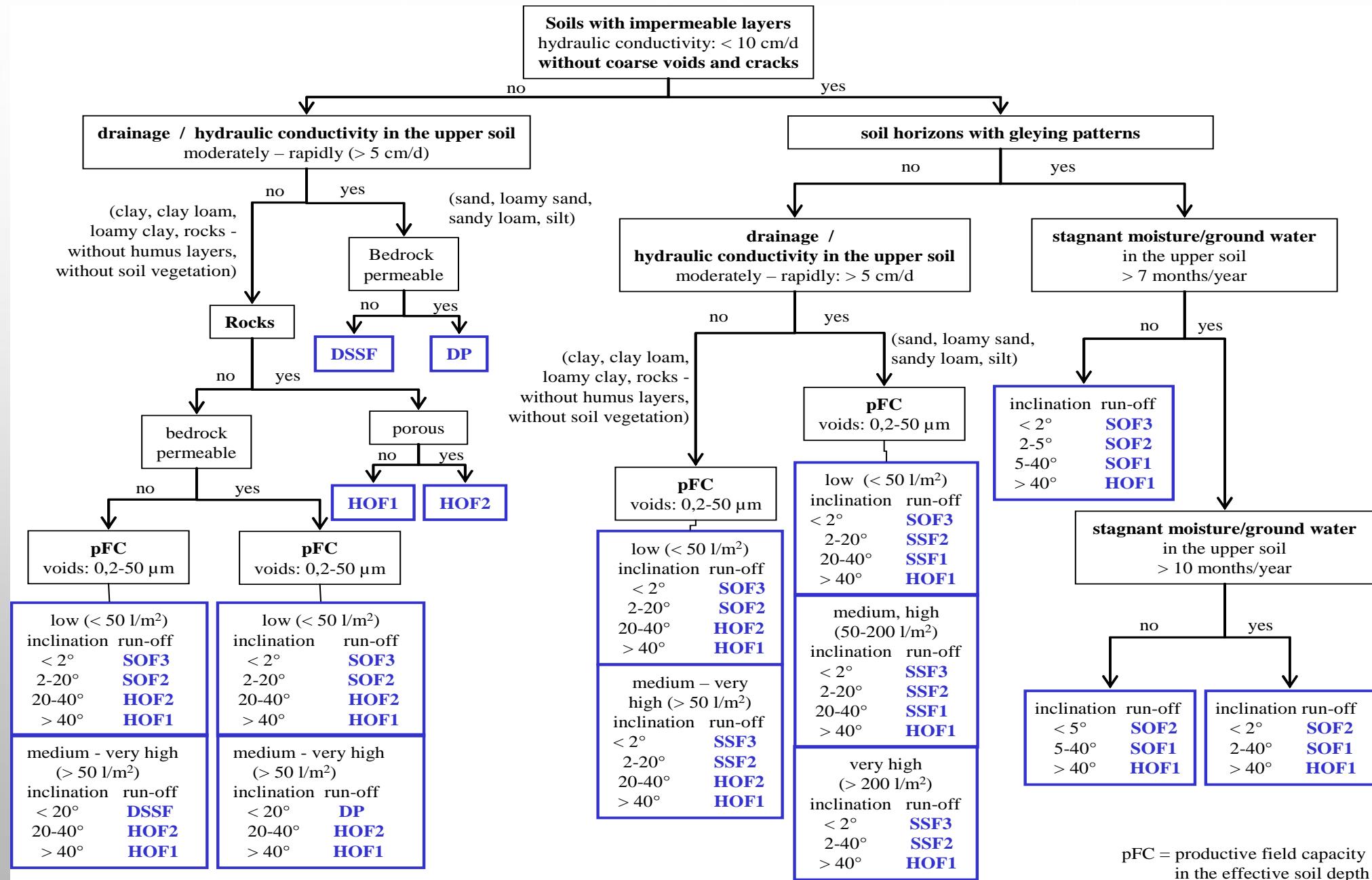
Existing roads



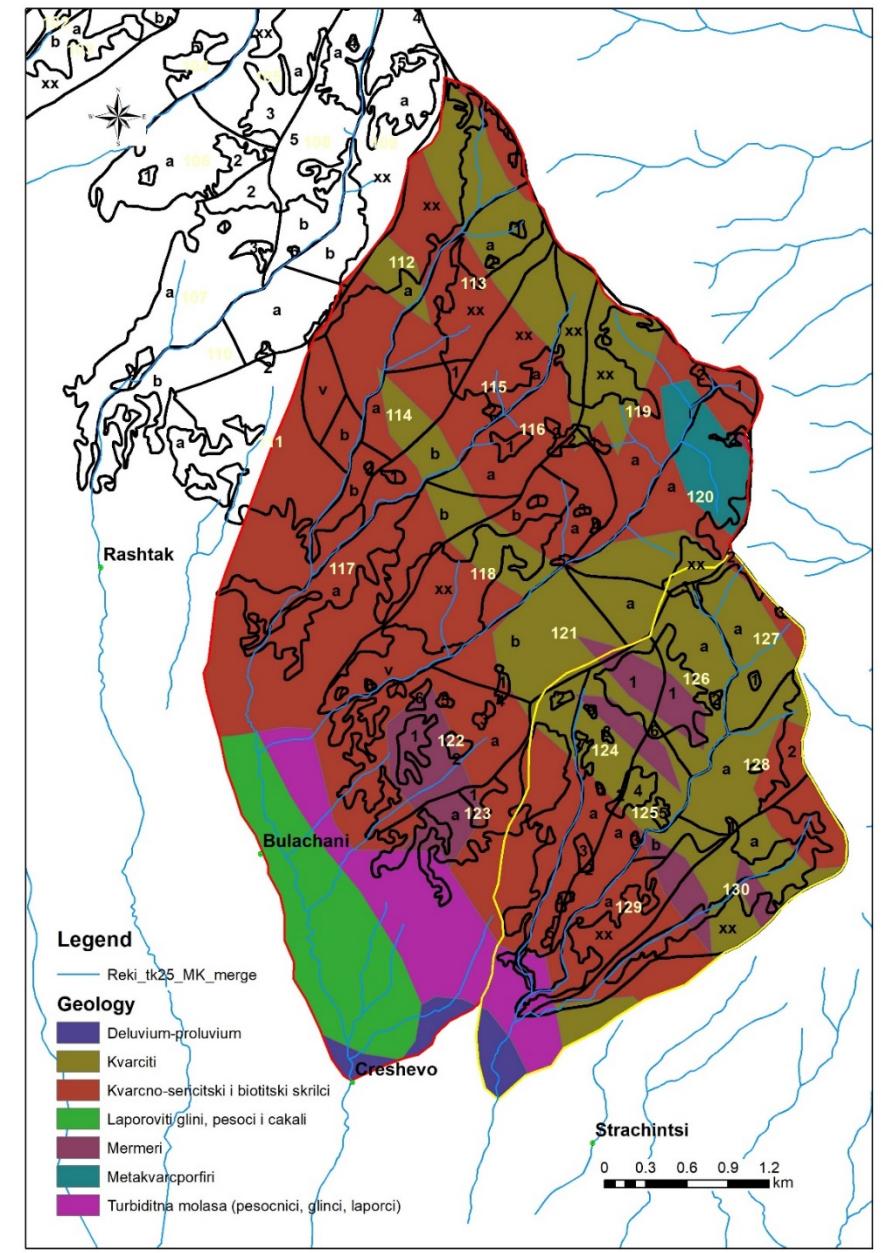
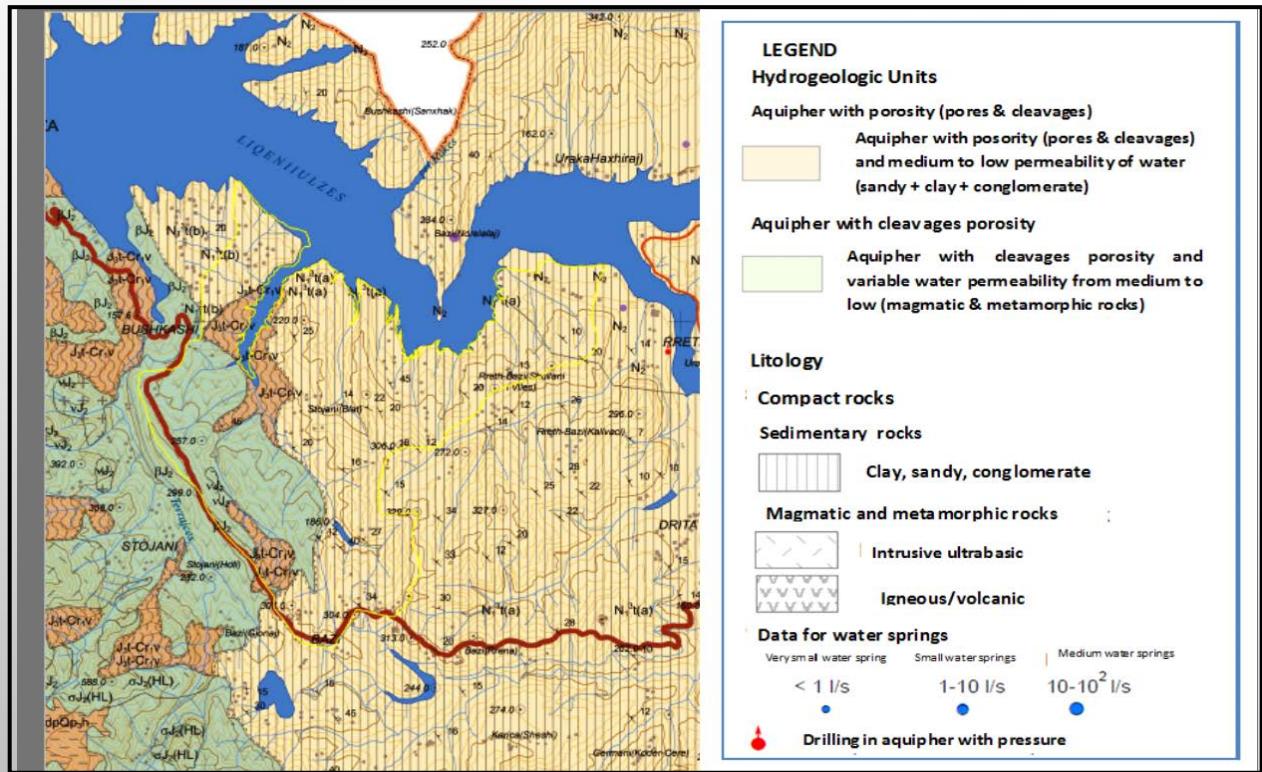
Slope



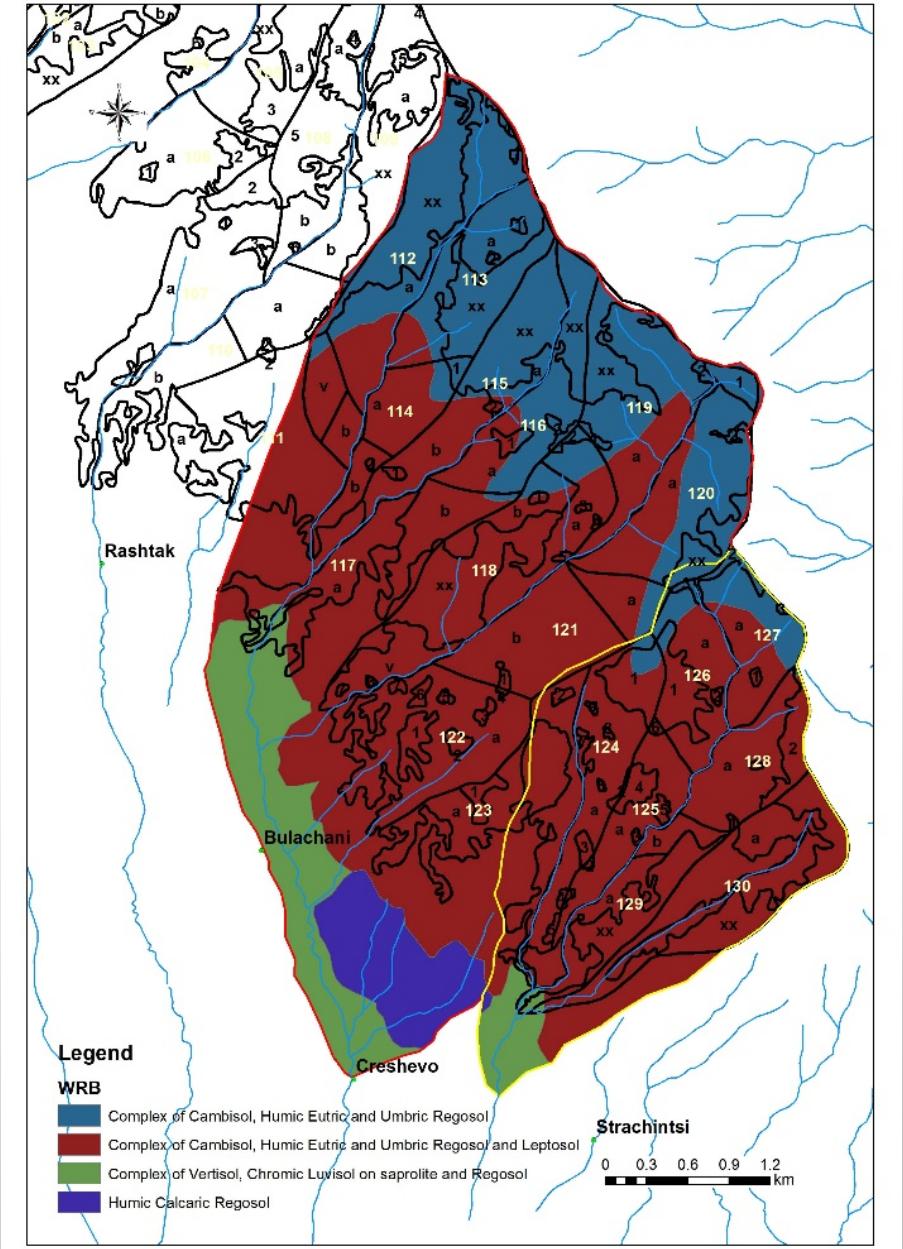
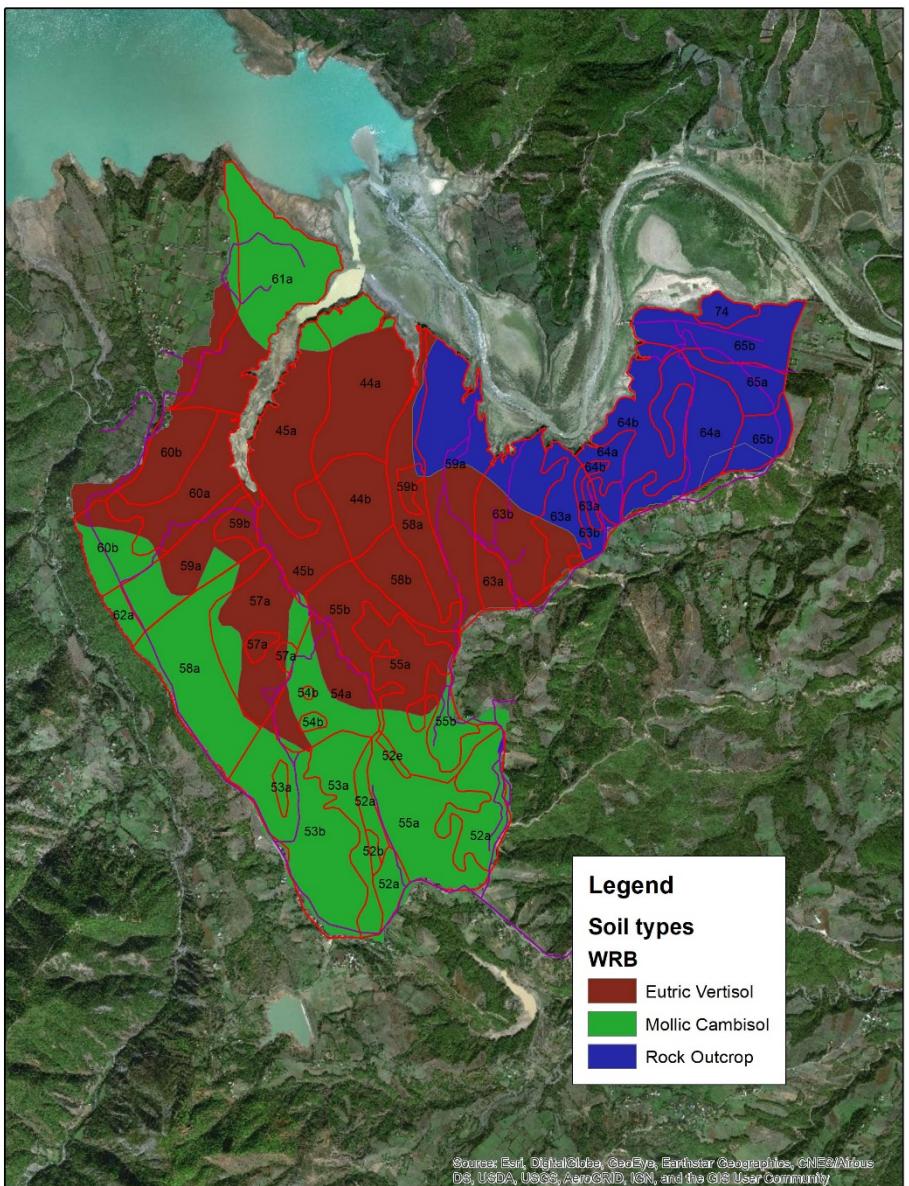
Expert system for identifying runoff sensitivity



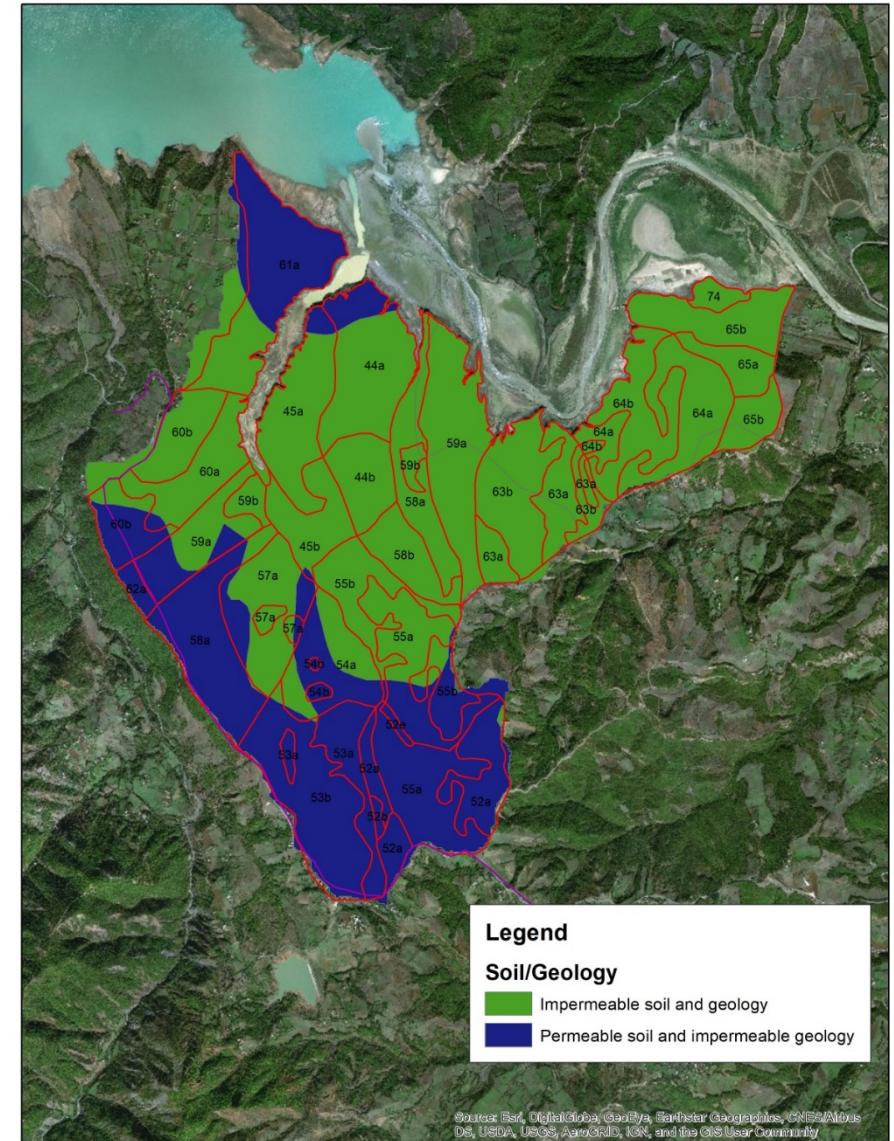
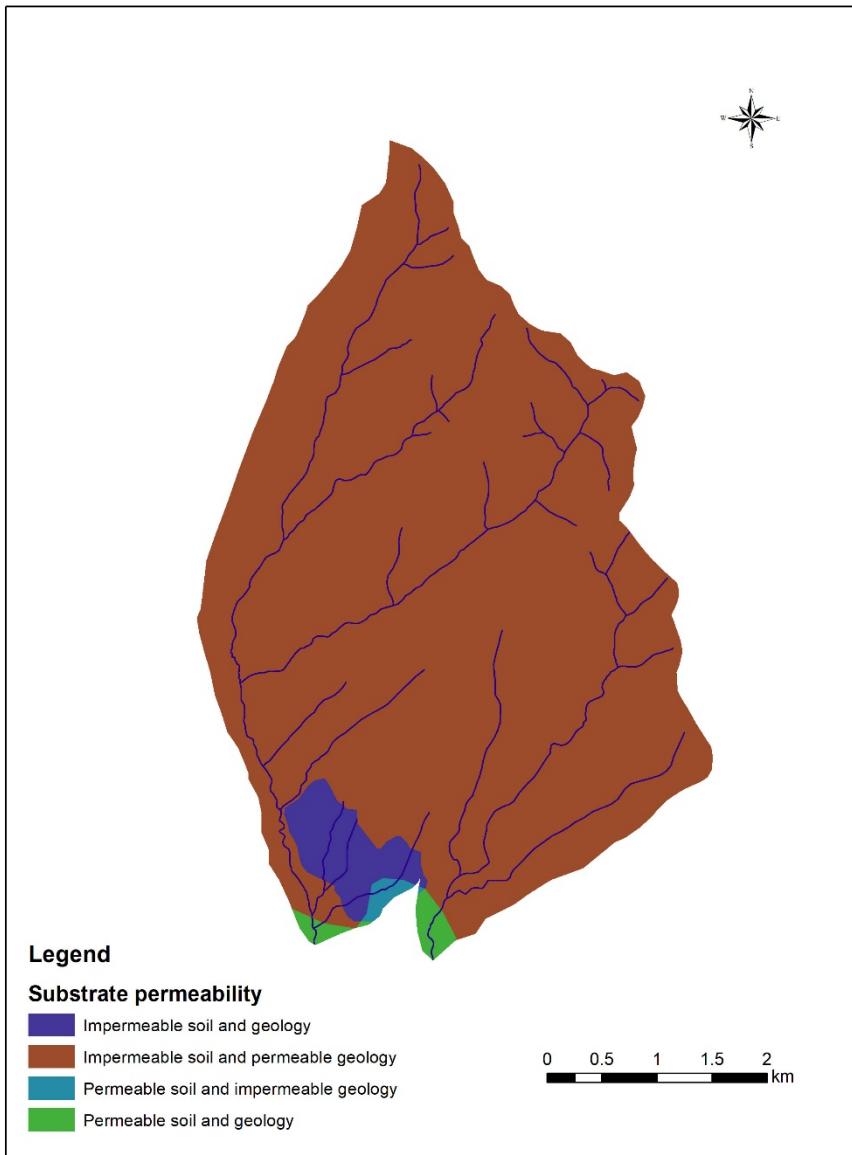
Geology map



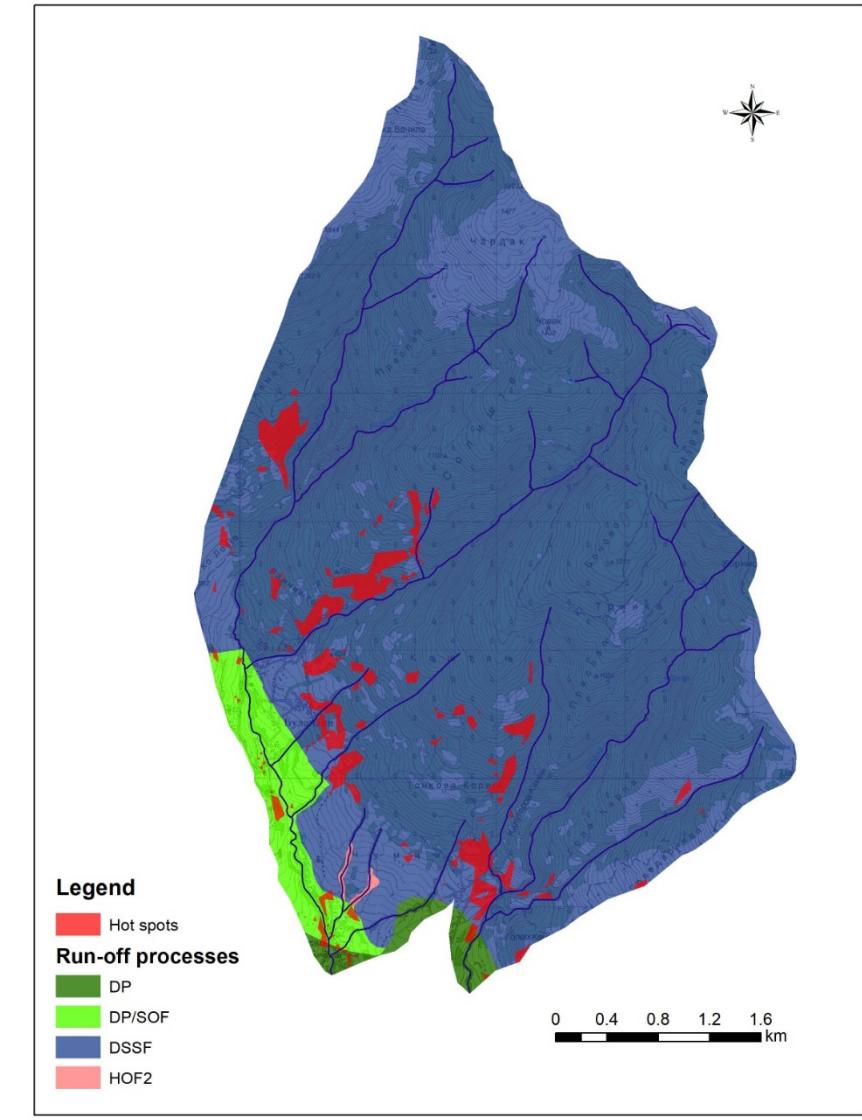
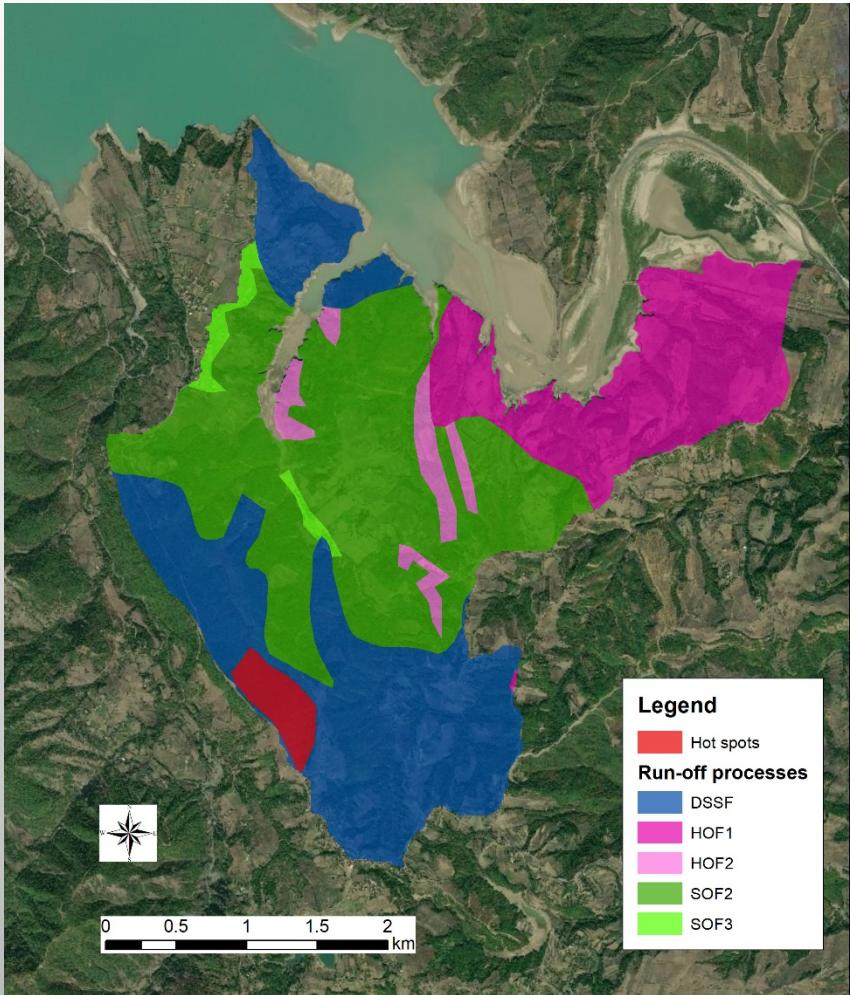
Soil map



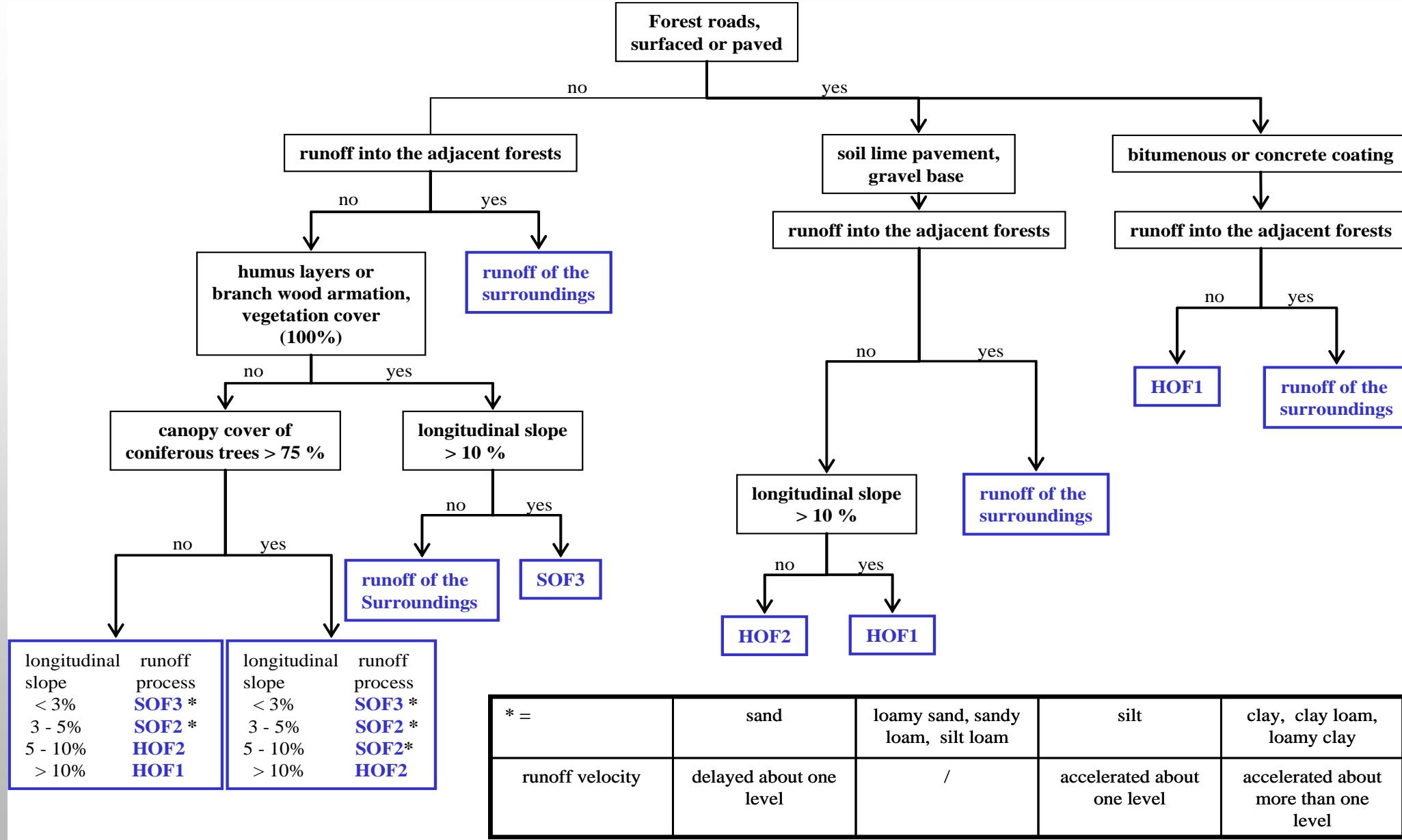
SUBSTRATE PERMEABILITY



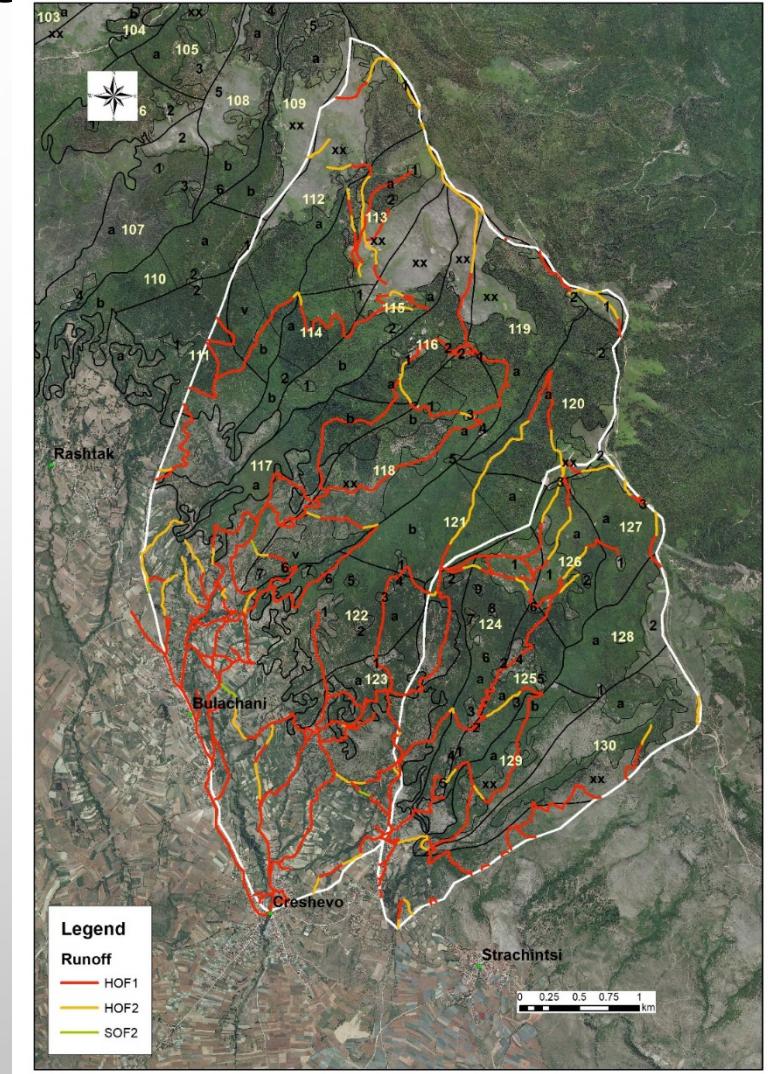
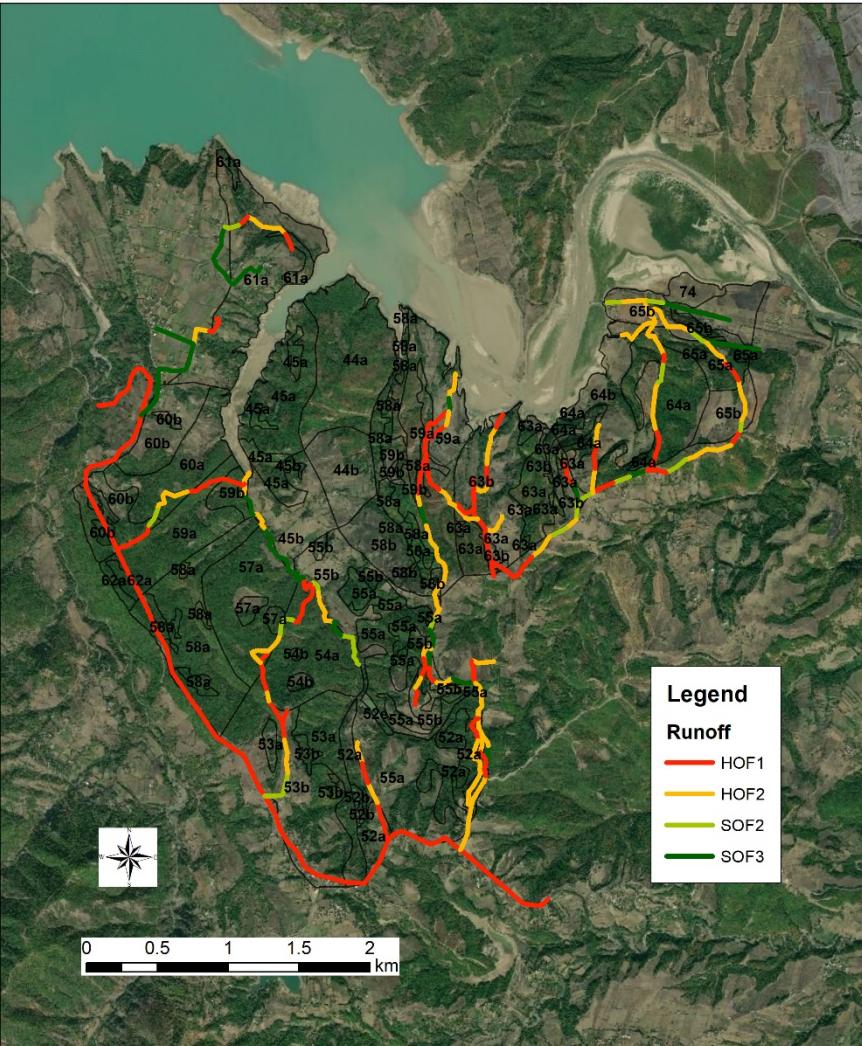
RUNOFF PROCESSES



Expert system for forest road assessment



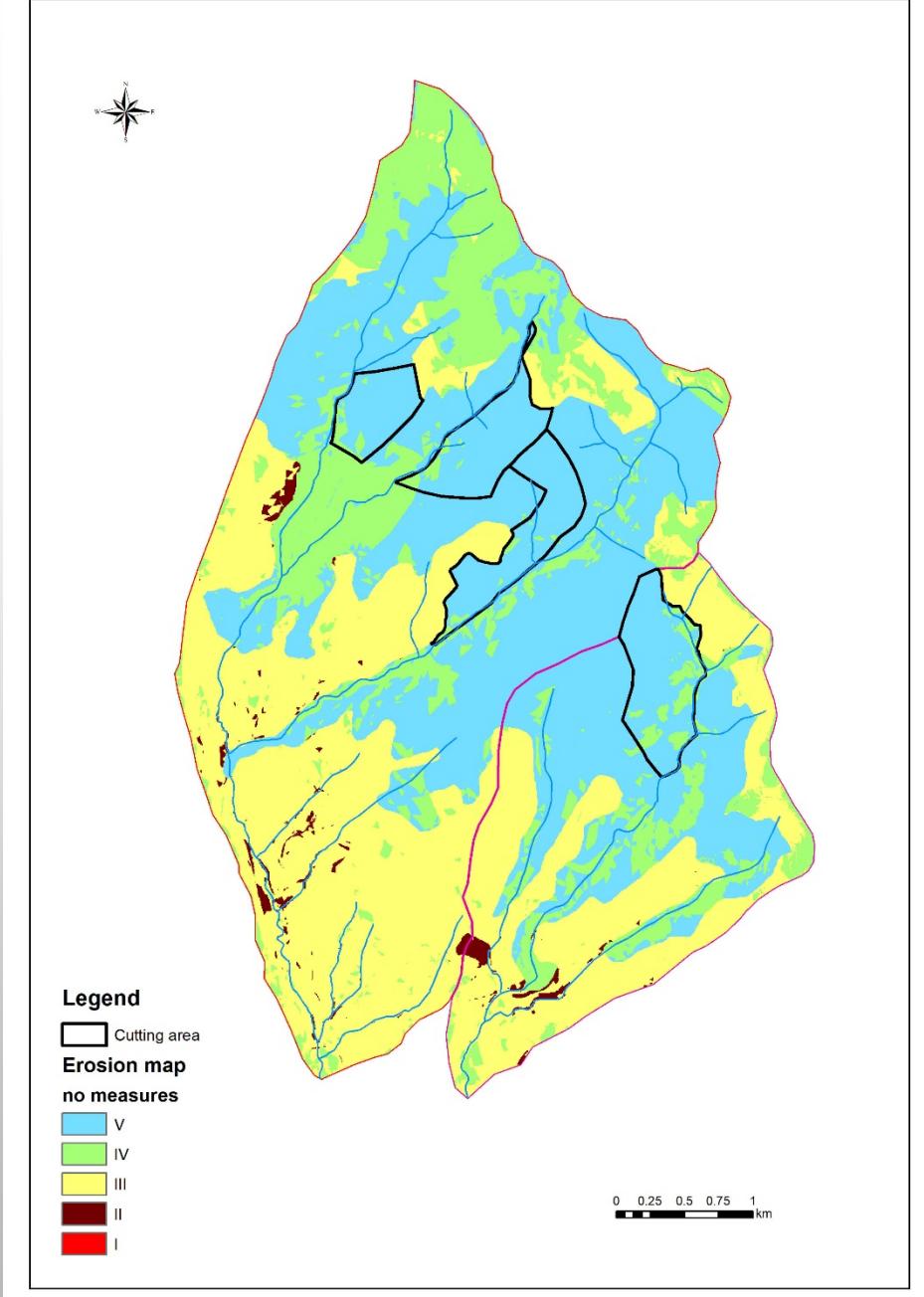
RUNOFF ON FOREST ROADS



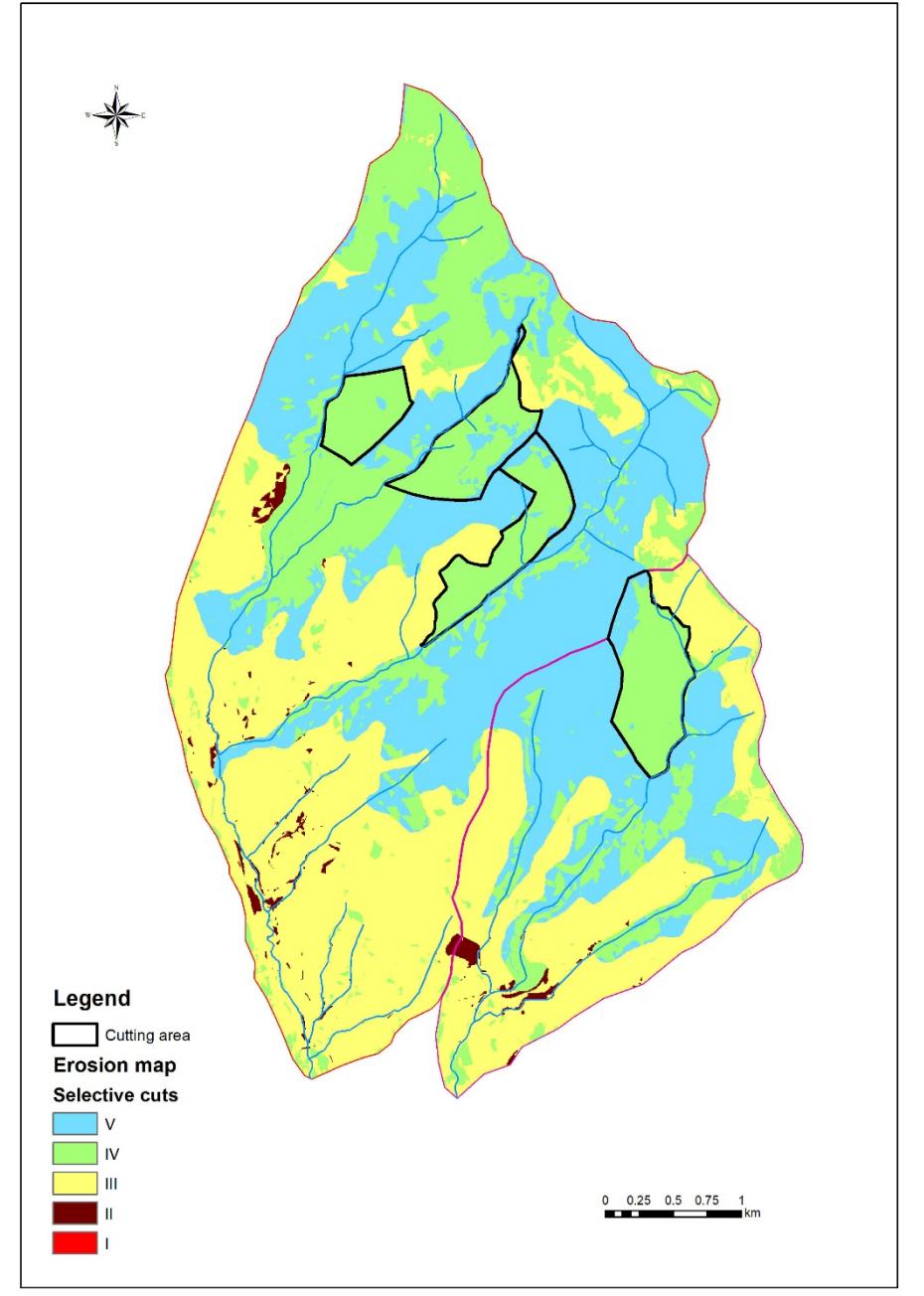
FOREST PRACTICES AND RISK OF EROSION PROCESSES

Hydrological element	Selective Cut	Shelterwood Cut	Clear Cut
Interception in crown (% of total precipitation)	8	5	0
Part of precipitation remaining in the forest floor (%)	10	7	4
Infiltration (%)	76	63	53
Surface runoff (%)	6	25	43

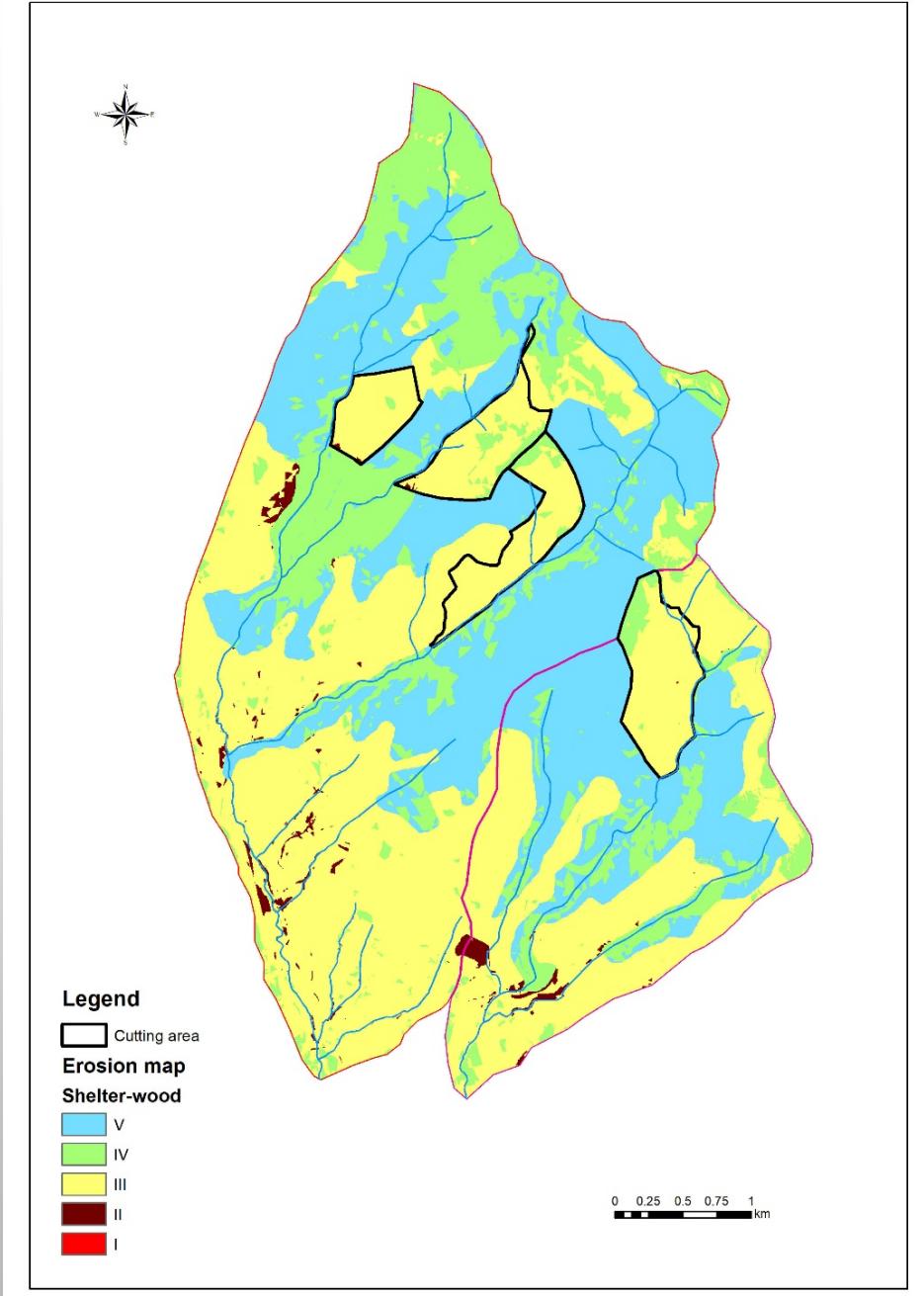
No activities



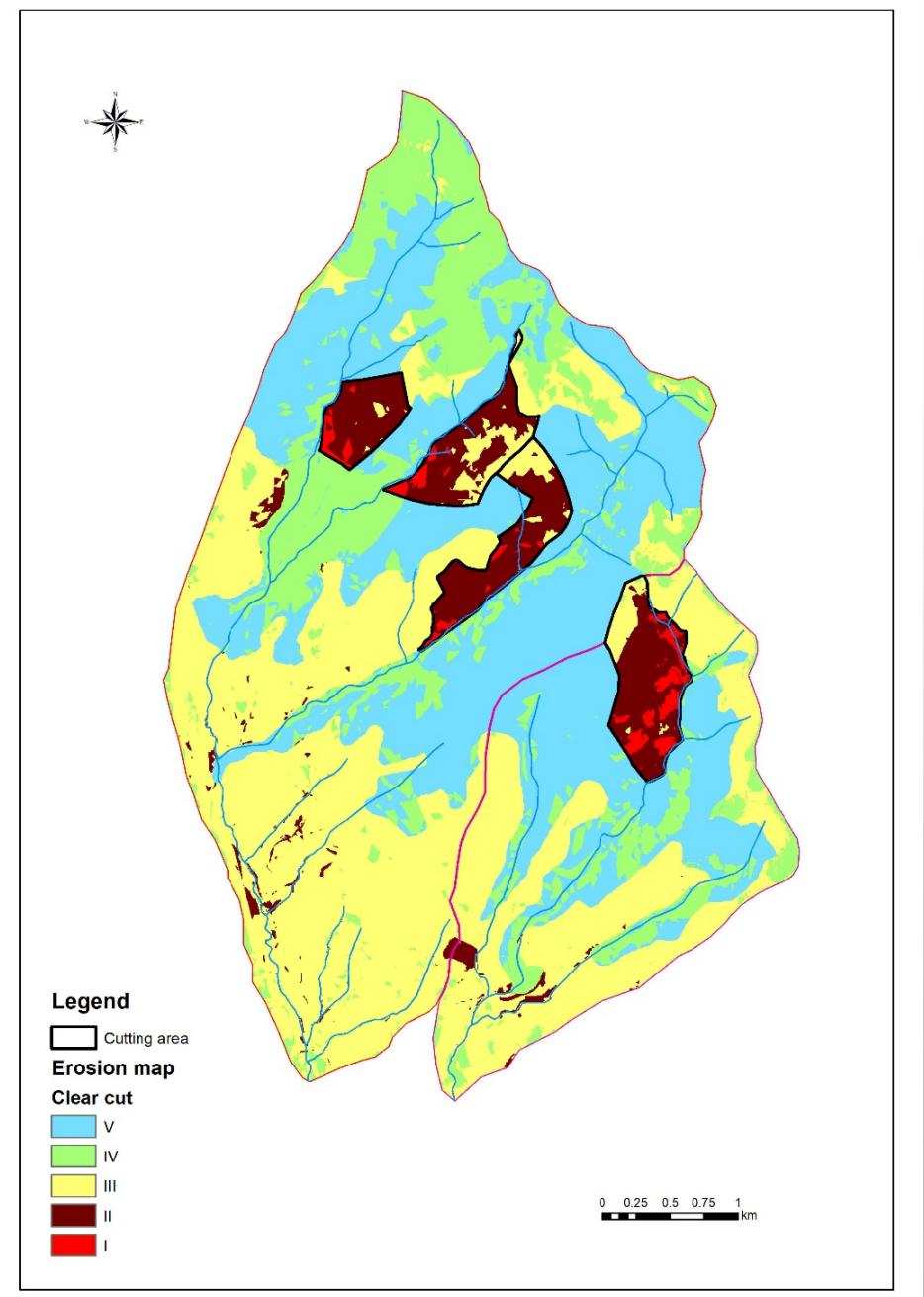
Selective cut



Shelterwood cut



Clear cut



VIDEO TUTORIALS

MACEDONIAN:

[HTTPS://WWW.YOUTUBE.COM/WATCH?V=QHLLJ9DXZTM](https://www.youtube.com/watch?v=QHLLJ9DXZTM)

[HTTPS://WWW.YOUTUBE.COM/CHANNEL/UC2OIRZ9NYL8H3I16WNIGIIQ](https://www.youtube.com/channel/UC2OIRZ9NYL8H3I16WNIGIIQ)

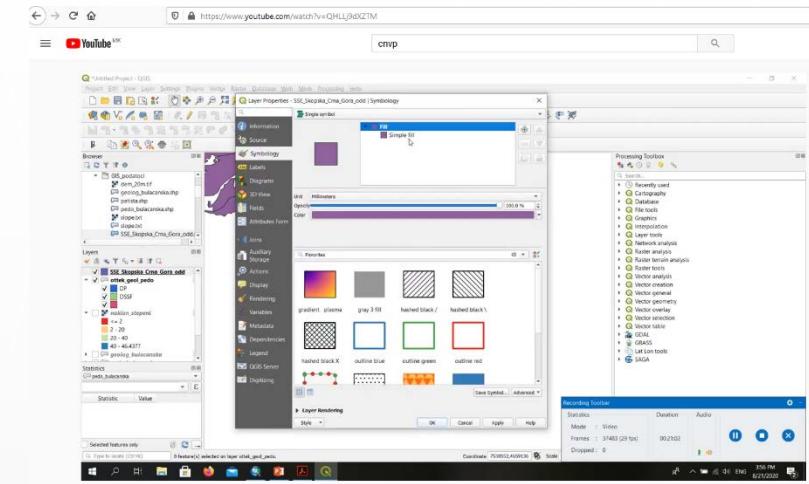
ENGLISH/ALBANIAN SUBTITLES:

BASIC:

[HTTPS://WWW.YOUTUBE.COM/WATCH?V=KP-LVFN2JLC](https://www.youtube.com/watch?v=KP-LVFN2JLC)

CASE STUDY:

[HTTPS://WWW.YOUTUBE.COM/WATCH?V=JOZJU-VELJ8](https://www.youtube.com/watch?v=JOZJU-VELJ8)

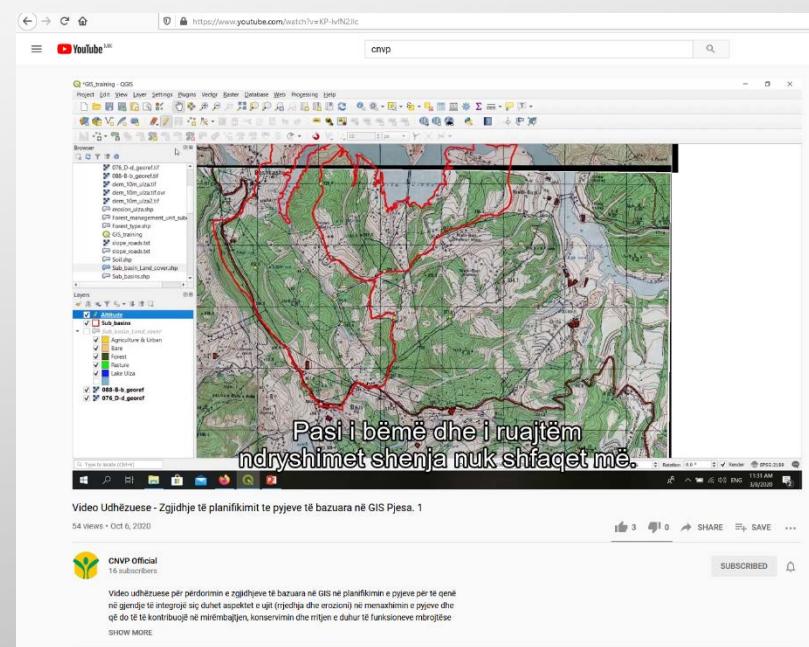


Видео упатство - ГИС-базирани решенија во планирањето на шумите

116 views · Aug 27, 2020



Видео упатство за употреба на GIS решенија при планирањето во шумите со правилно интегрирање на водата (истекување и ерозија) во управувањето со што ќе се придонесе во процесот на оджукање, зачување и соодветно подобрување на заштитните функции



Video Udhëzuese - Zgjidhje të planifikimit te pyjeve të bazuara në GIS Pjesa. 1

54 Views · Oct 6, 2020



Video udhëzuese për përdorimin e zgjidhjeve të bazuara në GIS në planifikimin e pyjeve të bazuara në gjerëjtë të integrat siç duhet aspekti i ushtrivshë dherëzacioni në memanahim e pyjeve që do t'ë kontrolojë në milëmbajtjen, konservanjen dhe rritjen e duhar të funksionuese mbrojtëse



Thank you for your attention