

# **History of Forest Restoration in Ashio and Black Locust**

## **Honey**

### **Historical Overview of the Ownership and Management of Forests During the Edo Period**

In the Edo period, the rights to own and use forests were determined by the Edo Shogunate, and forests were roughly divided into those under the direct control of the Shogunate, those owned and managed by clans, and others. Among the "others", there were forests where *iriai* (joint management and use by villages) was allowed in order to obtain the resources necessary for the livelihoods of the villagers. The villagers managed the mountain and used it as a place to get firewood, turf, building materials, agricultural materials, food, and so on. This social mechanism meant that the Edo Shogunate and the clans owned the land and maintained the villages while letting the people manage and use it whilst receiving land taxes from them. It was also one of the socio-economic mechanisms before the beginning of Modernization in Japan.

### **Historical Overview of the Ownership and Management of Forests Since Modernization**

After the Meiji Restoration, the Meiji government was established, and all the land that the shogunate and clans had authority over became the property of the government. Under the Meiji government, the policy regarding land including forests changed widely. However, because all the land was owned by the Meiji government, there was an adverse effect in that taxes could not be collected from the people. Since the country cannot be run without taxes, the government hastily enacted rules on land ownership and prepared to sell the land to the people. Similarly, the government rushed to sell forest ownership. This led to the appearance of forests that would later be called "national forests", (those that were owned and used by the government), and "private forests", (those that were owned and used by private people).

However, while this system of ownership was being clarified, the institutional design and policies regarding the management of forests were lagging behind. The Meiji central government created the outline of institutional design, and the Ministry of Agriculture and Commerce, which was a special government organization, was in charge of management and jurisdiction. However, both were slow to act. As a result, the nationwide movement to prevent deforestation and preserve forests was delayed.

Deforestation weakens the ability of mountains to catch and hold rain. It causes large amounts of rainwater and washed-out mountain sediment to flow rapidly into the valleys downstream, resulting in frequent floods. In other words, if the forests are kept healthy, their ability to retain water in the mountains, (the so-called "water resource storage function"), can work properly. This had been known since the Edo period and, of course, the Meiji government knew it. Floods occur more easily if nobody manages mountains. Until around 1897 (Meiji 30), forest conservation activities were not active nationwide and consequently, flood problems occurred frequently throughout Japan. Finally, the government promulgated the River Act in 1896 (Meiji 29) and the Erosion Control Act and Forest Act in 1897 (Meiji 30). These are the laws that were later called *chisui-sanpou* (the Three Laws for Flood Control). After that, the movement to protect forests became active nationwide, including in Ashio.

Since the Meiji era, the system of forest ownership and management had changed and forest resources were used to further develop the mining industry. In addition, modern technology increased the volume of ore processed at the smelter, and it released a large amount of metallurgical smoke, containing components that kill plants (mainly sulfurous acid gas). As a result, the forests around the mine were devastated. This happened nationwide, but it was remarkable at Ashio Copper Mine, where the discovery of rich deposits and the introduction of Western technology progressed extremely quickly, and forest devastation soon became a serious social problem.

### **Beginning of Modern Ashio Copper Mine Management**

In the Meiji era, as mentioned above, the land ownership and management system changed, but so did mines all over the country. The country once owned all the mines, and then it was divided into those operated by the country and those operated by others (private civilians, etc.). Ashio Copper Mine was placed under the control of Nikko Prefecture at the beginning of the Meiji era, and came under the jurisdiction of Tochigi Prefecture in 1870 (Meiji 3). After that, civilians took over its management from 1871 (Meiji 4). Then, in 1877 (Meiji 10), the rights were transferred to Furukawa Ichibei.

Although the rights had been transferred in this way, the management of the mine in the early Meiji era actually followed most of the management methods and customs from the Edo period. The proprietor of the mine only raised the funds necessary for its development, and the development itself was outsourced to a person known in Japanese as a, "*yamashi*", who could manage the work and personnel on site.

### **Discovery of Large Deposits at the Modern Ashio Copper Mine**

In 1877 (Meiji 10), Furukawa Ichibei took over the management of Ashio Copper Mine. In order to find copper deposits as soon as possible, he first revised the old methods of site management from the Edo period, such as directing the site himself. He brought in talented human resources to Ashio and had highly skilled miners redevelop the old tunnels, and introduce gunpowder, tracks and pumps. As a result, he discovered large deposits in 1881 (Meiji 14) and 1883 (Meiji 16).

### **From the Discovery of Large Deposits to the Construction of a New Smelter**

The discovery of large deposits increased the amount of ore extracted from the mine. As a result, it was necessary to reinforce the facilities needed for subsequent processes. The concentrator, (where the ore is sorted out), and the smelter, (where the copper is separated from the ore), were strengthened. In addition, the introduction of Western-style machines significantly increased the daily processing capacity compared to the methods that had been passed down since the Edo period.

### **Beginning of Forest Devastation of Ashio Copper Mine**

The discovery of large deposits led to the expansion of facilities and the introduction of Western-style technology. Since they required more manpower to operate these facilities, many workers were brought to Ashio. This is how Ashio took its great leap forward to become one of Japan's major copper mines. However, in order to support this, construction materials needed for production and workers' lives and fuel needed for smelting were taken from the mountains in and around Ashio. Until around 1890, Tochigi Prefecture allowed Furukawa to buy and cut down trees in national forests managed by the prefecture around Ashio Copper Mine. In addition, Furukawa bought the other mountains, and they became "private forests" owned by Furukawa. In this way, deforestation proceeded. If the restoring force of the forests exceeds the amount of felling, the forests restore themselves naturally through regeneration. However, what prevented this was the emission of metallurgical smoke from the smelter, which contained harmful components, (mainly sulfurous acid gas), that killed plants. As a result, the devastation progressed from near the smelter where the trees were cut down. If forests are properly managed trees catch and store rain, and the water resource storage function works, reducing floods in areas downstream. However, in mountains devastated by deforestation and metallurgical smoke, the usually beneficial rain becomes a destructive force that washes away the mountain surface.

### **Beginning of Forest Restoration of Ashio Copper Mine**

It was not until the middle of the 1890s that the country grasped the severity of this devastating situation and banned the felling of trees, and it was not until 1897 (Meiji 30) that restoration began by law.

On May 27, 1897 (Meiji 30), the then Minister of Agriculture and Commerce, Okuma Shigenobu, ordered afforestation, fire prevention measures, and tree planting in national forests in and around Ashio. As for private forests, he also ordered afforestation, efforts to prevent wildfires, and banned the felling of trees. After this order, efforts to restore the devastated forests of Ashio began.

### **Trial and Error of Forest Restoration**

In circumstances where the soil on the mountain surface had been eroded by the wind and rain, and the trees had died due to the metallurgical smoke, restorative tree planting activities began. Initially, cedar, cypress, Sawara cypress, larch, oak, and alder were planted in the heavily devastated areas, but the newly planted trees were washed away with the soil, and the trees that remained on the hillside also died due to metallurgical smoke and the oxidized soil. Since then, efforts focused on how to treat the metallurgical smoke that was killing the plants, while preventing the collapse of the hillside through erosion control works. Along with this, tree research was also conducted, in which various tree species were tested to find those that were resistant to the metallurgical smoke. After that, various methods were tried to restore the forests, but in the early 1950s, it was finally concluded that it would be difficult unless the metallurgical smoke could be eliminated.

### **Black Locust Is One of the Proofs of Trial and Error in Forest Restoration Projects**

With the development of innovative technology for the treatment of metallurgical smoke in 1956 (Showa 31), it was expected that smoke pollution, which had been a cause of forest devastation, would disappear. Then, from 1958 (Showa 33), active restoration projects began again in national forests and private forests. In these restoration projects, seedlings such as black locust and clethra, which are resistant to smoke pollution, were planted, and seeds such as Japanese knotweed, Japanese nutmeg, and mugwort were also sown. Today, these are widely distributed in the Ashio area, covering the exposed mountain surface and playing a role as a foundation for future forest restoration projects.

Harvesting and tasting honey from black locust on the mountain of Ashio is also a way to experience a part of the history of trial and error in the forest restoration in Ashio.