Packet loss is a significant cause of visual impairments in video broadcasting over packet-switched networks. There are several subjective and objective video quality assessment methods focused on the overall perception of video quality. However, less attention has been paid on the visibility of packet loss artifacts appearing in spatially and temporally limited regions of a video sequence. In this paper, we present the results of a subjective study, using a methodology where a video sequence is displayed on a touchscreen and the users tap it in the positions where they observe artifacts. We also analyze the objective features derived from those artifacts, and propose different models for combining those features into an objective metric for assessing the noticeability of the artifacts. The practical results show that the proposed metric predicts visibility of packet loss impairments with a reasonable accuracy. The proposed method can be applied for developing packetization and error recovery schemes to minimize the subjectively experienced distortion in error-prone networked video systems.