



Conservation for Satoyama, the Traditional Landscape of Japan

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Most people associate the notion of conservation and biodiversity with “natural” areas—those that have been minimally affected by human activities. In many parts of the world, however, much species diversity can be found in traditional agricultural landscapes that people have cultivated for hundreds or thousands of years. Japan, for example, is a densely populated archipelago that has experienced the impact of human activities for millennia; it nevertheless has species and ecosystems of great diversity and unique character.

Since ancient times, the Japanese people have respected and preserved the natural resources of their country. The traditional agricultural and forest landscape of Japan, known as *satoyama*, a mosaic of fields, ponds, forests, and villages, enabled this chain of mountainous islands to support not only a large human population but also a great variety of plant and animal species in a sustainable manner. When we see photographs, paintings, and films about the Japanese countryside, we are usually seeing a *satoyama* landscape.

Today, however, the Japanese are struggling to balance rapid economic growth with protection for their rich cultural and natural heritage. Modernization has led to new ways of farming and encouraged urban expansion, together with large-scale civil engineering projects like dam construction and wetland filling. The result has been neglect of *satoyama* landscapes and a reduction of the overall farm area where many species of plants, mammals, reptiles, amphibians, and freshwater fish previously thrived. Twenty percent of these species, many of them significant in Japanese culture, are now under threat of extinction.¹

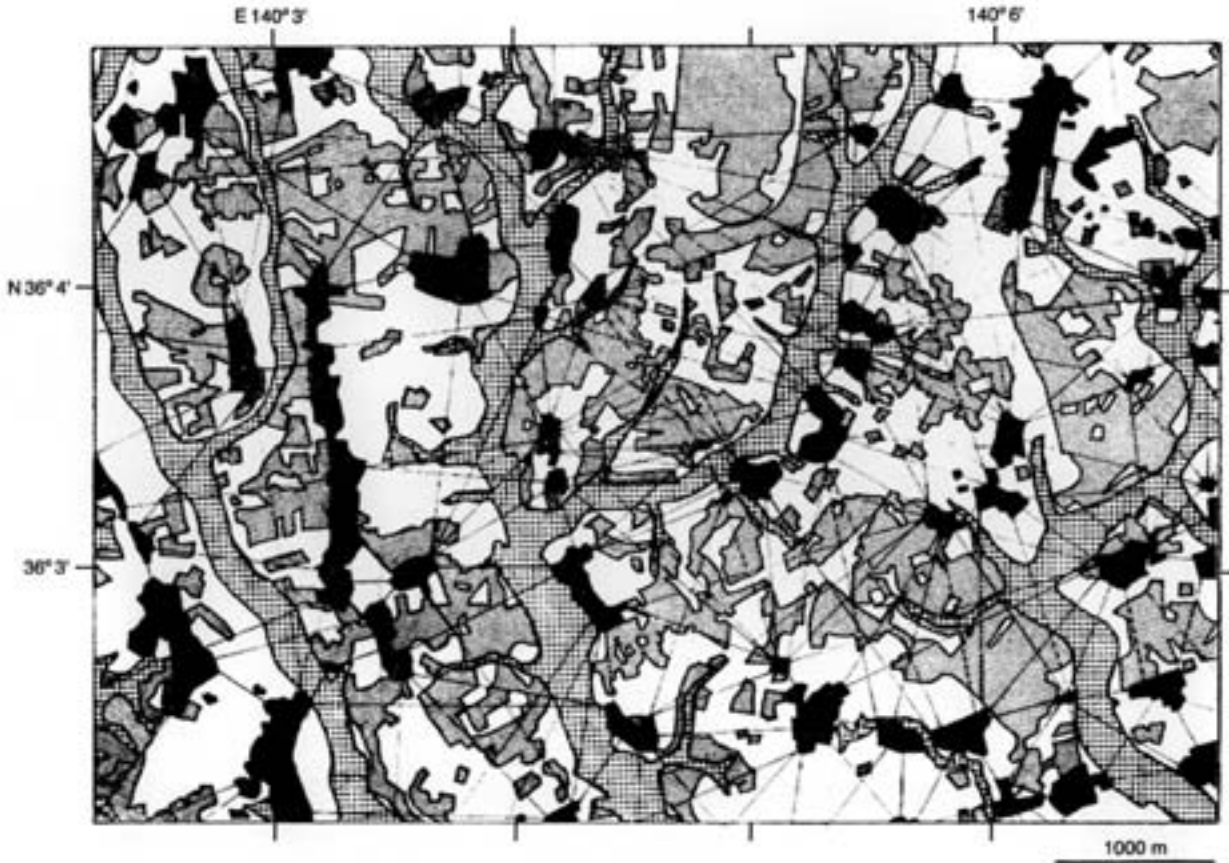
Two recent projects have been effective in restoring and protecting *satoyama* landscapes, however, even within densely settled urban areas. Crucial to the projects' success have been efforts to increase public awareness of the need for conservation and to promote participation by local citizens.

Satoyama: What Is It?

In the broadest sense of the term, *satoyama* is a mixture of forests, wet rice paddies, cultivated fields, pastures, streams, ponds, and irrigation ditches surrounding a Japanese farming village—the entire landscape necessary to supply the needs of a community. In the Edo era (1603–1867), around five hectares (over twelve acres) of *satoyama* landscape was needed to support each farm family of seven or eight persons. The grasslands were maintained for the horses and cattle that served as sources of power. Streams, ponds, and ditches were managed to maintain appropriate water levels in the rice paddies and to supply fish to eat. In a typical *satoyama* community, the rice fields were located next to the village houses, adjacent to the grasslands and the forests, which often formed the boundary with the next village.²

The word *satoyama* is sometimes used more narrowly in Japan to designate only the forest component of the traditional landscape. These forests, managed by local agricultural communities, are not wild but have developed through human intervention in natural systems over the centuries. The villagers gathered the leaves of community forests for use as fertilizer in the rice paddies; wood was used for construction and for cooking and heating; and bamboo shoots were collected for food. For each hectare of rice

Diagram of typical landscape of satoyama with villages surrounded by paddy fields, dry fields, and forest
From H. Moriyama, 1997, *Reviving Nature of Rural Areas*.



Typical land use of satoyama in Kanto district near Tokyo with villages (black); hayfields (white); secondary forests (gray shading); rice paddies (crosshatching) Modified from K Yamaoka, H Moriyama, and T Shigematsu, 1997, in *Bulletin of Toyo University* 20. 373–384

cultivated, several hectares of community forests were needed.³ The constant collection of leaves and wood kept the forest open and prevented succession to large trees and dense shade. However, in the late Edo era and in the Meiji era (1868–1912), farmers began to buy commercial fertilizers; when leaves were no longer needed for the rice paddies, management of the forest became less intensive.

Biodiversity in Satoyama and its Cultural Dependence

As an indirect consequence of the agricultural practices associated with satoyama, these landscapes supported a great diversity of plant and animal species. Their mosaic structure provided a variety of habitat types—ponds, rice paddies, grasslands, forests—and facilitated movement among habitats and from one village satoyama

to the next. Though not “natural” in the usual sense, therefore, the satoyama helped to maintain a rich biodiversity in the Japanese countryside.

Active management of satoyama forests for agricultural purposes, for example, promoted biodiversity by creating open, sunny habitats. In most communities, farmers maintained a mixed forest of deciduous, broadleaf trees, with the most common being Japanese oak (*Quercus serrata*) and Japanese chestnut oak (*Q. acutissima*). The trees were harvested in 15- to 20-year cycles for fuel wood and charcoal. This regular cutting, resprouting, and replanting prevented succession to the densely shaded, evergreen laurel forest—dominated by such species as chinquapin (*Castanopsis sieboldii* in the oak family), red machilus (*Machilus thunbergii* in the laurel family), and Japanese acuba (*Aucuba*

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Landscape of a well-managed satoyama: at top, satoyama forest managed by selective logging creates an open understory suitable for the production of edible bamboo shoots; below, paddy connected to mixed forests

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The giant purple butterfly (*Sasakia charonda*).

japonica in the dogwood family)—which, being native to the area in pre-satoyama times, is the usual climax forest in much of Japan. Compared to unmanaged laurel forests, the managed and more open mixed forests supported much more wildlife, much of which is familiar to the Japanese people and important to their culture. The national butterfly, the giant purple butterfly (*Sasakia charonda*), the large horned beetle (*Allomyrina dichotoma*), and the stag beetle (*Dorcus curvidens*) are some of the better-known species that are found in sunny, mixed deciduous forests but are absent in shady laurel forests.

Other beneficiaries of traditional forest management included many species of spring and summer wildflowers that can survive only when the foliage is thin and sunlight is able to reach the forest floor. Since these species cannot push their way through a deep layer of fallen leaves or grow in the darkness of evergreen forest, they are dependent on the traditional practices of collecting fallen leaves for fertilizer and the regular cutting of trees.

In addition, grasslands that were regularly cut for fertilizer, thatching, bedding, or hay provided a rich habitat for wildflower and insect species. When grasslands are not cut, they undergo succession to forest and many species are lost.

And thanks to the requirements for growing rice, satoyama helped preserve wetlands where many aquatic species thrive. The rice paddies themselves comprise half of all freshwater wetlands, and together with the associated ponds and reservoirs, they serve as a crucial habitat for most frogs found in Japan, being used throughout the year by numerous species for mating, egg maturation, larval growth, and adult feeding. Many bird, fish, insect, and mollusk species are also found primarily or even exclusively in the wetlands of the satoyama. In particular, these wetlands provide habitat for insect species that live in water during the early stages of their life cycle; these include fireflies and dragonflies, which are important in Japanese culture and frequently serve as motifs in poetry, painting, textiles, and toys. Since many small- and mid-sized dragonflies can migrate only short distances of a few kilometers, the creation of

networks of ponds and other wetlands for traditional agriculture have favored their survival.⁴

Loss of the Satoyama and its Biodiversity

Many forces at both the national and international levels have transformed the traditional Japanese landscape over the past several decades. Because of Japan's high cost of labor, its agriculture and forest industries are not able to compete in international markets, making farming less attractive economically, and many farmers have abandoned their satoyama to find jobs in cities. Many satoyama located in urban areas have been converted to residential or industrial uses, with the subsequent loss of natural habitat; the satoyama area in Yokohama, for example, has decreased from 10,000 hectares in 1960 to only 3,000 at present.

Outside urban areas, the decline in the rural population and the aging of the remaining farmers make it physically difficult if not impossible—as well as economically unappealing—to maintain satoyama as a communal village activity. The individual farmers who remain have introduced modern technology to reduce costs and to compensate for the lack of labor, often with financial support from the central government. All components of the satoyama system have suffered from these innovations, but wetlands in particular are rapidly disappearing. One of the programs most favored by farmers, the construction of new irrigation systems, has resulted in the loss or fragmentation of wetland habitat; in addition, farmers have increased their use of herbicides, pesticides, and commercial fertilizers, inadvertently killing off many insect and aquatic species. The “seven autumn wildflowers,” for example—a beloved symbol of nature's beauty and a focus since ancient times for poetic sentiment—are included among the threatened species. Indeed, two of the seven, fujibakama (*Eupatorium fortunei*, a relative of joe-pye-weed in the sunflower family) and kikyo or balloon flower (*Platycodon grandiflorum* in the bellflower family), face almost certain extinction in the wild within the next century. Fujibakama grows on river banks and flood plains and depends on natural and human-caused disturbances such as spring floods and grass cutting for its survival; increased river management for flood control and a decline

in grass cutting by farmers have drastically diminished its numbers. Altogether, 79 of Japan's total of 200 native freshwater aquatic plants are now facing extinction, according to the latest Red List.⁵

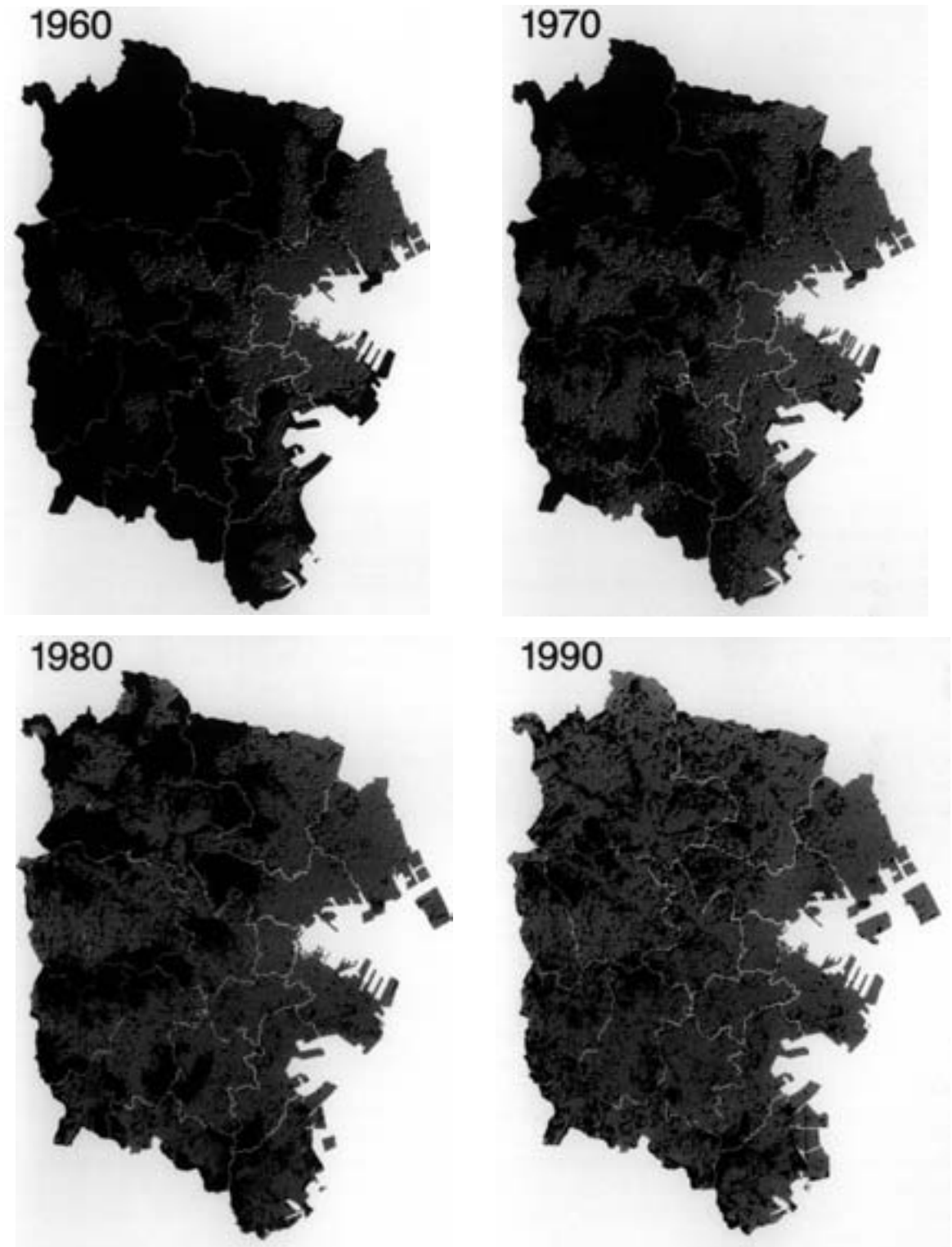
Many freshwater fish have also been severely affected by changes in agricultural practices. Among these is the Japanese killifish (*Oryzias latipes*), a species so familiar to the Japanese people that it has more than 5,000 local names, and a folk song about it remains popular among small children. Most Japanese believe that it is still a common fish in satoyama, present in wetlands throughout the country. In reality, however, many wetlands suitable for the killifish have been degraded or entirely wiped out by drainage, reclamation, or other civil engineering projects, a situation made worse by water pollution and invasion by exotic species.

Modernization of agriculture has also had negative consequences for satoyama forests. Coal and oil have replaced wood and charcoal as the primary source of energy, and trees are no longer cut regularly for fuel. As the forests become overgrown and more shaded, many plant and animal species are being lost; forest wildflowers in particular are rapidly declining in abundance.

Satoyama Conservation in Urban Areas: The Tokyo Example

To counter the steady loss of traditional agricultural landscapes and wildlife habitat, the Totoro Hometown Fund Campaign was founded in 1990 as an effort to save areas of satoyama located in the Sayama Hills on the outskirts of Tokyo, in the Saitama Prefecture.⁶ Initiated by local residents together with a private environmental organization, the project later received support from the National Environmental Agency and the local government as well.

The Sayama Hills, about 3,500 hectares in area, are home to roughly a thousand species of vascular plants, eleven species of mammals, and 210 species of birds. Not only is this small area a remarkable refuge for wildlife, but it is also an important repository of Japan's cultural heritage, with 114 shrines and temples. Humans have occupied the region from the time of the Stone Age, and 235 sites of ancient villages have been found there. Yet without an effective con-



Conversion of forests, farmlands, and parks (black) to industrial and residential use (light shade) in the metropolitan Yokohama area from 1960 to 1990. The diagrams also show how the natural landscape is increasingly fragmented by development. Each map represents an area of approximately 50 by 65 miles (78 by 105 km). Yokohama City Environmental Protection Bureau.



Publicity for the Totoro Hometown Fund Campaign Totoro attracts many people to support the national trust activities.

ervation program, the entire area would have been rapidly converted into residential housing, industrial sites, and roads.

The campaign used as its mascot “Totoro,” the central character from an extremely popular animated film called “Tonari no Totoro” (My Neighbor Totoro). Totoro is an imaginary furry animal, rounded in shape and pleasantly naive in demeanor, that lives in the forests of satoyama, helping children who get into trouble when adults are absent. The movie is set in an imagined time of innocence in the 1950s, when farms, rice fields, and managed forests covered the Sayama Hills—some of the place names used are those of actual sites in the hills—and depicts a simple agricultural community in which villagers work together for the good of all. The movie has served as a powerful focus for the positive feelings of the Japanese toward satoyama and traditional village life.

The project was built around four major activities. During the initial phase, a broad range of people were encouraged to contribute money to buy land for conservation as satoyama. In the first two years of the campaign, 110,000 people—40 percent of them younger than seventeen—donated approximately 110 million yen (equal to one million USD).

Second, the organization called for volunteers to restore satoyama landscapes with the help of local farmers. A total of two thousand people worked together to rebuild rice paddies and water reservoirs and, later, to cultivate

and harvest rice. Volunteers also planted tree seedlings, mowed grassland, cut trees, and removed undergrowth from the forests. For many city people this was the first opportunity to work on a farm, and they found great satisfaction in reconnecting to the agricultural traditions of their culture.

Third, researchers and local residents worked together to gather information about the area’s endangered species as well as about the cultural history of its people

and landscape. And finally, an environmental education program was designed to help Japanese children become familiar with the landscapes and the species that figure so prominently in their culture. The program includes guided tours, watching birds and other wildlife, and seasonal harvest events.

The key to the success of the Totoro Hometown Fund Campaign has been the combination of energetic citizen involvement along with governmental encouragement and support. Since its inception, the project has been characterized by a strong sense of local control: it is local residents who direct the management and volunteer programs. Municipal and prefectural governments of the region have responded to their efforts by buying additional land surrounding the satoyama trust areas. In addition, both the National Environmental Agency and the government of Saitama Prefecture have launched their own Sayama Hills conservation efforts through such campaigns as “Hometowns in Contact with Traditions and Nature.”

Satoyama Conservation in Urban Areas: The Yokohama Example

Another approach to conserving agricultural landscapes has involved cooperation between volunteers and university researchers. A successful example of this approach can be seen at the Musashi Institute of Technology in Yokohama. In 1997, when a new campus of the Institute’s Department of Environmental and



Farmers and urban citizens working to conserve and manage the satoyama landscape in Sayama Hills clockwise from top left, children managing rice paddies in summer, fall rice harvest, collecting fallen leaves in a mixed forest to encourage spring wildflowers, children and adults identifying dragonfly nymphs and removing exotic fish and crayfish

Information Studies was established on the site of neglected satoyama land, a little more than one hectare of forest was set aside for conservation. The area, which had been abandoned more than thirty years earlier, consisted mostly of deciduous and evergreen trees and a fruit orchard, all overgrown by a dense tangle of vines, bamboo, and weeds.

The forest is now being restored and managed by university researchers with two closely associated objectives. The first is to use the forest for teaching and directing research about satoyama ecology, management, and restoration. Students are able to access data accumulated in past years in order to make comparisons over time.

The second objective is to establish educational links between the university community and the citizens of Yokohama. A group of volunteers that included local citizens, faculty,

students, and university administrators began the restoration project by surveying and inventorying the area's resources. The area was then divided into five zones, each with its own conservation goals and management program. For example, a zone of mixed deciduous broadleaf trees was restored by removing the vines, bamboo clumps, and other plants that covered the entire forest floor. It is now being monitored to document changes in the wildflower community. Just a few years after restoration, many spring wildflowers, such as the orchids *Cymbidium goeringii* and *Cephalanthera falcata*—both widely appreciated for their great beauty—have started to appear, apparently growing from small, suppressed plants or dormant seeds. Another zone is being managed for bamboo, with bamboo poles and edible shoots being harvested in a controlled



The slipper orchid *Cypripedium japonicum*.

manner. The bamboo shoots are later used in traditional Japanese recipes at the volunteers' social gatherings.

While this conservation project is very small in area, it has received considerable local support and publicity. Many people living in the vicinity value the project as a local resource for education and recreation and as a point of contact with the university community. The social activities of the project, especially the bamboo shoot meals, are also attractive.

The Musashi project is linked to more widespread conservation efforts undertaken by the Yokohama city government, which has now preserved 1,267 hectares of the city's remaining 3,000 hectares of satoyama wooded areas by designating them as citizens' forests, parks, or reserved areas. The government's efforts, however, have been restricted to setting aside the areas; plans are now being developed to restore and maintain the forests' quality by turning management over to citizen groups and conservation organizations in order to reduce costs to the government and to increase public support for satoyama. The potential for expansion of conservation activities is indicated by a survey showing that 45 percent of Yokohama citizens would be willing to participate in this and similar activities.

Satoyama Conservation: A Model for Others?

These two programs have shown that traditional satoyama ecosystems can be restored and maintained even within the densely settled urban Japanese landscape if public attention is

directed to the need for conservation and if the projects offer volunteer opportunities that allow citizens to renew their sense of identification with traditional agriculture. Given that the rich biodiversity of traditional agricultural landscapes is being threatened in many parts of the world, these examples may serve to promote conservation efforts in other densely populated, rapidly modernizing parts of the world.

Notes

This essay draws on the authors' earlier work, which was published in 2003 in *Ambio* 32(4): 307–311, as "Participatory Conservation Approaches for *Satoyama*, the Traditional Forest and Agricultural Landscape of Japan."

- ¹ Environment Agency, Government of Japan, 2000, *Quality of the Environment in Japan* (in Japanese).
- ² K. Yamaoka, H. Moriyama, and T. Shigematsu, 1997, Ecological role of secondary forests in the traditional farming area in Japan, *Bulletin of Toyo University* 20: 373–384 (in Japanese).
- ³ T. Shidei, 1993, *Learning From Forests* (Tokyo: Kaimei Publishing Co. Ltd., in Japanese).
- ⁴ R. Primack, H. Kobori, and S. Mori, 2000, Dragonfly pond restoration promotes conservation awareness in Japan, *Conservation Biology* 14: 1553–1554, H. Moriyama, 1997, *Reviving Nature of Rural Areas* (Tokyo: Iwanami Publishing Co. Ltd.), p. 4; and *ibid.*, 1998, *Satoyama as reservoir of fauna and flora, Landscape Studies* 61: 281–283 (both in Japanese).
- ⁵ R. Primack and H. Kobori, 1997, *Introduction to Conservation Biology* (Tokyo: Bunichi-Sougou Publishing Co. Ltd.), p. 94; Ministry of the Environment, Government of Japan, 2000, *Threatened Wildlife of Japan, Red Data Book*, 2nd ed (both in Japanese).
- ⁶ 1998, Totoro Hometown Foundation News (in Japanese).

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