

Integrated Evaluation of Forest Ecosystem Services that Contribute to Sustainable Rural Society in Harmony with Nature

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[Abstract]

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A large area of natural forests has been converted to tree plantations, while forests are underutilized and gradually aging in general. Since it is anticipated that these forest changes have had unfavorable effects on biodiversity and biodiversity-related forest services, the present research project aims at analyzing these effects on such services as collecting non-timber forest products (NTFP), recreation, pollination and pest control. In order to make quantitative evaluations of these ecosystem services we conducted questionnaire surveys with choice experiments, measurement on the collection of NTFP and field counts of forest uses. To evaluate pollination and pest control services we sampled insects visiting the flowers and predatory natural enemies, and conducted inventory researches of arthropods to evaluate ecosystem functions that support these services. These surveys revealed the following results. (1) Willingness to pay (WTP) was approximately three times as high among the people in Tadami Town as among the general public over the nation due to much higher WTP to buffer zones. (2) A combination of various methods would result in more effective estimates of ecosystem services than a single method not only to cover a large area but also to make more precise estimates in a small area. In western part of Fukushima Prefecture local people visited forests frequently and collected such a large amount of NTFP that could yield great commercial value. There local people most frequently collected wild vegetables along streams that were disturbed by heavy snow fall, while statistical analyses did not reveal negative impacts. (3) The number of native honeybee and non-*Apis* insect pollinators visiting flowers was greater, when a farmland was next to a large area of forests than a small area of them. The predator abundance had positive relation with forested areas, but it did not have a significant relationship with the buckwheat damages by aphids. Asian honeybees at buckwheat fields were significantly influenced by the area of surrounding natural forests. (4) Pollination by bees, parasitoid by braconid wasps and decomposition by longicorn beetles were high in the forest stands just after the clear-cut, and

lower in the plantation forests than in the secondary broadleaf forests. In contrast, decomposition by collembolans and parasitoid by ground beetles did not show any significant changes with forest age and type. As such, human disturbance would contribute to having higher ecosystem functions when forests are left with natural regeneration, while plantation will give negative effects.