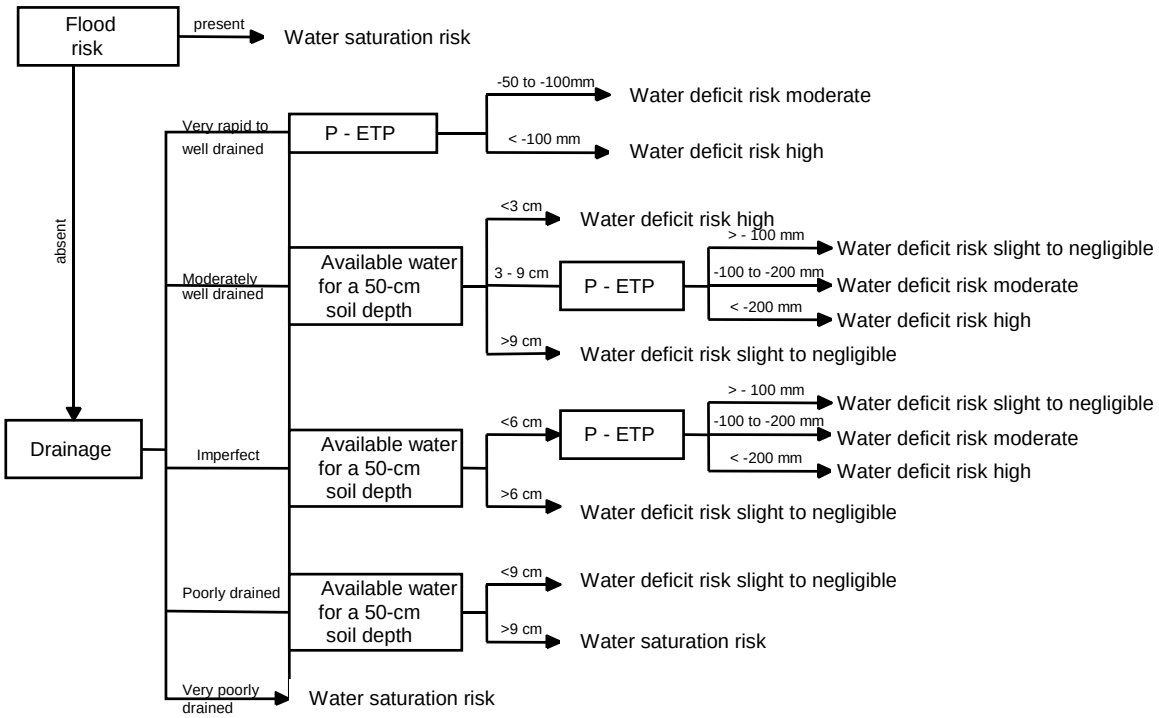
Water stress risk

Water stress may mean either not enough water for the plants during the growing season, or excess water in the soil. Excess water (i.e. saturation conditions), no less than inadequate water, affects crop yields. Excess water may cause deterioration of a soil's physical properties and make it more vulnerable to degradation (see improved drainage).

There are three factors that determine water stress during the growing season: climate (precipitation (P) and evapotranspiration (ETP)), drainage, and the soil's rainfall storage capacity. The characteristics used in the general assessment model are flood risk, drainage, humidity index (P-ETP) and soil moisture content over a depth of 50 cm (Lavoie and Nolin 1997).

The map represents two extremes: inadequate water risk, which is a possibility mainly in the case of a dry growing season, and soil water-saturation risk (excess moisture), which is a possibility during a wet growing season. Soils are assigned to four water stress risk classes: (1) water deficit risk slight to negligible, (2) water deficit risk moderate, (3) water deficit risk high and (4) water saturation risk. It is essential to adapt type of crop, tillage and anticipated yields on the basis of these risks. Soils with low water-holding capacity (sandy soils and shallow soils) are at high or moderate risk of a water deficit during the growing season. Water saturation risk is encountered in the case of fine- or medium-textured soils that are imperfectly to very poorly drained, and also in areas that are at risk of flooding (Figure 1).

Figure 1. Water stress risk assessment model



According to the assessment model, soils for which the risk of a water deficit is slight to negligible account for 57.1% of the study area where subsurface drainage is in place, and 33.5% in the absence of subsurface drainage (e.g. Sainte-Brigide series). The risk of a water deficit increases for drained soils (deficit risk moderate, 30.8% (e.g. Sainte-Rose series) and deficit risk high, 8.2% (e.g. Yamaska series)), as Gosselin et al. (1986) observed. However, the advantages of drainage appear clearly from a comparison of the water saturation risk (3.9% for drained soils, according to our model (see improved drainage) and 59.9% for soils that are not drained (e.g. Saint-Urbain series)).