

## Analysis of diffuse source water contamination in rural and semi-rural areas in Europe and United States

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### Introduction

In the rural and semi-rural environment, many diffuse sources of contamination may impact surface water quality. In addition to nutrients from agricultural activities, contaminants occurring at low concentration so-called trace contaminants are a growing issue for water quality.

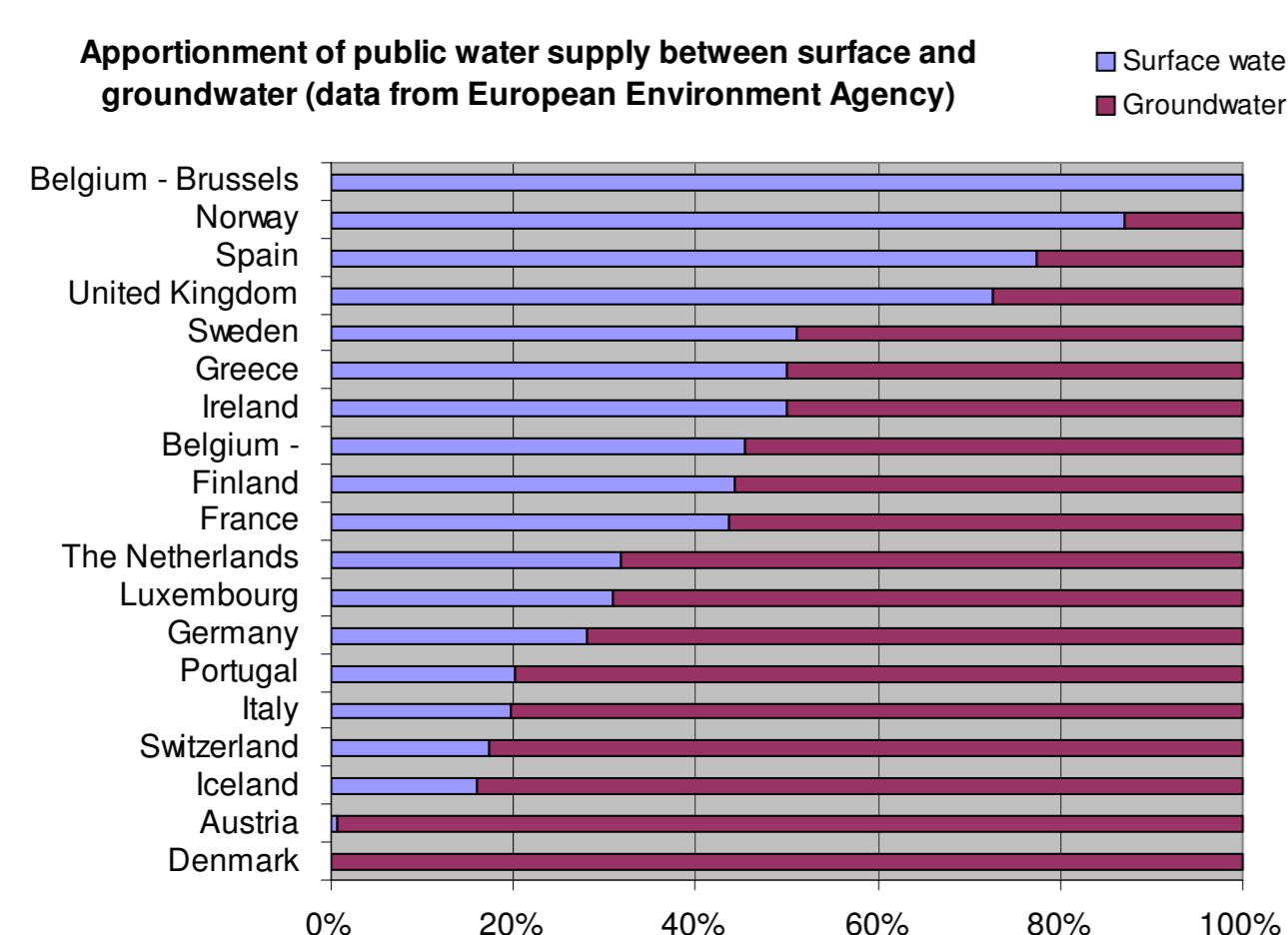
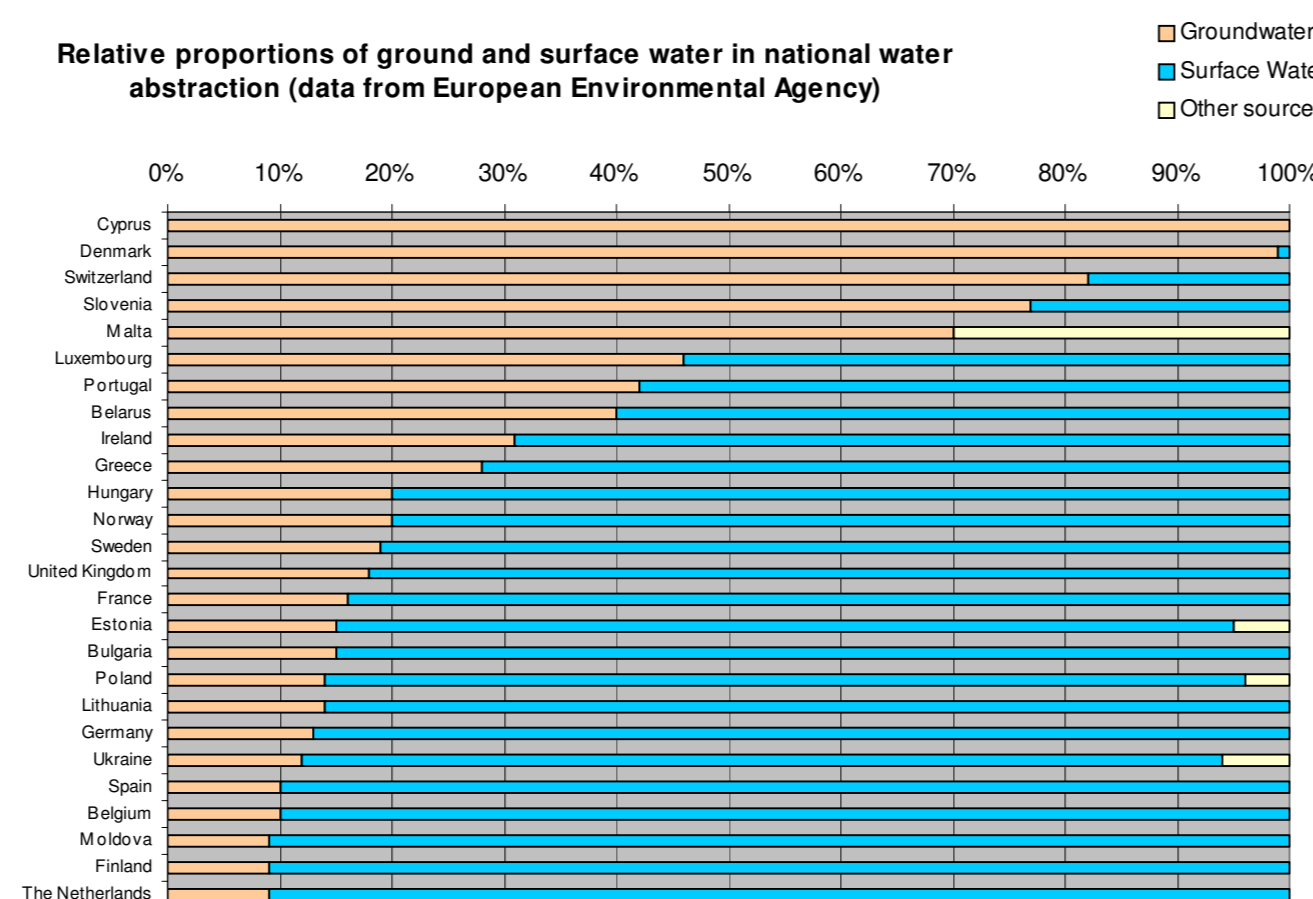
To address this issue and investigate mitigation measures, the Berlin Centre of Competence for Water (KompetenzZentrum Wasser Berlin) developed a collaborative research project called Aquisafe, in association with Indiana University – Purdue University Indianapolis (IUPUI), the German Federal Agency for the Environment “Umweltbundesamt” (UBA) and Veolia Water.

The project aims at investigating mitigation zones such as constructed wetlands or riparian zones to improve the quality of surface water with respect to diffuse pollution. Before using models and conducting field experiments, the first part of the project is an analysis of the nature, occurrence, and risks of source water contamination in rural and semi-rural areas in both Europe and the United States.

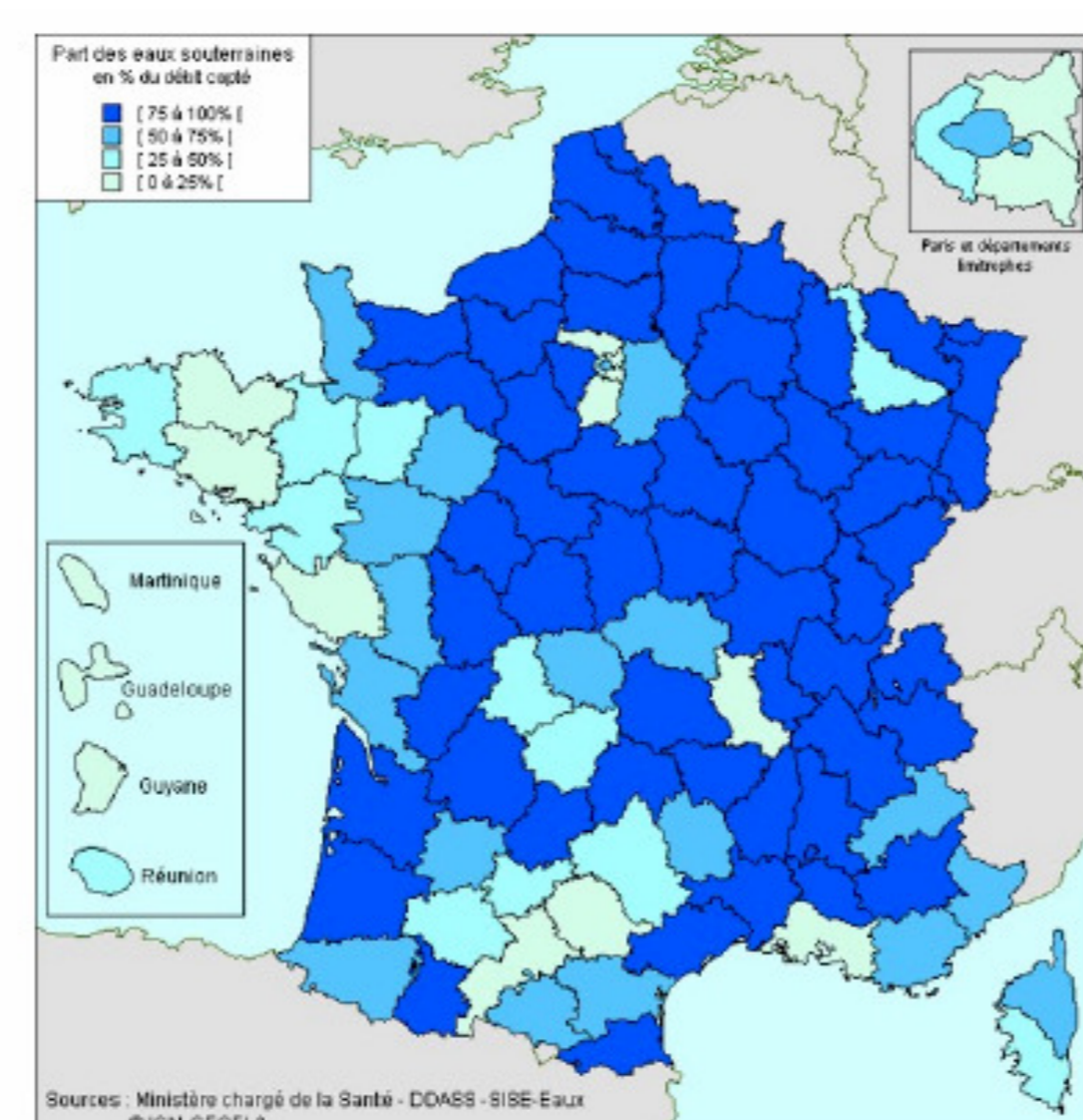
### Surface water in Europe and the United States, challenges for drinking water production

#### Europe

Among the 27 countries in Europe, 70% of total abstracted water is drawn from surface water, with large variations between countries as shown in the following graph. Total abstracted water stands for public water supply (drinking water), agricultural irrigation, and industry. For some countries it represents a key resource.

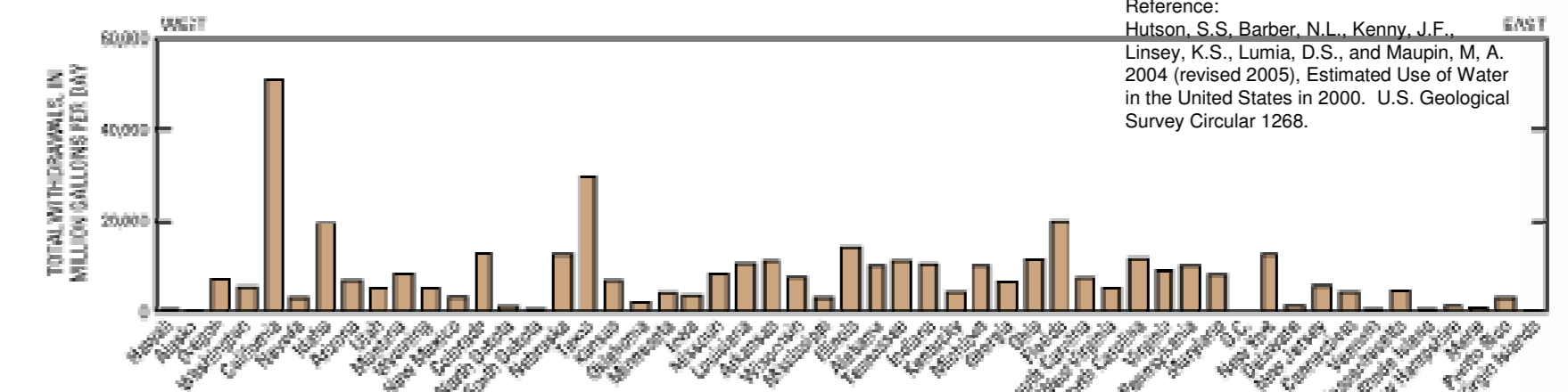
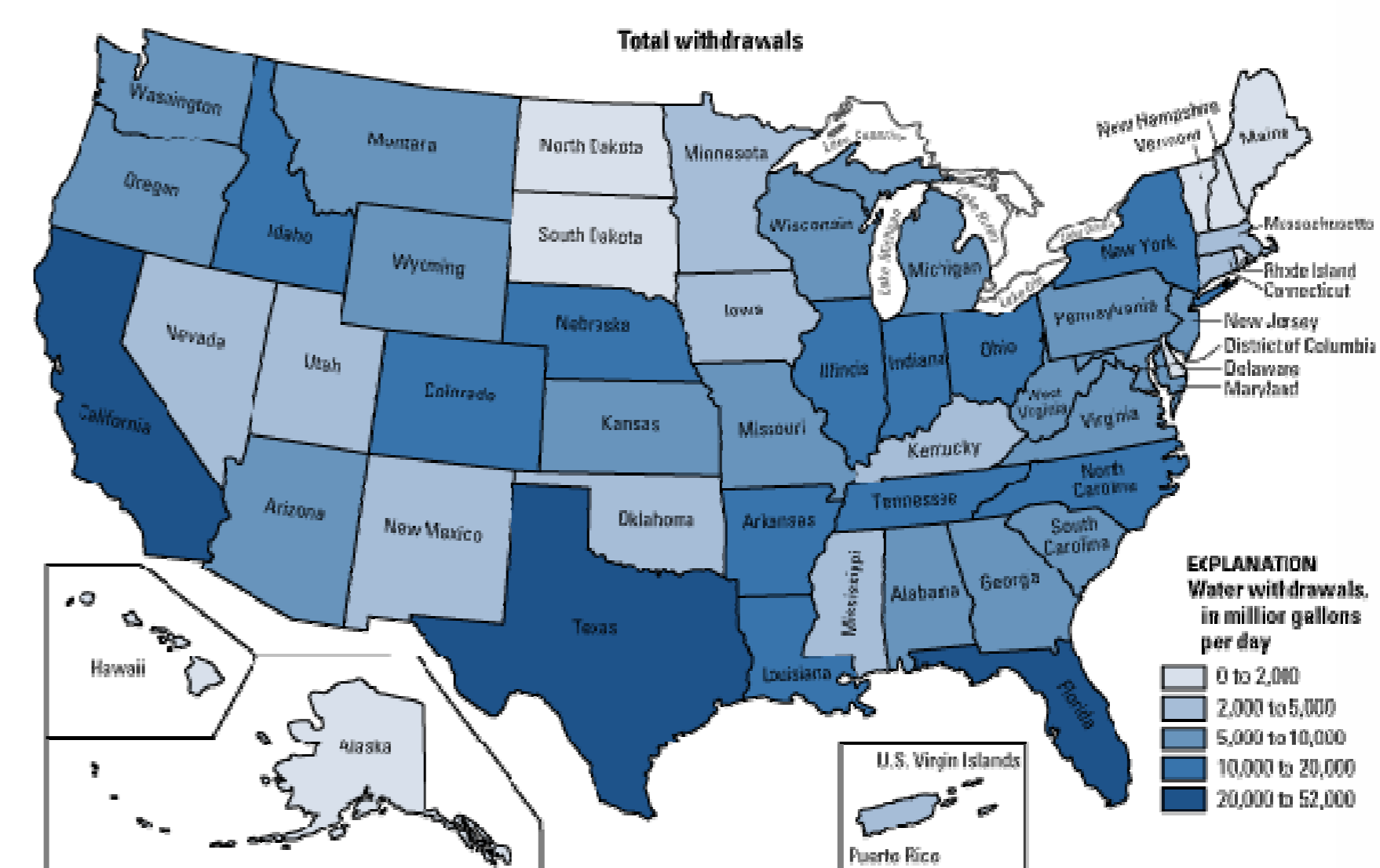
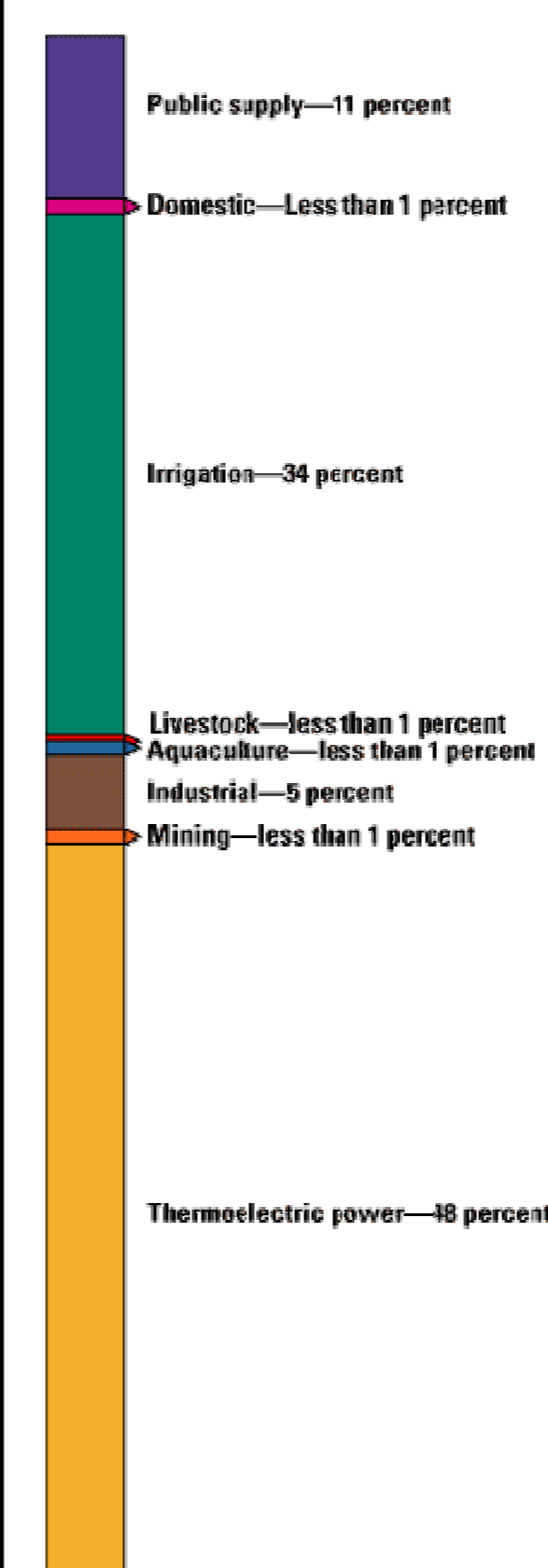


On average in Europe, water used for public water supply (drinking water) is 40% surface water, comprising variations between countries but also between regions inside a country.

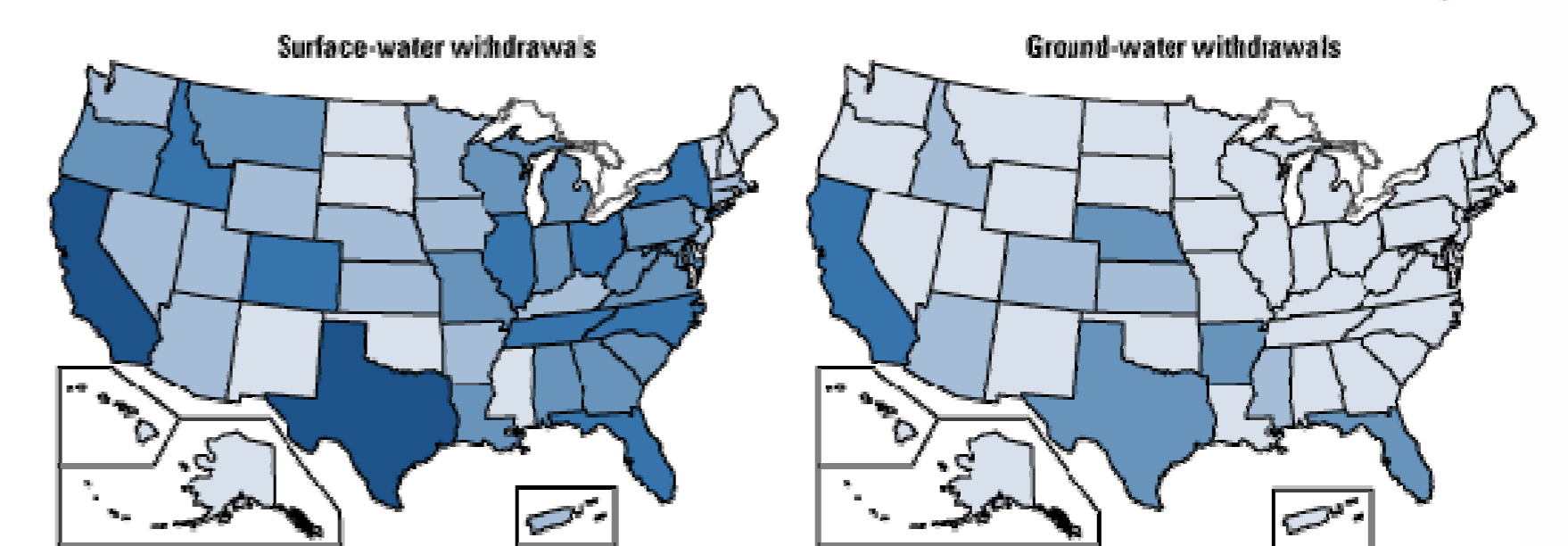


In France, Brittany and South-West are using more surface water than groundwater for public water supply, but the majority of regions use groundwater in big amounts.

#### United States



In the United States, approximately 63% of the total water withdrawals are surface water, with large variations between the States. In 2000, surface water withdrawals were estimated at 262 billion gallons a day (bgd), and ground water withdrawals at 83.3 bgd.



In the United States, about 63% of water used for the public water supply is surface water. In 2000, approximately 242 million people depended on water from a public water supply. California and Texas are the largest users of surface water for the public water supply. California, Texas, New York, and Florida use the most ground water.

### Relevant groups of trace contaminants from diffuse sources in rural and semi-rural areas

The scope of potential trace pollutants is very large, since they only need to be detected in small amounts. In rural and semi-rural areas the possibilities of water pollution are multiple.

The different groups chosen as relevant are shown in the scheme

These contaminants might be intercepted by constructed wetlands or mitigated by riparian corridors.

Agrochemicals: pesticides  
Herbicides  
Fungicides  
Insecticides  
...

Veterinary pharmaceuticals  
Antibiotics  
Parasiticides  
Hormones  
...

Animal pathogens  
Viruses  
Bacteria  
Parasites  
...

Contaminants from wastewater sludge  
Organic contaminants  
Hormones  
...

Individual sewage facilities

Pathogens  
Untreated organic household pollutants  
...

Contaminants from transportation networks

De-icing products  
Oils and exhaust particles  
Toxic organic compounds  
Heavy metals



### Conclusion and perspectives

- ✓ In some areas in Europe and United States, surface water is a key resource for drinking water and should be protected with “source control” measures
- ✓ The potential number of trace contaminants reaching surface water is very high, and is closely related to the land use and the activities taking place in a given watershed.
- ✓ The issue of emerging contaminants has to be taken into account, although their properties, impacts and long-term behaviour in the environment might not be known at the moment
- ✓ The project Aquisafe runs case-studies (modeling and on-site work) in Europe and the United States to assess the mitigation processes and efficiency in constructed wetlands and riparian corridors. The results will add knowledge to mitigation processes and possible natural countermeasures.

### Partners

