

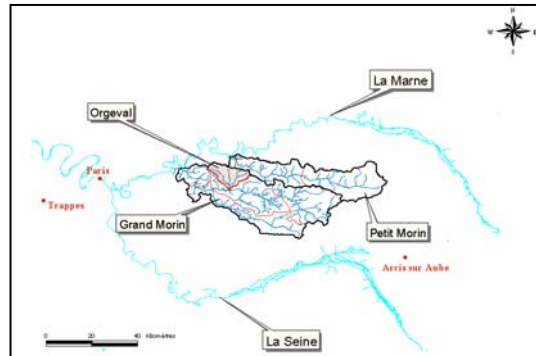
Grand Morin river, France

Location

The Grand Morin catchment is located 50 km east of Paris. The Grand Morin River is an affluent of the Marne River, known to have contributed to large historical floods in Paris in the 20th century.



The area is known as the "Dairy Brie", where the cheese of the same name is still made. However, cows, pastures and apple trees have been largely replaced by cereal crops and sugar beats since the 1960s following the massive installation of artificial drainage in the area.



Catchment description

The catchment is mainly rural (76%) with less than 130,000 inhabitants living in small towns, villages and hamlets, and only one sizable town of 20,000 inhabitants (Coulommiers), the whole covering 7% of the area. Forests cover up to 20% of the area.



The dominance of agricultural activity within the catchment means that diffuse pollution is regarded as the main environmental pressure. Nitrate and pesticides concentrations in drinking water supply are source of great concern. The watershed hosts areas and particularly wetlands of recognized ecological value.

Most of the Grand Morin watershed is a relatively flat plateau (Alt. 140 m), which is incised by streams and the Grand Morin river (Alt 100m). The area is situated in a sedimentary basin, where several aquifers associated with layered tertiary formations (Eocene and Oligocene) interact with the Orgeval creek. In particular, the Brie and Champigny limestones formation host two distinct aquifers of the respective name separated by loam layers.

Key descriptors:

Catchment area at downstream monitoring site	1183 km ²
Average annual rainfall	750 mm
Average annual PET	490 mm
Average annual runoff	232 mm
Average annual flow	5.65 m ³ s ⁻¹
Highest peak flow and date	88.6 m ³ s ⁻¹ , 30 Dec. 2001
Lowest daily mean and date	1.7 m ³ s ⁻¹ , 20 Oct. 2007
Flow and rainfall data available from 1962 (Cemagref Stations)	

Hydrological summary

The hydrometric stations currently in place make it possible to follow 13 catchments (embedded or not) whose surfaces vary from 1 to 1070 km².

Flows in the catchment are generated by two main and distinct components: artificial drainage (which covers around 40% of the area) and groundwater. The magnitude of surface runoff contribution to flow is relatively small due to the flatness of the area, except during extreme events. The contribution of subsurface drainage usually starts in late fall to end in April, while groundwater contributes to flow all year long.

Data availability

See the table below for the types of available data

Equipment	Types of measurement	Number of stations	Measurement periods	Time period
Limnometric station	water level + punctual gauging	11 stations	Continuous way	Since 1963
Water sampling	NO ₃ , NO ₂ , NH ₄ , PO ₄ , Cl and conductivity	11 sampling points	Daily	Since 1975
Meteorological station	Air T°, total radiations, ground T°, ETP	1 full station on the catchment and 2 in proximity	Continuous way	Since 1996
Pluviometry	Amount of precipitation	19 pluviometers	Continuous way	Since 1963
Soil moisture	Volumetric moisture of the soil at various depths	1 profile from 5 cm to 155 cm, 16 points of measurements	Continuous way	Since 1998
Piezometry	Water table level	11 piezometers	Continuous way and Daily	Since 1989

Supporting data are also available, e.g. geological and pedological maps, DEM, and annual land cover maps.

Research Activity and Outputs

A group of scientific interest, the GIS ORACLE, was set up in 2007 around the Grand Morin catchment. The GIS gathers 13 research and operational units belonging to 9 institutions, and is an experimental area of the Piren-Seine research program. The GIS is an ideal structure for scientific knowledge exchanges, data sharing and research coordination related to the experimental catchments.

The three broad research topics of the GIS ORACLE are:

- Water and pollutant transfers - process modelling
- Risk forecasting linked to extreme hydrological events – outflow modelling
- Measurement strategy and systems representation

In almost fifty years of experimentation on the basin, the studies are and were carried out within various sets of disciplines (study of pluviometry, teledetection, distribution

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and characterization of the moisture of ground, impact of forest on flows and water quality, modifications of cultivation methods, influence of the drainage on flows, erosion).

With the evolution of these sets of topics, the measurement devices have been gradually adapted. A network of "basic" measurements is maintained permanently, in order not to stop the chronicles. Indeed, the length and the continuity of some chronicles on the long term are necessary to apprehend behaviour of hydrosystems correctly, to detect tendencies or changes in the behaviour, or to evaluate the impacts of modifications (of anthropic origins, modifications of vegetation cover, modification related to hydro-agricultural installations, or climate change).

Facilities

Although the Grand Morin watershed is 1,200 km² in size, the reliable station for which flow has been monitored since before the 1970s, is located further upstream at Pommeuse, which drains 770 km² of land. A new station has been recently (2006) installed at the mouth of the Grand Morin (1183 km²). Cemagref, which is the scientific partner for this site, undertakes monitoring of the Orgeval watershed, a 104 km² sub-catchment of the Grand Morin catchment. Flow is monitored at nine stations on a continuous basis, with the longest records starting in 1962 for three of them. Rainfall is currently monitored on a continuous basis at twenty points throughout the watershed and around it. Water quality is monitored on a daily, or 12-hour basis during events, on seven stations (Cemagref stations), and on a biweekly basis on the other ones. Nitrate concentrations are available on one station since 1973 and are currently measured with in situ spectrophotometers at the site to test this new technology.

Institutional support

The Grand Morin catchment includes a hydrometeorological network managed by several partners: DIREN Ile-de-France, Météo France and Cemagref and the hydrological data form parts of the national hydrological data base (Base HYDRO).

A group of scientific interest, the GIS ORACLE, was set up in 2007 around the Grand Morin catchment. The GIS gathers 13 research and operational units belonging to 9 institutions, and is an experimental area of the Piren-Seine research program. The basin is also one of the observation platforms of the FIRE (Ile-de-France Federation for the environmental research) and of the OSU-Centre (Observatory of the Sciences of the Universe).

The data are regularly communicated to the scientific community, such as climatologists of the EPFL (the Federal Polytechnic School of Lausanne - Switzerland) or the Vrije Universiteit Brussel and form an important network of potential users.

Value to network

The Grand Morin catchment, is near Paris (50 km East of Paris), and is monitored since 1962 for hydrological, geochemical and meteorological data. All compartments in the hydrological system and the biogeochemical cycling are studied: wet

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atmospheric deposition (rain), streams and springs, ground waters (piezometer), soil and geological profiles, land use, etc. The catchment is located in the Seine basin with an agricultural dominance and strong anthropogenic influences, representative of the great sedimentary units with a temperate oceanic climate.

The Grand Morin provides the scientific bases necessary for the management and the control of the risks related to the extreme events (floods, droughts), the estimation of the impacts of the anthropogenic activities on the hydraulic loading and water quality and weathering processes.

The Grand Morin Observatory provides data for hydrological conditions that are common in its region but which are quite different from those monitored by many other observatories in the network. Some important distinguishing features of the Grand Morin catchment in the European context are its intense artificial drainage and temperate oceanic climate.

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For all references of the catchment see the link