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et des milieux aquatiques

Aquatic corridors
The Blue Network

Pascal ROCHE
ONEMA Rhône-Alpes Region

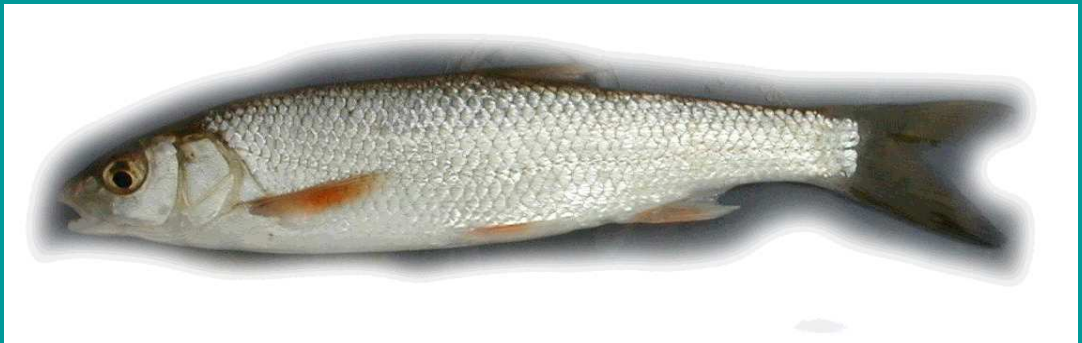



Essential needs in a fish's life

Nutrition with necessity to disperse when food becomes scarce and competition increases

Rest with good protection against predators and changes in the choice of resting spots according to fish size

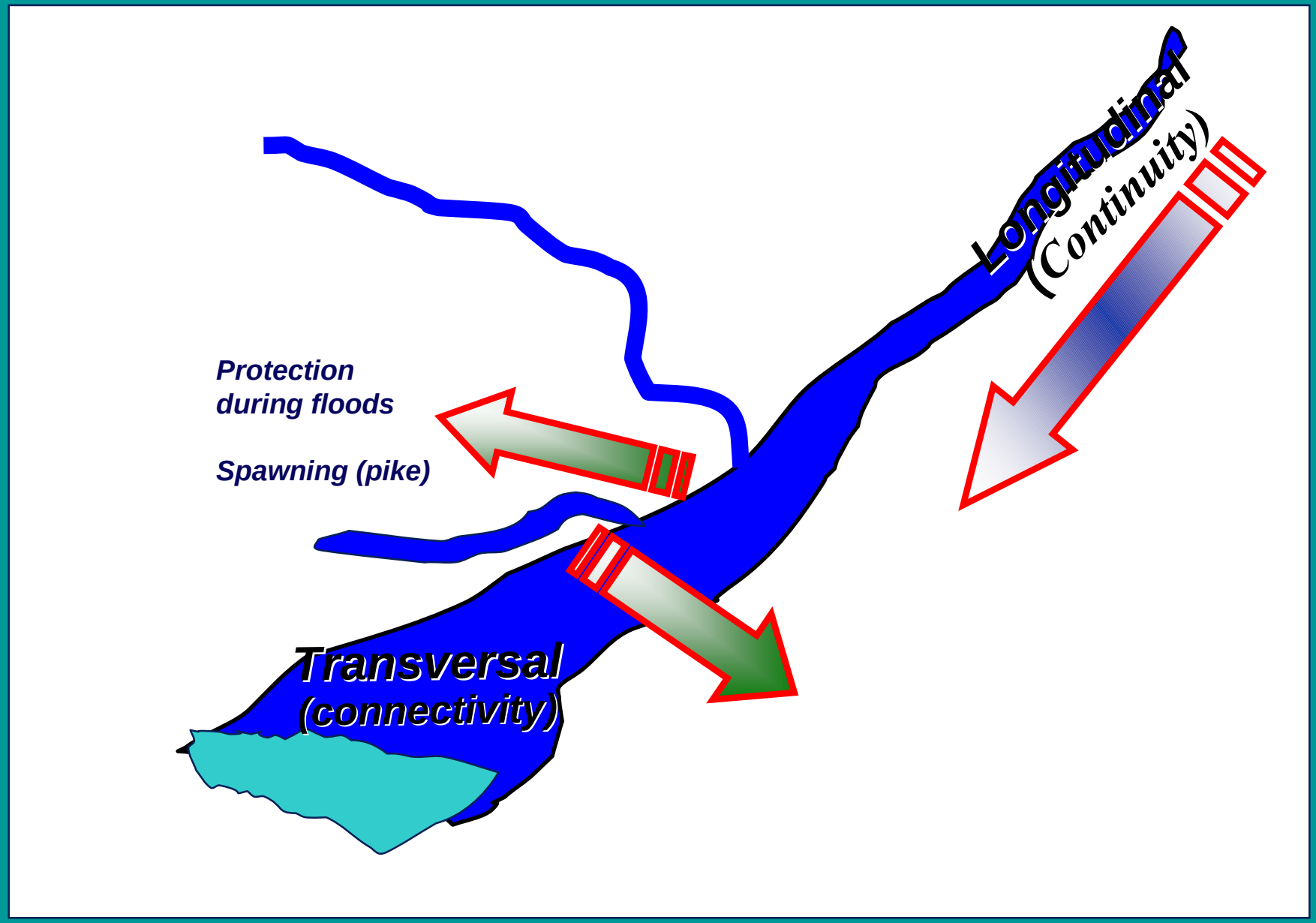
Reproduction in suitable habitats, often different from feeding habitats



Habitat preferences change according to :

- **species**
- **size**
- **season**
- **activity**
- **availability of preferred habitat**

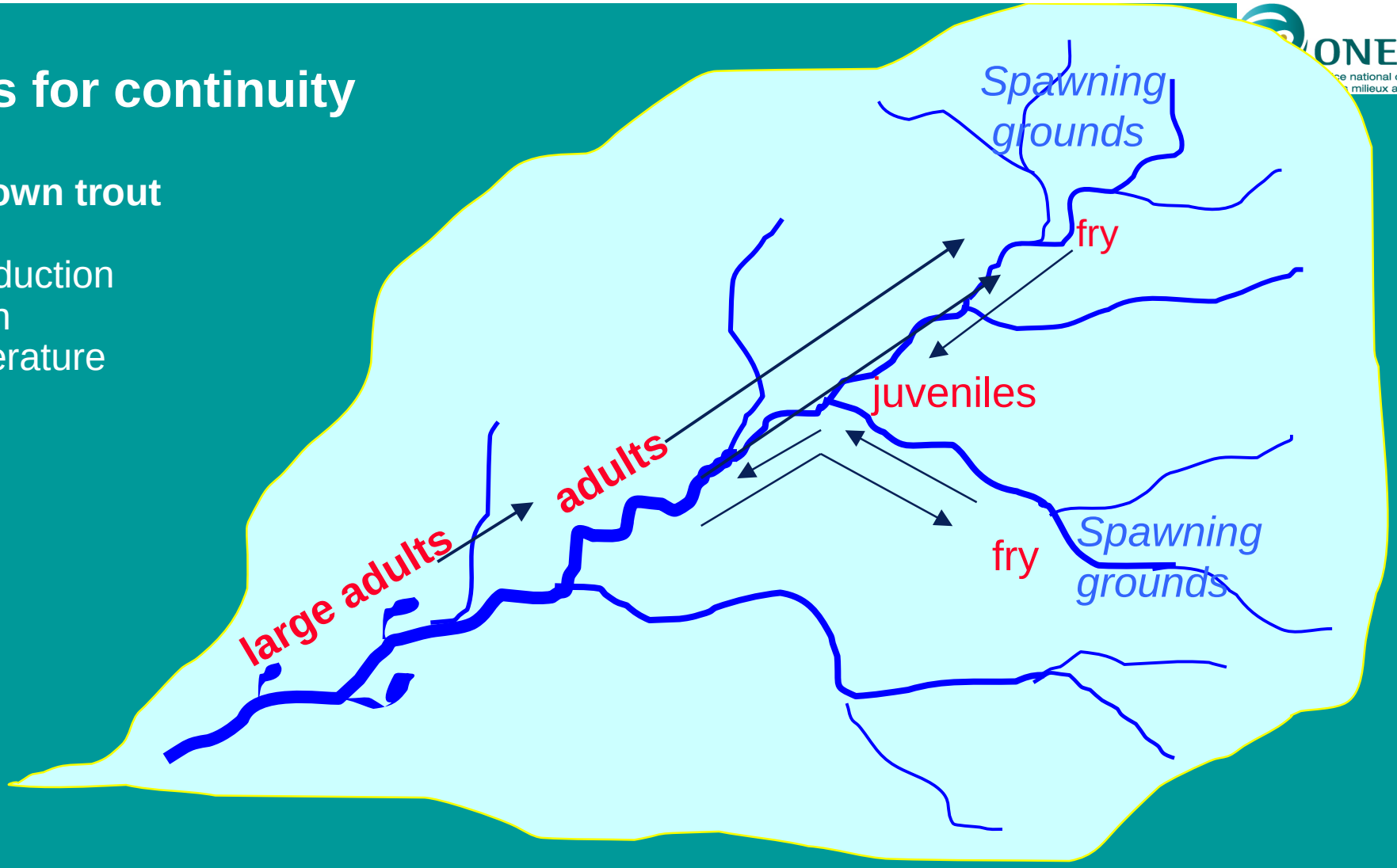
Connectivity and Continuity



Needs for continuity

Ex : Brown trout

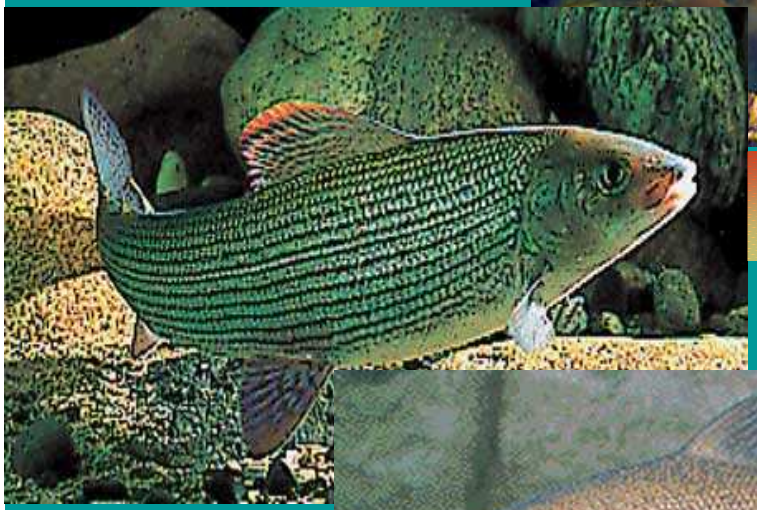
- Reproduction
- Growth
- Temperature



Fish species may need access to whole watersheds to accomplish their life cycle and survive environmental and habitat changes

Migration distances
(radiotracking studies)

Brown trout : 9 km



Grayling : 2,3 km

Barbel : 3,5 km

Pike : 8 km

Ovidio et Philippart, 2002. The impact of small physical obstacles on upstream movements of six species of fish. Hydrobiologia, 483: 55-69

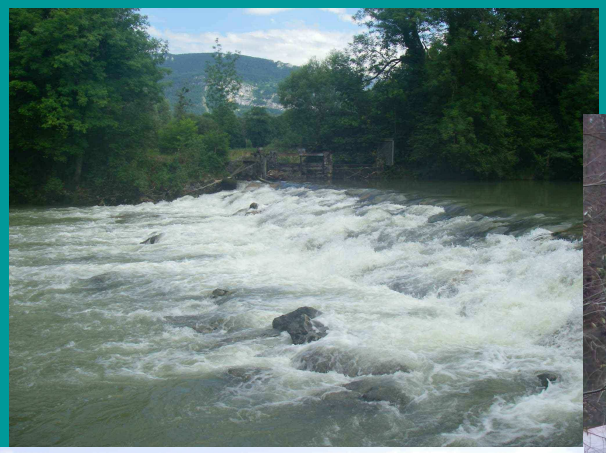
Obstructions in small streams

Mostly culvert for road and trail passages

Little hydraulic impact

Obstacles in alpine streams and rivers

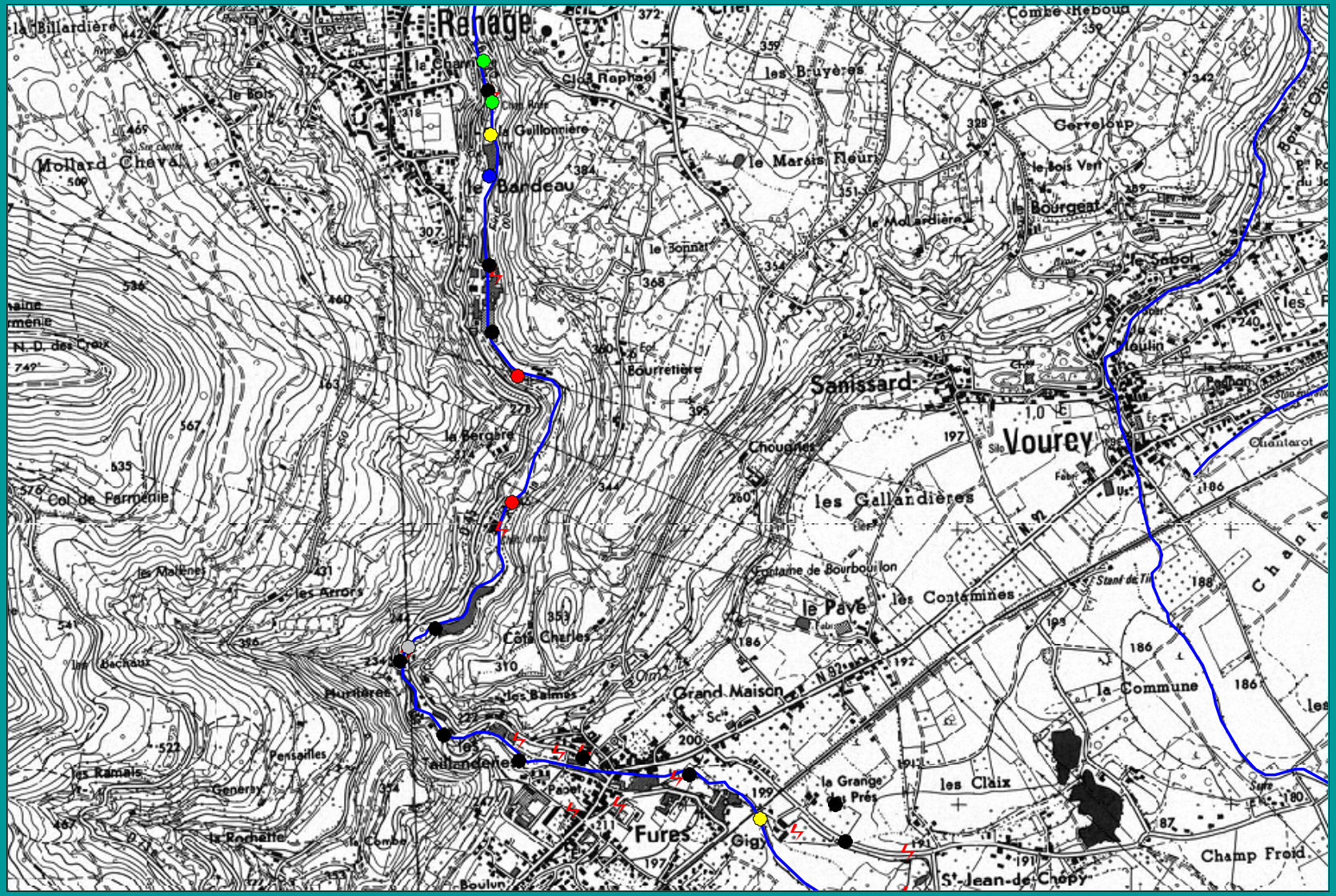
Rock weir
Le Guiers



Hydroélectric dam
Le Guiers

Hydroélectric dam
L'Isère

Numerous obstacles in old industrial valleys but many are not used anymore



La Fure

Restoring continuity and connectivity

The blue Network :

1 - National : Classified waters (conservation or restauration)

- « Migratory fish » : Eel, Salmon, Shad, Sturgeon,Lampreys
- Stretches of rivers with a role of « Biological reservoir »
- « Very Good Quality » streams

2 - Regional : Complementary approach

- Rivers where local effort for continuity has started
- Rivers where restoration of continuity is a priority

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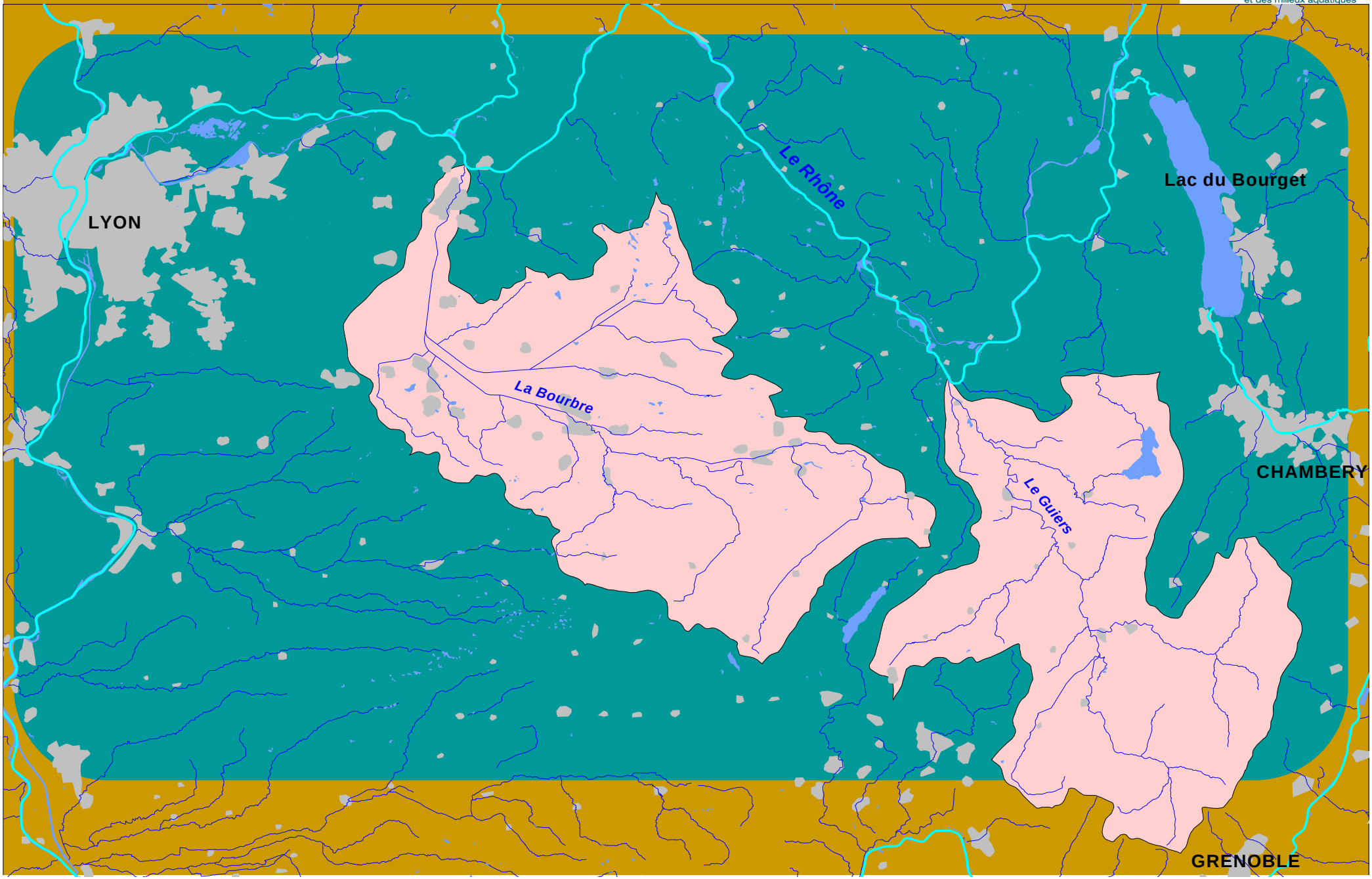

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Obstacles in rivers (Water District database)

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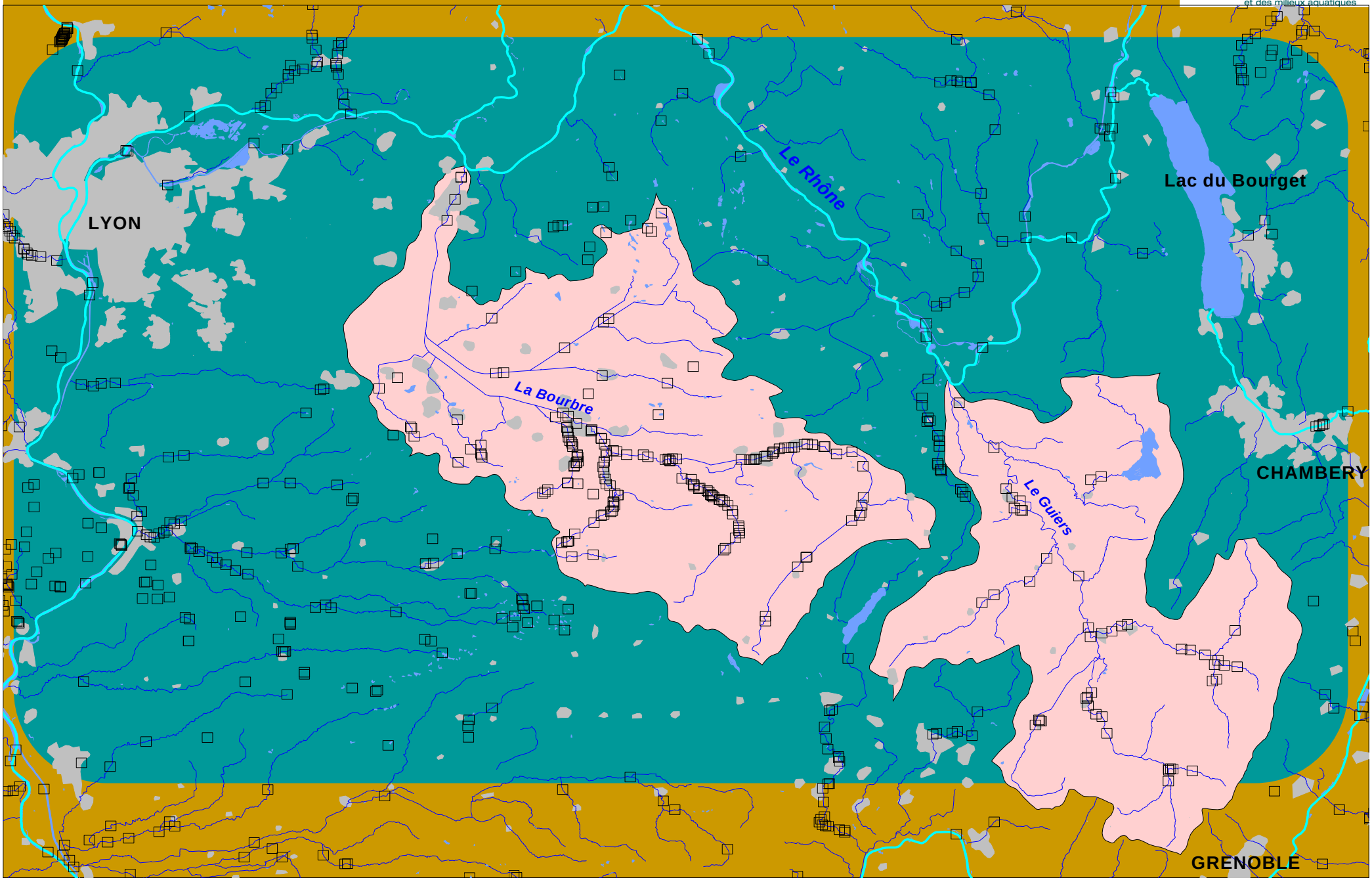

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Bio Reservoirs
Eel waters

Very good quality

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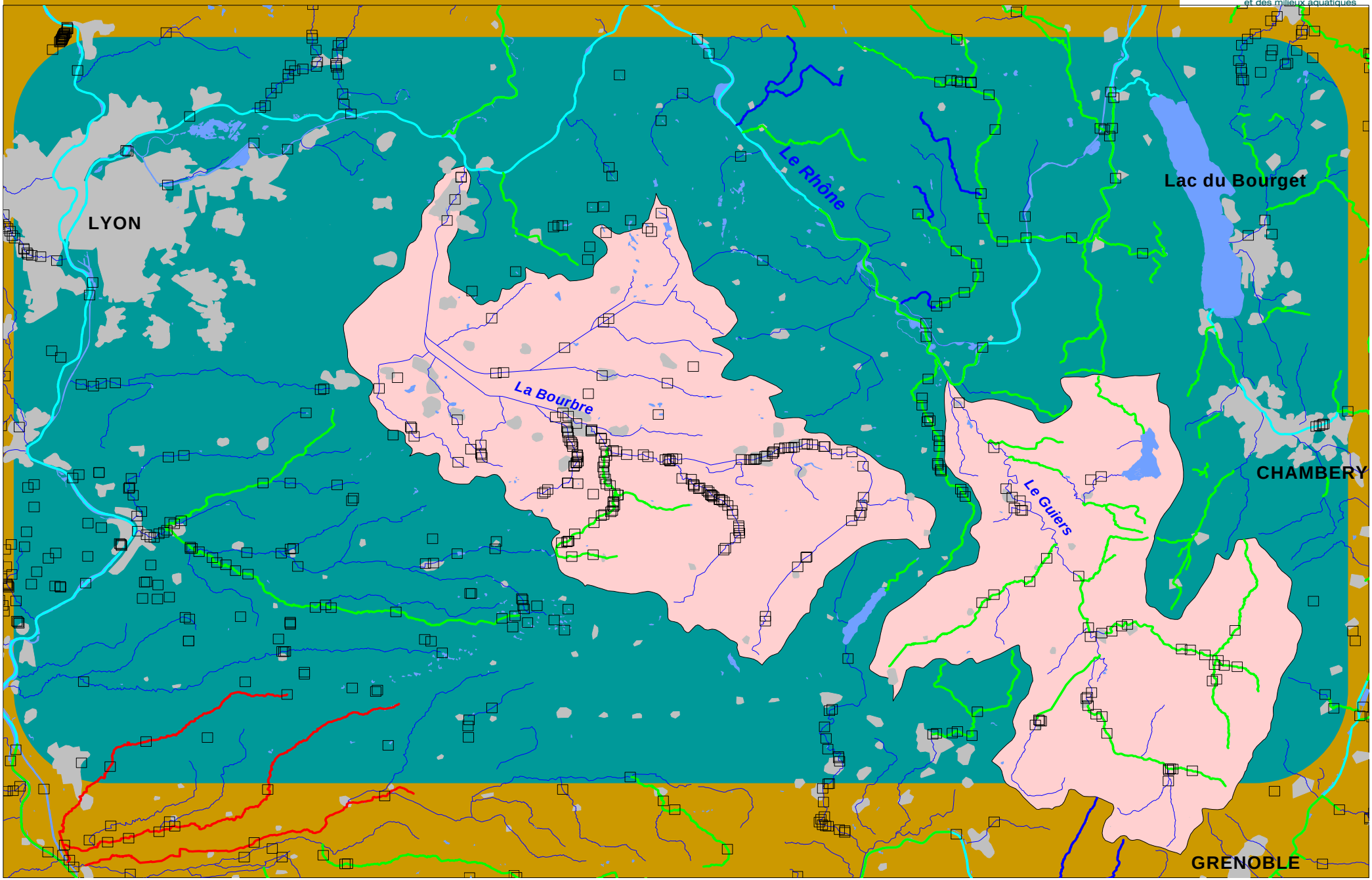

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prio 1 | prio 2 | prio 3 | no prio | natural

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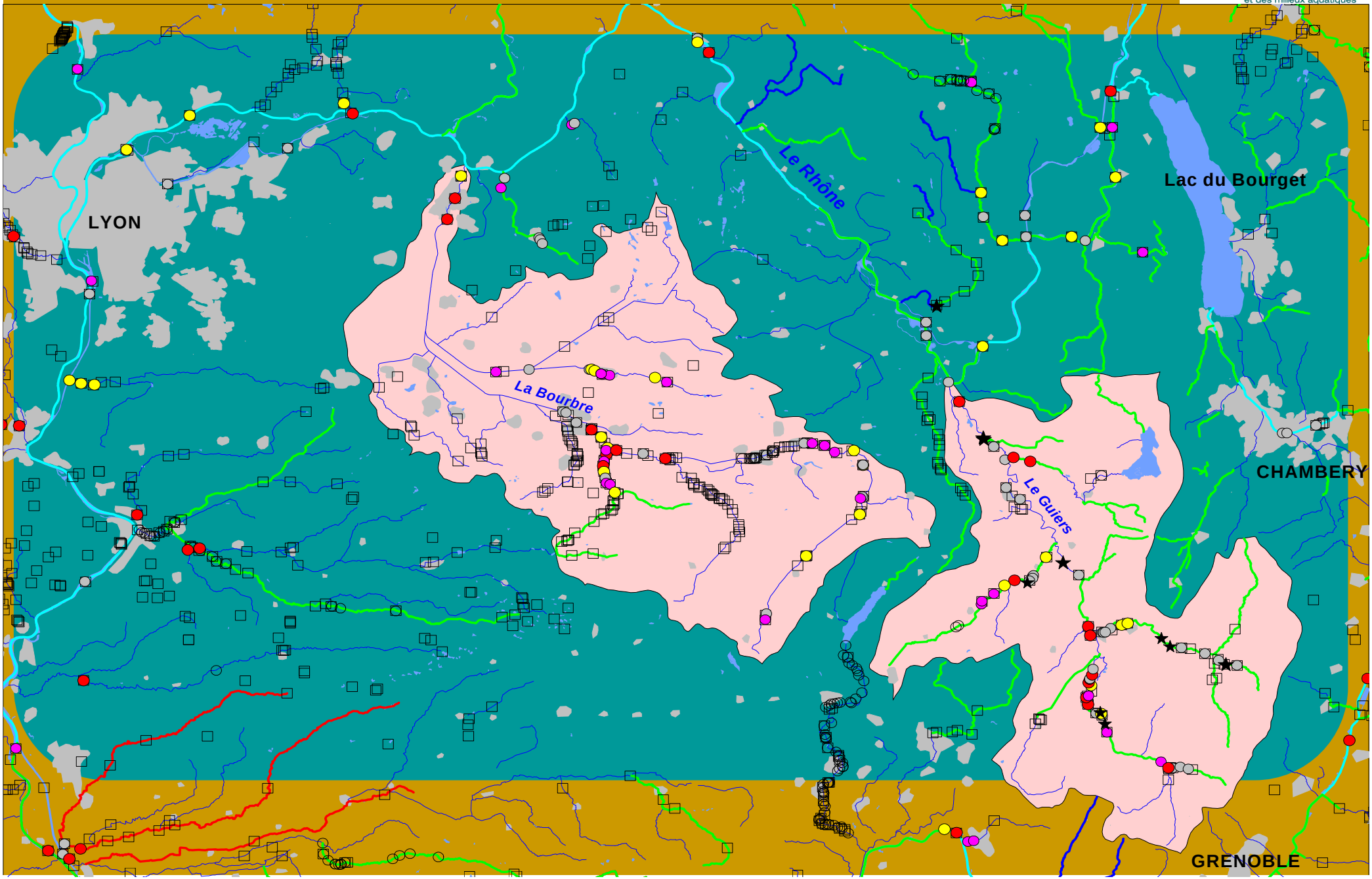

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— Classified for restoration of continuity

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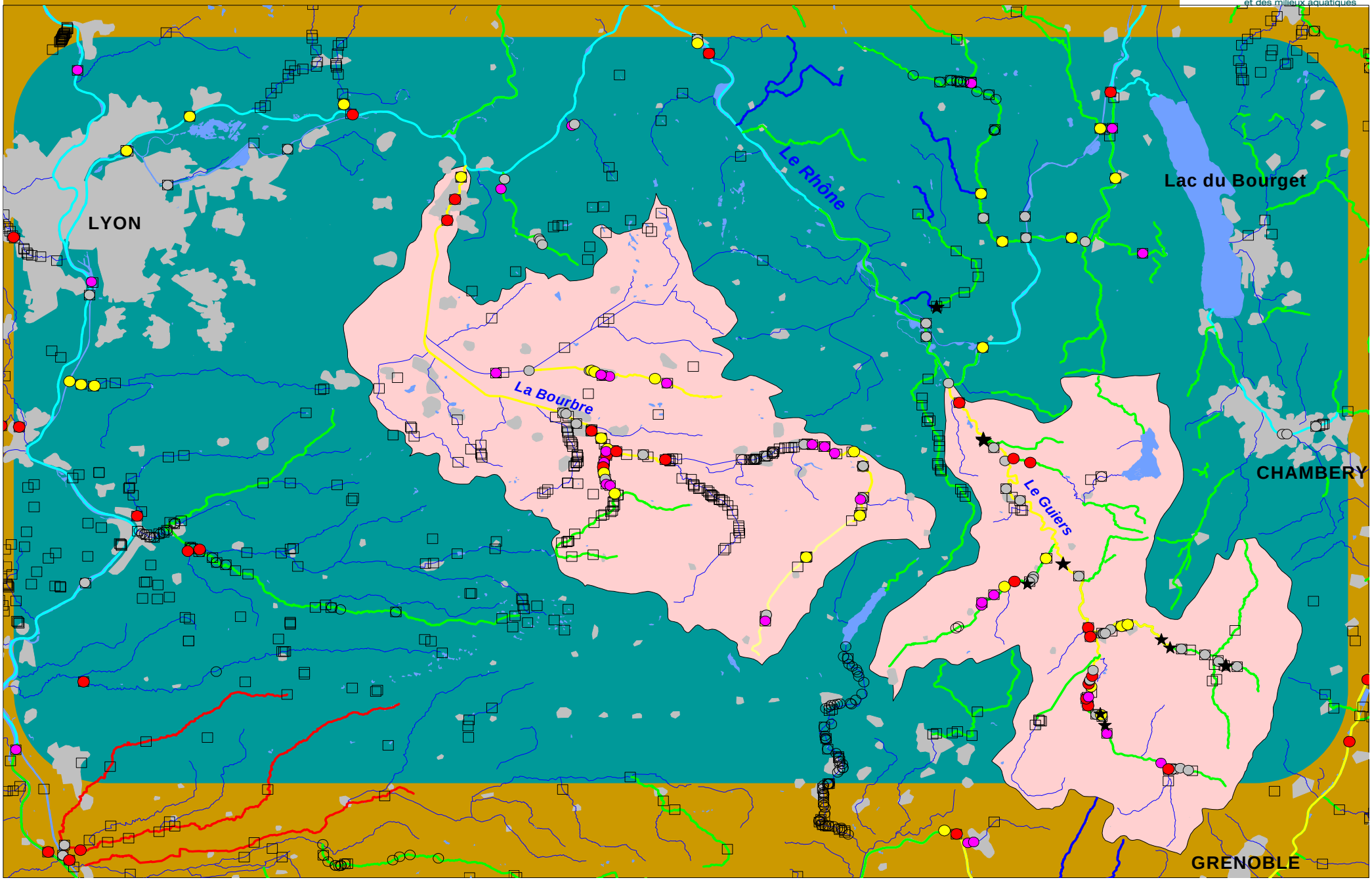

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Classified rivers

Restoration of continuity
Prio 1 and 2

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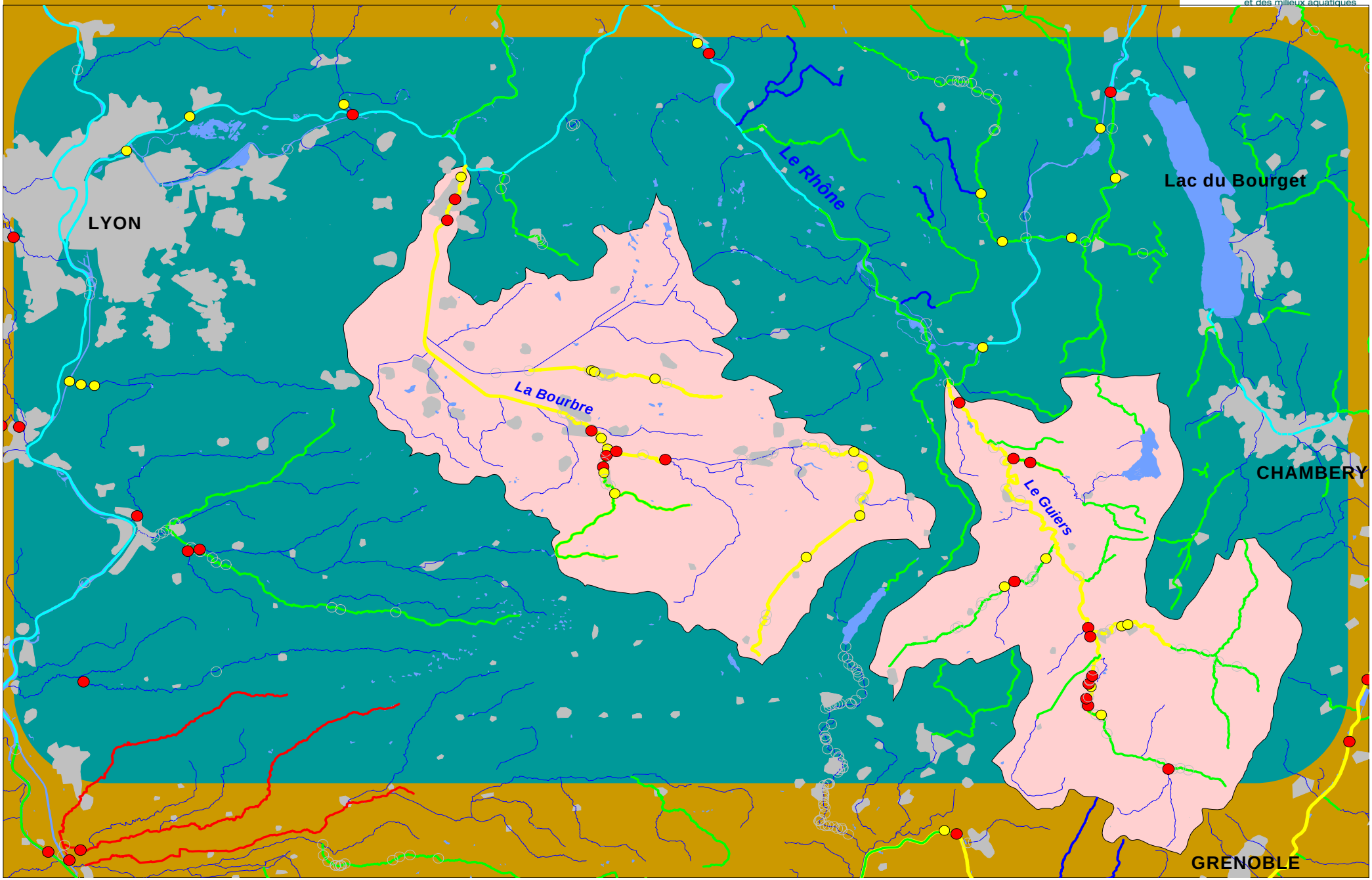


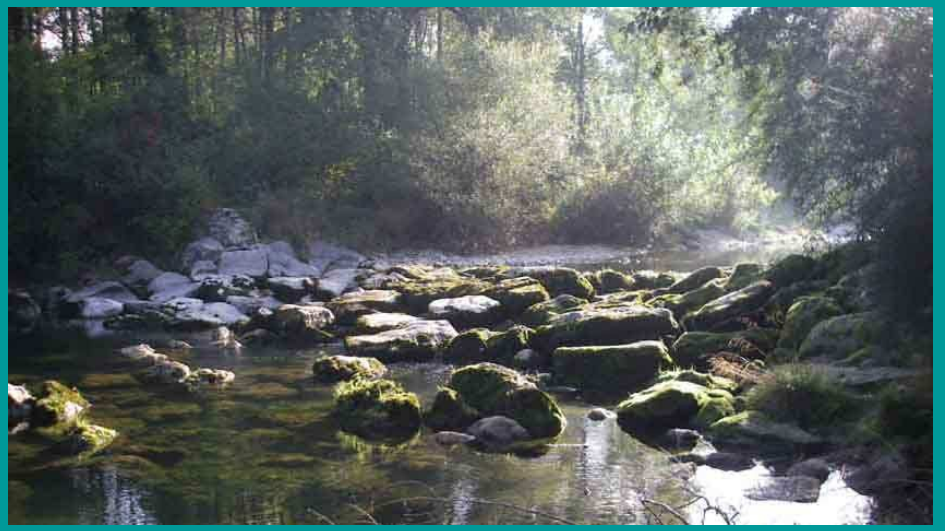
Restoring continuity

The blue Network :

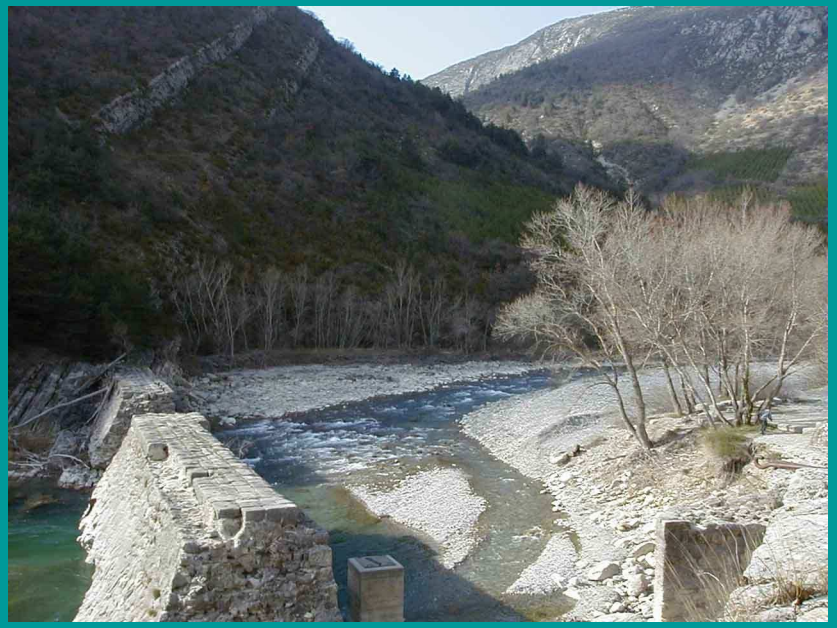
What is to be done with those dams?

Dam removal

Le Guiers vif
Dam replaced by
A small rock weir



Le Guiers vif
Bypass of a dam with creation of a new streambed



Le Buëch
Breaching of the dam

Technical solutions when removal is not possible

La Dranse

Le Guiers

Fish pass

La Leysse

Solutions for large and small species

Artificial bypass chanel
La Drôme

Fish entrance *Overflow outlet*

Fich pass with regular roughness
Le Gardon

Passable rock weirs

Rock weirs passable by design
Le Guiers
Height< 1,2m
Slope 5%

Devices for downstream migration

Halsou (Nive)

Downstream migration device

Poutes (Allier)

Lalevade (Ardèche)

Problems with fish passes

Lack of maintenance *(BSN dam, Ardèche)*

Streambed erosion
Special care is needed during construction in powerfull rivers
(natural thresholds ensure some stability)

Lack of bottom roughness

OK : Big angular stones

No roughness : Stones deep in concrete

Better cooperation for better results
an example of what should be avoided…

La Cance

Rock weir built to replace a vertical weir (2009)
Supposed to be passable by fish
slope 9-10%, height 2 m, length 23 m

1.8 m/s

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Thank you for your attention