Abstract: The “more transmission = more disease” paradigm is rightly a central concept in infectious disease science. However, there are mechanisms that can lead to more complicated relationships. Hemorrhagic disease in white-tailed deer (caused by a virus vectored by biting midges) displays evidence suggesting the parasite is most active (even maintained in a source-sink sense) in regions with little, or no disease. I will lay out the case for complex and cryptic transmission using surveillance data, seroprevalence studies, statistical and mechanistic models and sequence-based phylogeography. I will review the potential for similar processes to operate widely in a range of disease systems along with the challenge that cryptic refuges for parasites brings regarding surveillance, intervention and inference.