Selbyana 26(1,2): 28–31. 2005.

ACHIEVING BALANCE IN CONSERVATION EDUCATION

MARILYN H.S. LIGHT

174 Jolicoeur St., Gatineau, Québec Canada J8Z 1C9.
Email: mlight@uottawa.ca

ABSTRACT. There is a difference between the "how-to" and the "why" of conservation. Through training, we teach or learn how to apply conservation techniques. Why a certain approach or methodology should be employed to achieve conservation objectives is something that must continually be re-assessed. A case study is used to demonstrate the importance of the "why" in conservation initiatives.

Key words: *Cypripedium reginae*, conservation education, management practices

INTRODUCTION

Why? It is such a small word but often entails such a lengthy, complex response. Often no clear simple answer exists, at least as far as the respondent is concerned. Children frequently pose, "Why" questions. They ask their parents or schoolteachers questions, such as: "Why is the sky blue?" This question, at least, has a scientific answer, although not every adult may know it. Asking questions is a valuable part of learning, as are receiving answers and then learning how to discriminate between facts, plausible explanations, and potentially misleading statements of opinion. Learning how to test supposition through trial and error or experiment is an on-going life experience. Complex questions may give rise to simplistic answers, given our present state of knowledge. This is something especially true of ecosystem interpretation: the reasons why an orchid behaves the way it does can be very elusive.

Conservation managers often are tasked with the stewardship of fragile ecosystems. These managers can face serious challenges, including limited resources that can overwhelm their desire to do the best possible for a site. To conserve precious human and financial resources, they will seek out the most efficient means to achieve their conservation objectives, inquiring about the best stewardship methods and when and where these measures should be implemented. Without knowing exactly why an ecosystem functions in a certain way, how can we recommend measures to ensure success?

Some managers of conservation properties are heavily involved in public education, and this is especially so for sites where showy orchids are featured. Luck (2003) reported that visitors do want more information, when they participate in ecotourism. The conservation message, which can be difficult to define in simple terms, should be designed to make the public aware of the challenges faced by orchids, by their ecosystems, and by those tasked with a management role (Light et al. 2003a).

METHODS AND MATERIALS

At the Purdon Conservation Area, Lanark County, Ontario, Canada, the featured orchid is the showy lady's-slipper (*Cypripedium reginae* Walt.). Busloads of tourists arrive via a recently improved access road to marvel at and photograph the orchids during their flowering period in late June. Although individual flowers may last but 10 days, the estimated 10,000–16,000 stems that spread over a 4-ha wetland make an extended blooming season a distinct and welcome possibility (Mosquin 1986). While one conservation area objective may be to educate the public in matters such as habitat fragility, the interdependence of organisms in a fen wetland, and the consequences of management activities, another goal is to keep visitors coming. This means keeping lots of orchids growing and blooming now and in the future. How do site managers keep both the visiting public satisfied, and the orchid colony thriving? This was the question I was asked in 1998, after an ice storm wreaked havoc with the fen. After the winter storm, fallen trees and limbs (*Thuja occidentalis* L., *Larix laricina* (DuRoi) K. Koch) blocking the fen boardwalk had to be removed, as did some of the tangle that could obscure the view. Thinning is recommended in the fen management plan (Mosquin 1986). It is recommended by conventional wisdom that orchids suffer from lack of sufficient light. The former landowner, the late Joseph Purdon, had observed that tree thinning and management of the water levels improved orchid flowering. So if additional thinning was needed, when, where, and to what extent should it be accomplished? Thinning operations were conducted in winter, when the fen was frozen and snow-covered, and it was essential to plan and execute operations quickly, since

funds had been reserved to deal with storm damage.

During the past 20 years, we have been conducting long-term studies of terrestrial orchids, including *Cypripedium parviflorum* Salisb. var. *pubescens* (Willd.) Knight, but had been unable to correlate light levels with plant behavior. The exception was a sympatric orchid, *Epipactis helleborine* (L.) Crantz (Light et al. 2003b). Lady's-slipper orchids grew and flowered across a range of light regimes, but it seemed that disturbance, including tree fall and increased litter events, contributed more to their behavior than light alone (Light & MacConaill, this issue). Precipitation or, more importantly, much less than average precipitation at critical times of the year could affect fruiting in *Cypripedium* and, in *Epipactis helleborine,* even the probability of re-emergence a year later (Light et al. 2003b). Since 1991, Purdon Fen had become increasingly dry because of repeated summer drought. With questions remaining regarding thinning outcomes, including the possibility that brush would regenerate in the drier conditions, I recommended that thinning be conducted where tree damage was greatest and where "rooms" of thinning could be established. Thus, we would eventually have the opportunity to monitor cleared areas in comparison with uncleared areas nearby. Fortunately, we had the original census of 1985 (Mosquin 1985), a 1991 partial census (Willson & Sheffield 1991), and the 15-year census conducted by 17 volunteers of the Ottawa Orchid Society and the Kingston Orchid Society in 1999. Additionally, in 2000, we selected for annual tracking 16 emergent plants close to the boardwalk and representing a variety of habitats and light exposures.

Results

During the winter of 1998–1999, thinning was conducted to open up dense areas of felled or damaged trees in the immediate vicinity of the boardwalk. Small trees and shrubs of all representative woody plants were removed from irregularly shaped "rooms" ca. 10 m wide. During the summer of 1999, most of the newly cut trees and shrubs produced dense coppice shoots, which necessitated more clearing work during the winter of 1999–2000. The 15-year census conducted in 1999 revealed 1558 clumps, 3729 single-stemmed plants, and 197 small seedlings of *Cypripedium reginae,* representing an estimated 11,700 stems overall. Nearly half of the grid squares showed an increase in single-stemmed plants compared to the 1985 census. Plant numbers around and outside the edge of the 1985 colony boundary had increased, but numbers of plants in the colony core had decreased by about a third. Some plants that bloomed in 1999 were found in the colony periphery, where no plants had been counted in 1985; but some squares reported as supporting many stems in 1985 and 1991 were relatively sparsely inhabited in 1999. No evidence was found of illicit digging of orchid plants. A total of 325 capsules were counted, these being variably distributed through the colony. Approximately 25% of the capsules were damaged by moth larvae, with infestation limited to capsules in the colony core (Light 2000).

The summer of 2000 was cooler and wetter than normal, while 2001 was hot and dry. During the first 2 years of census of the 16 selected plants (2000–2001), I observed that a quarter of these plants did not re-emerge in 2001. Plants were found blooming and fruiting under a wide range of light availability, 50–1900 $\mu E \cdot m^{-2} \cdot sec^{-1}$. More capsules were produced by the 16-plant sample in 2001 (nine fruits) versus 2000, when one fruit was formed. On July 19, 2001, we observed an example of late shoot emergence. This shoot, with no flower buds, was starting the growth process ca. 8 weeks later than the rest of the colony. Years 2002 and 2003 have been wetter, although it may be sometime yet before fen water levels return to normal. In 2003, a total of 15 of the 16 test plants re-emerged, which may be attributed to improved moisture conditions (Table 1).

Discussion

Cypripedium reginae is a perennial orchid that, under certain growing conditions, can be long-lived. Plants exist as seedlings with 1–4 leaves, as single-stemmed flowering specimens, or as clumps of 2–10+ stems. Not all stems in a clump necessarily produce flowers, but large clumps generally do produce some flowers. Since 1991, the Purdon fen gradually has become less wet. A series of dry summers progressively affected the water table, such that where one once sunk up to the ankles in water, one can now walk dry shod. The surface is still moist, especially in spring, but drier conditions in recent years have favored the growth of deciduous brush such as Willow (*Salix* sp. L.) and Dogwood (*Cornus* sp. L.) especially in clearings. We wonder if thinning may actually be encouraging growth of deciduous plants under the present climatic conditions.

Although we still have limited data from only 4 years of observing a sample of plants selected for annual tracking, we note that (1) these plants are flowering well under a range of light conditions, and (2) plants can disappear (become

TABLE 1. Flowering stems/total stems and fruit production in *Cypripedium reginae* plants growing under various light regimes at Purdon Conservation Area, Ontario, 2000–2003.

Light level PAR* 2001	Flowering stems/total stems no.				Capsules no.
	2000	2001	2002	2003	
High					
1800	0/2	—	0/4	2/2	0
1770	13/14	7/9	8/14	4/7	2
1710	8/8	6/6	5/5	7/8	2
1645	5/6	9/9	2/5	3/3	5
1635	5/8	5/8	—	5/7	2
1545	3/5	3/3	3/4	1/5	1
1500	4/4	4/4	3/4	4/4	6
1400	5/7	—	—	4/5	2
Medium					
700	2/2	—	—	0/3	0
265	1/1	1/1	1/1	0/2	0
160	1/3	—	—	0/1	0
140	7/8	7/8	6/6	7/7	2
Low					
53	2/2	2/2	2/3	0/2	0
52	4/5	6/8	3/4	—	3
48	5/5	11/13	10/13	7/10	0
38	1/1	—	1/1	1/1	0

* Photosynthetically active radiation (PAR) in $\mu mol \cdot m^{-2} \cdot s^{-1}$, as measured with a LI-COR meter.
Light ranges: high > 1000, medium 100–1000, and low < 100.

non-emergent) abruptly and for up to 2 years under all light regimes, rather than progressively diminishing in size over several years. Of the 16-plant sample, a quarter was non-emergent in 2001. This group included plants having 1–5 stems. Our observation of a late-emerging shoot could indicate that some instances of non-emergence may be linked to insufficient water being available to plants when they are ready to emerge in late May or perhaps even earlier, in the previous year, when the buds were forming. A plant that does not emerge when conditions are unfavorable may not necessarily be dead. A more extensive data set will be needed to narrow the possibilities surrounding this behavior.

No evidence was found that the present population behavior is strongly linked to a particular light regime. Plant numbers have decreased markedly in some grid squares that are fully exposed to the sun and have increased where light conditions are less favorable or remained constant under either light regime. This it is difficult to recommend which management direction to take regarding tree and brush removal. What might be a productive option during an extended cycle of wet years might not be appropriate for drier cycles, but we cannot reliably predict a run of wet or dry years and therefore must remain flexible. Tree and brush removal may have more impact on water availability. The very act of removing top growth may have a substantial impact on nutrient availability to fungal associates of orchid roots. It seems that the best advice is to thin some areas according to the management plan, while keeping other areas untouched as controls, at least until we obtain more information about the population dynamics of *Cypripedium reginae* in Purdon Fen. Regular monitoring of orchid numbers in all parts of the colony eventually could reveal patterns of response, if they exist; but this may take many more years. Maintenance and data collection should continue as far as resources permit. Costs can be controlled, if teams of volunteers are used to collect data. Obviously, in situ management is a long and involved process. Long-term experiments are needed to discover which factors are most important to orchid survival in the fen.

CONCLUSION

The in-situ conservation of orchids presents some formidable challenges, the least of which is establishing a conservation area. Once a tracking and management plan is produced, the real challenges come into play. Both an analytic and a systemic approach are needed in terms of the nature and effects of ecological interactions and for the educational approach (Saner 1999). The analytic approach will support the needs of conservation professionals, while a more comprehensive, multi-faceted educational program can

serve the visiting public. Management of a complex ecosystem over decades will lead to many questions, for which there are presently only a few answers. The most interesting and challenging aspect of in-situ conservation begins when we test the methodologies against species recovery objectives.

Literature Cited

Light, M.H.S. 2000. In situ orchid conservation: challenge and opportunity. Orchid Conserv. News 3: 4–5.

Light, M.H.S., S.P. Kell, and P.S. Wyse Jackson. 2003a. The role of education and training in orchid conservation: an overview and critique. Pp. 357–382 *in* K.W. Dixon, S.P. Kell, R.I. Barrett and P.J. Cribb, eds. Orchid Conservation. Natural History Publications, Kota Kinabalu, Sabah.

Light, M.H.S., H. Koopowitz, and T.A. Marchant. 2003b. The impact of climatic, edaphic, and physiographic factors on the population behavior of selected temperate and tropical orchids. Pp. 159–182 *in* K.W. Dixon, S.P. Kell, R.I. Barrett and P.J. Cribb, eds. Orchid Conservation. Natural History Publications, Kota Kinabalu, Sabah.

Luck, M. 2003. Education on marine mammal tours as agent for conservation—but do tourists want to be educated? Ocean & Coastal Mgmt. 46: 943–956.

Mosquin, T. 1986. A Management Plan for the Showy Lady's Slipper, *Cypripedium reginae,* in the Purdon Conservation Area, Lanark County, Ontario. Part I: Final Report. Mosquin Bio-Information Ltd., Lanark, Ontario.

Saner, M.A. 1999. Two cultures: not unique to ecology. Cons. Ecol. 3: r2. URL: http://www.consecol.org/vol3/iss1/resp2

Willson, B. and J. Sheffield. 1991. Census and Management Study for a Representative Sample of the Showy Lady's Slipper Orchid (*Cypripedium reginae*) Colony in the Purdon Conservation Area. Mississippi Valley Conservation, Lanark, Ontario.