QUICK FIX

Nature's Apostles: A Model for Using Ecological Restoration to Teach Ecology

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Key Words: *Apostle model; keystone species; ecosystem engineer; invasive species; species at risk.*

The "apostle model" provides an interesting approach to understanding the ecology of invasive species, species at risk, and keystone species. The model was developed in the mid-1990s by the Harvard Business School as a tool to improve the performance of an organization that offers a product to customers. It plotted customer loyalty against customer satisfaction and identified "apostles" as customers who are very satisfied and very loyal who would also convince more customers to buy a product. By contrast, "hostages" are customers with no alternative, and "mercenaries" buy what is cheapest. "Defectors" are not very satisfied and not loyal, so they would readily switch to other products.

If we think of the product as habitat and the clients as species, there are interesting parallels between the business model and ecology. Apostles, hostages, mercenaries, and detractors in the business apostle model all have ecological analogues. They can be identified in a "nature apostle model" to offer a unique perspective for students of ecological restoration in high school or university. Ecological restoration deals with removing invasive species (mercenaries), conserving species at risk (hostages), supporting ecosystem engineers (apostles), and enhancing other biodiversity (detractors).

Apostles, hostages, mercenaries, and detractors in the business apostle model all have ecological analogues.

The Harvard business apostle model and nature's analogue are shown in Figure 1. In the nature apostle model, reproductive success, energy, abiotic factors, and productivity replace customer satisfaction, and community specificity replaces customer loyalty.

In the business apostle model, "loyalists" include the apostles and near apostles that become the extended "sales force," helping to promote the company. In the nature apostle model, species that help to promote the ecosystem (the company analogue) are keystone species such as ecosystem engineers and climax species.

An interesting side note about the business model is that it encourages paying special attention to the near apostles because even small changes in their satisfaction will greatly increase their level of performance in the ecosystem. The current process of determining which species may benefit from climate change is one of identifying near apostles in the nature apostle model. For example, planting more Douglas-fir (*Pseudotsuga menziesii*) and less western redcedar (*Thuja plicata*) on the northern half of Vancouver Island, British Columbia.

Hostages cannot switch companies because of high costs or the effort involved; for example, the company may be the only one offering a particular service in their neighborhood. In the nature apostle model, these hostages are species at risk. Their habitat has been diminished, and they are being held hostage in what remains.

Mercenaries in the business apostle model are very satisfied yet not loyal to the company. In the nature apostle model, this category represents invasive species that are very satisfied because they prosper in their new circumstances, but they are not invested in the ecosystem and would readily go elsewhere.

Defectors remind us that when a habitat has little to offer a species, it will defect and live elsewhere. There is low satisfaction and low loyalty. The defector category would include ruderal species and other early-successional species that play a critical role in succession because, in general, they are able to colonize disturbed areas and, compared to other species, have fewer specific requirements.

The "subversives" in the defector category of the business apostle model may have no immediately apparent analogue in nature. The subversives in the business apostle model are customers who no longer support the company and not only leave themselves but would encourage other customers to leave as well. In the nature apostle model, perhaps a species such as the mountain pine beetle (*Dendroctonus ponderosae*) is a subversive; its loyalty to the ecosystem's health is low and it behaves more like a mercenary or invasive species, a native invasive species as opposed to an alien invasive. Unlike a subversive in the business apostle model, which leaves the company, the subversive in the nature apostle model could, like the mountain pine

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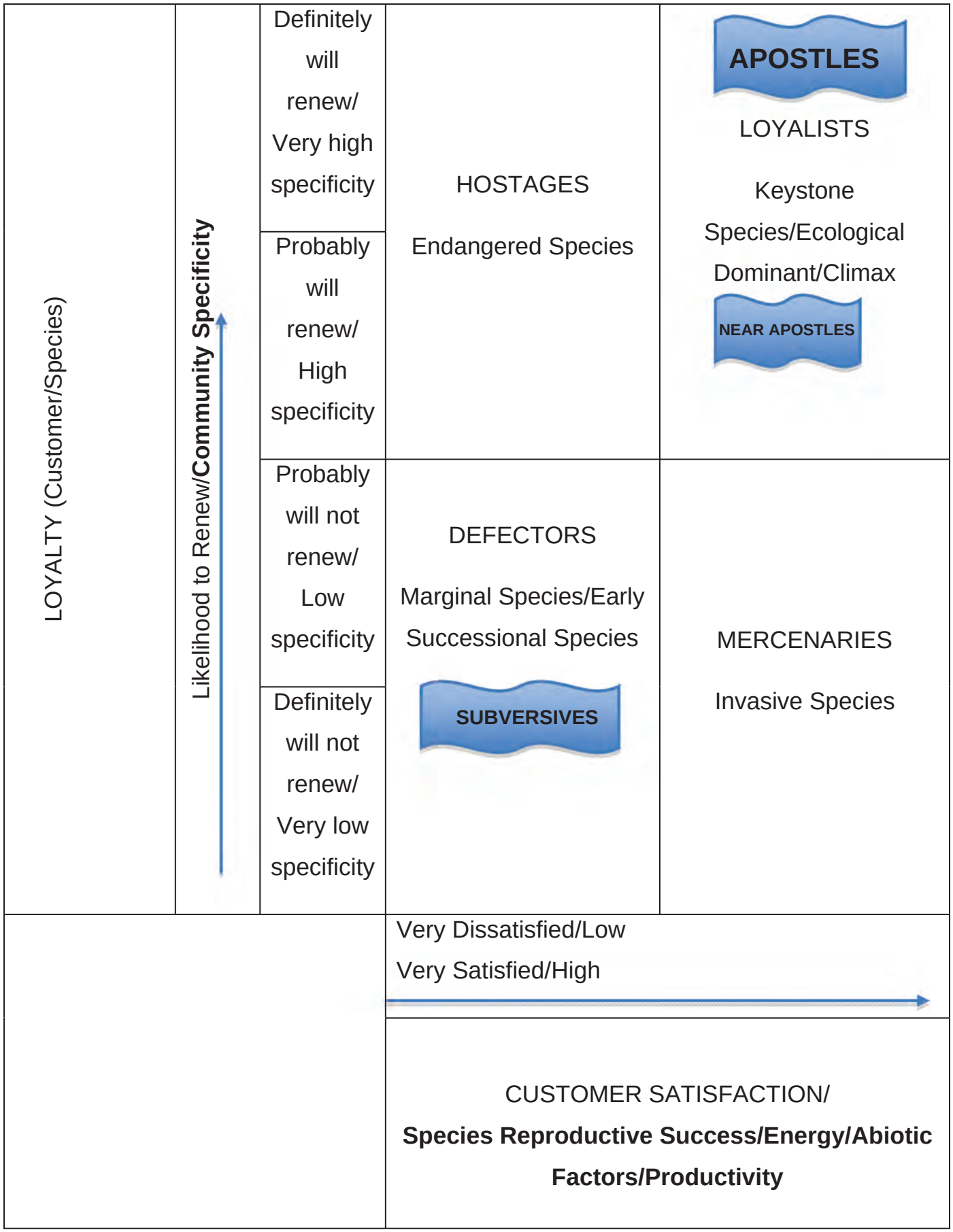

Figure 1. The Harvard business apostle model to describe performance of a business (after Jones & Sasser, 1995), and proposed nature's analogues.

beetle, instead "change" the company – it would alter the ecosystem, causing it to collapse or transform.

Another possible defector analogue is that the pool of defectors may contain some species that benefit from climate change. In ecological restoration, one approach to dealing with climate change is to maximize the number of such species in the pool of defectors (and near apostles as well) if they are not there already. These species would move from the defector category to become apostles in the new climatic regime.

Although the parallels between the business apostle model and the nature apostle model are aligned for apostles, mercenaries, and hostages, the parallels for defectors are less clear. The analogy may not apply here, but the concept can be used to generate class discussion to explore ecological relationships and identify suitable restoration targets. Are the defectors also the largest group in nature? Are they "average species" that don't determine direction for an ecosystem but contribute to its daily functioning? Or are they less abundant species living in marginal habitat?

Reference

Jones, T.O. & Sasser, E.W., Jr. (1995). Why satisfied customers defect. *Harvard Business Review*, November–December, *88–99.*

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