Dynamics and sensitivity to harvest of the threatened goldenseal populations in Canada

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Hydrastis canadensis, goldenseal, is a perennial clonal herb native to North America, highly prized for its medicinal value. Only 20 populations are now known in Canada, all occurring in southwestern Ontario at the northern limit of its distribution. Planning the recovery of the species in Canada requires an evaluation of the status of the populations. All populations were censused and five were sampled to model their dynamics and sensitivity to harvest, the main potential threat in Canada. In each sampled population, the fate of all ramets occurring in one square-meter was monitored from 1998 to 2001. Transition matrices were built for 2000-2001, using six stage classes based on size, reproductive status, and origin of the ramets (established vs newly produced). Seed production was excluded since recruitment by seed was not observed. Population size varied from 106 to 4440 ramets and the average population growth rate (was 0.967 ± 0.098. This value was not significantly different than the equilibrium value (1.0) suggesting that Canada's goldenseal population is stable. However, there is large variation in growth rates among population samples, with ranging from 0.805 to 1.302. These asymptotic growth rates (computed from transition matrices), which were close to the observed growth rates, are typical of slow-growing forest perennials. Populations with values less than or close to 1.0 require environmental change to increase. Extinction can occur rapidly when population size is small, and replacement of any harvested individuals would take many years. Harvest simulations based on stochastic projections, using inter-site variation as a proxy for yearly variation in vital rates, indicated that in a varying environment, the average population cannot sustain harvest. If all large vegetative and flowering ramets were to be harvested one year, it would take up to 17 years for an average population to recover its pre-harvest size and structure, and this does not account for catastrophic events. These results suggest that in addition to strict prohibition of harvest, recovery of the species in Canada would require augmenting the smallest population sizes and habitat management to increase the growth rate of the declining or near declining populations.