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Colonisation trends of the invasive plant, Impatiens glandulifera, along river corridors: some preliminary findings

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Originating from the Himalayas, the highly invasive plant, Impatiens glandulifera (Himalayan Balsam), is now found on three separate continents, with a distribution that includes most temperate European countries, large areas of east and west North America and parts of New Zealand. As a ruderal species, it prefers damp, shady and fertile soils that are frequently disturbed. This means that it commonly occurs along the riparian zone of rivers and streams. Being highly sensitivity to cold weather, however, whole stands suddenly and often simultaneously die-off; leaving riparian areas bare or partially devoid of vegetation. These lifecycle traits have implicated it in promoting soil erosion in affected river systems in temperate regions. Recent work undertaken by members of the Physical Geography & Environmental Change Research Group, University of Basel, has documented erosion rates along a section of contaminated river systems in northwest Switzerland, and southwest UK. Collectively, these data now span a total of seven separate germination and die-off cycles. Results from both river systems over all monitoring campaigns indicate that soil loss from areas contaminated with I. glandulifera is significantly greater than comparable areas supporting perennial vegetation. Crucially, however, extremely high-magnitude erosion was recorded at approximately 30% of contaminated areas (n=41). Reasons for high disturbance levels focus on the possibility that I. glandulifera tends to colonise depositional areas within a flood-zone. As those areas act as foci for the accretion of flood-derived sediment, the ability of this material to resist subsequent mobilisation processes is low due to limited cohesion, poor compaction and undeveloped soil structure. We hypothesis, therefore, that the tendency of I. glanduilfera to grow in depositional sites will be reflected in a number of key physico-chemical traits associated with soils in such areas; namely lower in-situ bulk-density, finer grain-size characteristics, and possibly higher total phosphorous (TP) content, when compared against soils from nearby uncontaminated areas. Approximately 250 pairs of (contaminated and uncontaminated) soil samples were obtained from nine different sub-catchments located in four different European countries; namely, France, Germany, Switzerland and the UK. Sample pairs were sub-divided into contaminated & uncontaminated soils and each variable was subjected to a pair-wise statistical test; firstly for all catchments combined, and then on a catchment-by-catchment basis, to determine whether differences were significant. In addition to the above analyses, further evidence of spatial and topographic colonisation tendencies was sought from digital imagery captured using a remotely-controlled drone (quadcopter) flown along a ca. 1.0 km section of contaminated river corridor. Images were georeferenced, displayed together in a Geographic Information System (GIS) and used to construct a 3-dimensional digital elevation model (DEM). The DEM was interrogated to determine the presence / absence of colonisation trends (i.e. a tendency to colonise low-lying areas). This communication reports preliminary findings from this ongoing work and discusses key implications and possible future directions.