Shiretoko World Natural Heritage Site Conservation Project Supported by Daikin Industries

(July 2020–June 2021)

(1) Project to Restore Rich Diversity of Shiretoko's Forests

1-1. The 100 Square-Meter Forest Movement Trust and Related Projects

The 100 Square-Meter Forest Movement Trust (organized by Shari Town) purchased land formerly set aside for agricultural and forestry development in Shiretoko, Hokkaido to restore the native forests that once grew there. This initiative, which began in 1977, completed the purchase of land after receiving support from countless individuals. From 1997, full-fledged reforestation activities were launched on the land that was purchased (Trust Lands).

This project is now expanding its forest restoration efforts to all of the Trust Lands following its efforts to restore nature along the Iwaobetsu River flowing through the Trust Lands and its river basin conducted in the phase one period from 2011 to 2015.

During the phase two period spanning from 2016 to 2024, the project will grow and plant broadleaf trees and conifers as well as repair deer fences and tree bark protectors installed in the past to stop Shika deer that posed an obstacle to forest restoration. In addition, afforestation work will be conducted on broadleaf bamboo areas and artificial forests that occupy around 25% of the 860 hectares of Trust Lands. This will mark a step forward in restoring the forest to before development for agriculture and forestry.

1-1-1. Restoration of Mixed Forest

Seedlings were grown and planted from spring to autumn, and in July, heavy machinery was used, following a similar effort last year, to plow and remove broadleaf bamboo. As other plant life cannot grow in soil covered by broadleaf bamboo, this work encourages the renewal of new trees and forest. In FY2020, which marks the fourth year of the program, broadleaf bamboo was removed at a 0.3-hectare site along the road leading to the Shiretoko Goko Lakes on the Iwaobetsu Plateau. The location in 2017 where work initially began is already beginning to see the growth of small seedlings of broadleaf trees, such as willow and Japanese white birch (photos 1-1 to 1-4). Moreover, as the condition of the bridge over the camp site of the Shiretoko Nature Classroom was deteriorating, we rebuilt the foundation and replaced the logs as part of the service road maintenance (photo 1-5).

Additionally, we strived to maintain the deer fence with regular patrols, particularly following bad weather in order to check for any damage from wind or snow. Initiatives are also underway at the Iwaobetsu River to restore the river's ecosystem, including restocking the masu salmon population that once resided there. In FY2020, we borrowed a space within the special exhibition on salmon and trout at the Shiretoko Museum to highlight our efforts on restoring the ecosystem of the Iwaobetsu River (photo 1-6).

In FY2021, this project will mark its 10th anniversary since the start of the phase one period. Ahead of this milestone, we are working on presenting the results as scientific data and analyzing them based on a wide array of expertise. In FY2020, under the full support of ASM's Lab at Yokohama National University, we have attempted to derive the forest growth amounts and CO2 reduction amounts by taking aerial photographs with a drone and comparing the results with past data. We aim to publish these results in 2021 (photos 1-7 and 1-8).

Photo 1-1. Transplanting medium-sized seedlings (May 17, 2020)

Photo 1-2. Watering a field of rice seedlings (August 24, 2020)

Photo 1-3. Removing broadleaf bamboo with heavy machinery (July 1, 2020)

Photo 1-4. Researcher from Yokohama National University conducting a vegetation survey of immature trees planted at the site of a previous broadleaf bamboo removal (September 2, 2020)

Photo 1-5. Ponhoro Bridge undergoing replacement work (November 6, 2020)

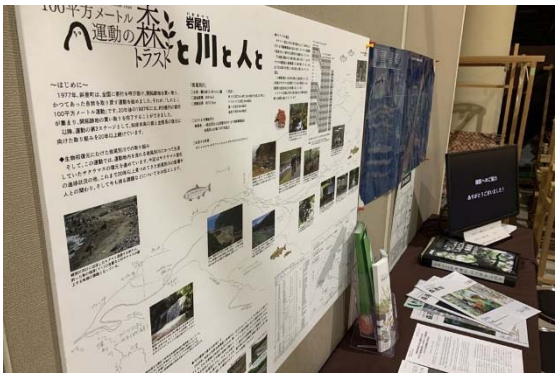

Photo 1-6. Exhibit at the Shiretoko Museum introducing initiatives along the Iwaobetsu River (October 16, 2020)

Photo 1-7. Drone operator and researcher of Yokohama National University monitoring the flight (July 6, 2020)

Photo 1-8. Measurement drone used for aerial photographs (July 20, 2020)

1-1-2. Hosting of Employee Volunteers from Daikin Industries

In FY2020, Daikin Industries Shiretoko Volunteer events scheduled for the fall (September) and winter (February) did not take place due to the COVID-19 pandemic. To date, this program had hosted 17 volunteer events with a total participation of 187 employees.

1-1-3. Challenges and Goals for the Next Fiscal Year and Onward

There are spots of pasture and broadleaf bamboo land (un-established woodland), which have not transitioned into a forest even after 40 years of cultivation, located within the Trust Lands. The afforestation of such un-established woodland and diversification of tree species within the forested area have become a medium- to long-term issue. For this reason, we have been attempting to plow the broadleaf bamboo land and replenish the top soil in

preparation to transform this un-established woodland into forest. In addition, we have been utilizing the natural processes that cause thinning and gap formation to efficiently direct the formation of mixed forests consisting of deciduous and coniferous trees. One of the major challenges in forest development in Shiretoko is to grow broad-leaf deciduous trees in the habitat of Sika deer, which feed on board-leaf trees. We have been working on this issue for over 20 years. To prevent deer from feeding on the plants while we develop the forests, we began by installing deer fences, and transplanted small and medium sized seedlings nursed from seedling fields into the fenced area. The plants were then brought outside of the fence after being wrapped with a protective bark netting. In recent years, however, the Sika deer capture projects promoted by the government such as the Ministry of the Environment and the Forestry Agency are starting to show results with gradual decline in the Sika deer population in certain places. As such, we have also started a new trial of bringing seedlings out of the fenced area without additional protection.

In the future, we will focus on wind and broadleaf bamboo as deterrents to tree growth. This is because it is necessary to carry out afforestation with higher efficiency and sustainability, with the major goal of creating locations capable of natural renewal for coniferous and deciduous trees and developing habitats for deciduous trees.

(2) Project to Protect and Pass on Shiretoko's Value as a World Heritage Site

2-1. Activities for Passing on Shiretoko's Forests to Future Generations

This project supports nature learning activities for local children with the aims of passing on the values and appeal of Shiretoko as a World Natural Heritage, as well as fostering human resources crucial to the conservation of Shiretoko's nature in the future.

Efforts are being made to enhance understanding and visibility of the 100 Square-Meter Forest Movement Trust by actively visiting all levels of schools in Shari Town and its vicinity to lead classes and accept on-site visits. In addition, lectures on the topic of forestation are given at the Shiretoko Nature Center to promote the activities and philosophy of 100 Square-Meter Forest Movement Trust to the general public.

2-1-1. Supporting Environmental Education for Children

Elementary schools in Shari and Rausu towns have class time dedicated to learning about the nature of Shiretoko within the comprehensive learning period each year. In FY2020, third grade students at Shiretoko Utoro Elementary School spent a class period learning about the living things on the shallow rocky shore of Chashikotsuzaki. In addition, Shiretoko Museum in Shari Town hosts the Shiretoko Museum Kids event once a month. In August, a nature observation event was held along the rivers of Shiretoko. In addition, elementary schools in Shari and Rausu towns organized presentations on Shiretoko's nature during comprehensive learning period. This fiscal year a river observation class was held as for sixth graders at Asahi Elementary in Shari Town. During the session each year, children wear waders that were purchased using a donation from Daikin Industries in 2017. Each year the children rave about the experience of observing living things in the water up close (photos 2-1 an 2-2).

The exchange program between Shiretoko Kids of Rausu Town and Shiretoko Nature Loving Youth Group in Shari Uroto, launched in 2015, did not take place in FY2020 due to the COVID-19 pandemic. As a result, there was no expenditure from donations for boat charter fees normally contributed to the Cape Shiretoko Cleanup held as part of the program each year.

The snowshoes purchased using the donations from Daikin Industries have been utilized during the winter program of Shiretoko Kids. The snowshoe experience, which centers around the Rausu Visitor Center, was popular in wintertime as it granted visitors access

to areas that would otherwise be hard to reach in the summer (photo 2-3).A picture book creation project has been initiated to convey to the general public the history of forests and development in Shiretoko and the current reforestation projects taking place there. We are working with picture book author Nobuko Akashi (resident of Shari Town) to collect inspirations for the picture book, including many early morning walks in the forests of Shiretoko and multiple meetings in front of the pictures taken while on these walks. The picture book is planned to be published in fall 2021 (photo 2-4).

Photo 2-1. Shiretoko Museum Kids' river fishing in Shari River

Photo 2-2. Comprehensive learning period of third graders at Shiretoko Utoro Elementary School in Shari Town

Photo 2-3. Snowshoeing and trekking at Bokyo Forest under the Rausu Shiretoko Kids program

Photo 2-4. Idea gathering in Shiretoko's forests for the picture book development

The project hosted experience-based learning for local schools to promote initiatives for Shiretoko's nature and the Shiretoko 100 Square-Meter Forest Movement Trust.

Despite the COVID-19 pandemic, lectures were given both in class at school and onsite to learn about the history of pioneering and progress of the movement. Additionally, as part of hands-on learning, fourth grade students from Shiretoko Utoro Elementary School and sixth

grade students from Asahi Elementary School participated in tree planting. With the new addition of Asahi Elementary School in FY2020 to the existing participating schools of Shiretoko Utoro Elementary and Shari Elementary schools, we have now conducted lectures at all elementary schools in Shari Town (photos 2-3 and 2-4)

2-1-2. Activity to promote initiatives for nature conservation and forest restoration to visitors of Shiretoko

The project developed a promenade for the opening of *Shiretoko Morizukuri no Michi* to the general public, a walking trail built within the Trust Lands. *Shiretoko Morizukuri no Michi* features the Deer Fence Trail and Pioneer House Trail. These trails were created for visitors to learn about the pioneer history, actual process of forest development, and the environment in the Trust Lands.

Shiretoko National Park Nature Center had an unprecedented year in FY2020 with the announcement of the state of emergency due to the COVID-19 pandemic, causing the Center to close for about one month. Along with this, the *Shiretoko Morizukuri no Michi* promenade, which is normally open year-round, was also closed to the public from mid-April to late-May together with the Shiretoko National Park Nature Center (photo 2-5).

Despite the pandemic, both the Shiretoko National Park Nature Center and the *Shiretoko Morizukuri no Michi* trail reopened to the public from mid-May. The Pioneer House Trail saw 1,085 visitors, including those using the snowshoe course in the winter. The number of visitors was about half of those in FY2019 (2,174 visitors).

The pandemic not only resulted in fewer visitors to the center, but also led to the cancellation of the staff commentary event (Staff Talk) held regularly every year.

As one of the proposals to make effective use of the trimmings of Glehn's spruce created during the forest development process, we began a trial of extracting essential oil from branches and leaves. The refined essential oil has been put on display at the Shiretoko National Park Nature Center and the Shiretoko 100 Square-Meter Forest Movement House for visitors to enjoy its fragrance as well as to highlight the process of making the refined essential oil (photo 2-6).

Photo 2-5. Sign indicating trail closure (April 28, 2020)

Photo 2-6. Essential oil of Glehn's spruce on exhibit at the Center (August 14, 2020).

2-1-3. Challenges and Goals for the Next Fiscal Year and Onward

In FY2020, many environmental learning events geared towards local children had to be cancelled due to the COVID-19 pandemic. While the pandemic is expected to persist going forward, we will proceed with planning the program to include outdoor-based activities while thoroughly following infection control measures in order to for children to get close to Shiretoko's nature and have a place to learn.

The picture book development project is currently scheduled to be unveiled at the Daikin Industries 10th Anniversary Symposium (tentative name) scheduled for October 2021. Moreover, we hope to extend the promotion activity for the picture book itself in order to reach as many readers as possible.

While we achieved the goal of implementing learning activities on the Shiretoko 100 Square-Meter Forest Movement in every local elementary and junior high school in FY2020, the lecture itself has not been taken up by every school as part of their standard lesson. For this reason, we hope to lobby schools in order for the lessons to be implemented in all schools each year.

Awareness activities on the Shiretoko 100 Square-Meter Forest Movement through lectures within the facility have, as mentioned earlier, not taken place due to the COVID-19 pandemic. The same situation is expected to continue in FY2021. On the other hand, as *Shiretoko Morizukuri no Michi* is an outdoor trail, it is planned to remain open to visitors even during the COVID-19 pandemic. The walking trail is open to the general public for the pioneering history and actual progress of forest development to be exposed to and appreciated by as many visitors as possible. In addition to regular inspection and maintenance of the walking trail, we are also considering adding signs along the path for self-guided walking tours and

improving and extending the trail, in order to enhance the trail's attractiveness and increase the number of visitors.

2-2. Supporting activities so that humans and bears can coexist

The support program conducted by Rausu Town to assist activities that foster coexistence between people and brown bears has moved on from phase one (FY2011-2015) to phase two (FY2016-2024).

In phase one, electric fences were installed in urban areas between Kitahama and Aidomari where people live in order to prevent conflicts between people and brown bears. In order to ensure the electric fences function effectively, it required a great deal of maintenance. As a result of the fences installed, the area saw reduced brown bear activity. However, since residential areas continue on a long skinny strip along the coastline in Rausu Town, it is unrealistic to install electric fences in all areas from the perspective of budget, maintenance, and inspection. As a result, the methods for dealing with brown bears in areas where electric fences are not installed remained an issue.

Therefore, during the second phase, in addition to the maintenance of electric fences installed in phase one, we have established a new goal of creating a town that is difficult for brown bears to approach, as a measure for areas without electric fences. Specifically, we aim to prevent brown bears from coming to human residential areas by making the area clear of obstructions and removing places for brown bears to hide, feed, or move about through cutting down tall bushes of giant butterbur, giant knotweed, and broadleaf bamboo.

2-2-1. Maintenance of the electric fences installed in phase one

In Rausu Town, electric fences are in operation from late-April until late-December. This timing coincides with the time of snow melt, which is right before brown bears start to become fully active, until the beginning of snowy season when brown bears start to be less active.

In FY2020, the installation of electric fences in the urban center started on April 7, earlier than in FY2019, with the entire area connected to electricity and in operation on May 2 (table 2-2, photo 2-7). For electric fences north of Kikiribetsu, priority was given to the two areas of Lusa and Konbuhama, where there were few physical barriers, with installation work started on May 3. After that, installation also gradually began in other areas. All 12 areas had the fences in operation on July 21.

Electric fences will not fully function due to issues such as electricity loss from power lines contacting with plants, disconnection due to wind or fallen trees, or unraveling or corrosion due to deterioration. Hence, inspections were conducted once to twice a week to ensure the voltage was maintained at 4,000 volts or higher, which is the benchmark for what brown bears tend to avoid. If a reduced voltage was noted, the location of power loss was promptly identified for repair, replacement or updating. The electric fences in urban centers, which were especially important, were inspected for connectivity on a daily basis using a new remote monitoring system, and operated closely since FY2020. Moreover, grass weeding was carried out as needed to ensure no power loss due to contact with overgrown weeds. For the urban areas, herbicide was sprayed to improve efficiency.

In FY2020, the removal of electric fences began on December 2 (photo 2-10). Electric fences do not function in the snow, and since the power supply and fiberglass support columns may be damaged by snow pressure, these parts are also removed and collected in early December. In addition, in order to prevent electric fences from being blown over by strong wind, they are taken down to the ground and bundled with strings. The removal work of electric fences was completed on the 11th of the same month.

In FY2020, there were eight sightings of brown bears within the area of installed electric fences, and of these, five took place while the electric fences were in operation. There were two sightings on the other side of the electric fence along the ocean. Of these, one sighting was noted in Sakaecho, city center of Rausu Town, where houses are concentrated. Evidence of breach was confirmed in a place where the ground under the electric fence became a wetland due to spring water. The same brown bear was captured on the same day. The other sighting happened in Kombuhamakita (right bank), where it was confirmed that the electric fence was not in operation due to loss of power when the brown bear entered the area.

Photo 2-7. Installation of electric fences

Photo 2-8. EfMos installed (remote monitoring system)

Photo 2-9. Maintenance work (grass weeding)

Photo 2-10. Removal of electric fences

2-2-2. Creating an Environment that is Difficult for Brown Bears to Approach Residential Area

In Rausu Town, there are many groups of plants consisting of giant butterbur, giant knotweed, and broadleaf bamboo located between the residential area and forests, which form bushes of poor visibility. The height of these plants can hide the body of brown bears that exceed two meters in length. Also, giant butterbur makes up an important food source for brown bears in early summer. As such, these groups of plants can easily become a travel route and feeding ground for brown bears, plus the poor visibility makes it possible for people and the bears to come in very close contact. Hence, these are considered highly dangerous areas.

For this reason, in phase two, we began to create an environment that brown bears dislike, and is difficult for them to approach around human residential areas by removing the plants mentioned above surrounding residential areas.

In FY2019, in addition to the bush mowing conducted by the Shiretoko Nature Foundation alone, an event involving bush mowing with local residents was planned as a new initiative, which was conducted in two districts in town. In FY2020, this initiative was expanded with the grass mowing event planned for 11 districts within Rausu Town. Together, a total of 179 participants consisting of local residents, municipal employees, and businesses in town, mowed the bushes that could potentially contribute to brown bears' infiltration route in their respective local area (figure 2-1, photo 2-11). In particular, grass mowing events were held within the electric fenced area in Midoricho, which is part of Rausu's city center, giving the residents an opportunity to experience firsthand the installation progress of electric fences.

Photo 2-11. Conducting the weeding event

2-2-3. Challenges and Goals for the Next Fiscal Year and Onward

In phase one, activities were conducted with a primary focus on the installation and maintenance of electric fences. Upon analyzing their effect on brown bears, we got the result that we can expect them to be sufficient in intrusion prevention. In phase two, while electric fences will continue to be the heart of the program, there are still multiple outstanding issues with regard to their maintenance and operation.

In FY2020, there were two reports of brown bear sightings from the fence in the city center and seaside during the operation period. One of these sightings was thought to be due to movement toward the seaside from a place where the fence was unable to operate normally. If there is a power loss or disconnection in one location along the electric fence, the entire section from that point to the terminal becomes inoperative. Therefore, precise maintenance work is indispensable to maintain sufficient effectiveness. On the other hand, in order to operate the electric fences sustainably, it is also important to cut the cost of maintenance work. Hence, to achieve both objectives, we need to strive for the optimization of electric fence installation and management of operation.

For example, within the electric fence area, there are some places of frequent brown bear sightings versus places without, as well as places with higher risk of brown bears crossing over the electric fence. We believe there is room for reconsideration on the areas of installation and their distance in order to prioritize maintenance costs on places with frequent or higher risk of brown bear sightings. Moreover, improving the efficiency of maintenance work by introducing the remote monitoring system as described earlier in more sections is also a necessary step to be considered for developing a sustainable countermeasure system.

In addition, for areas with retaining walls, the wires attached to the fence on the retaining wall

are currently used as energizing lines, but their position is too high and thus not effective in controlling brown bears. Furthermore, if they cause a power loss, then time can be taken away on the inspection of the very long wire. We believe we can simplify and strengthen management and achieve better electric fence operation with higher efficiency through removing these wires and installing energized lines only at the breaks of retaining walls prone to passage by brown bears.

Next, there are also a few outstanding issues to be considered on the bush mowing that was launched as part of the program to create a town that is less approachable by brown bears.

Places with grass mowed had no brown bear sightings while the plant height was low. This suggested that grass mowing was sufficiently effective in bear control. However, as bears have been sighted in nearby areas without grass mowing or when the bushes have overgrown again, we believe there is room to consider the target area of grass mowing and frequency. Moreover, the likelihood for continued management, participant number and location for the grass mowing event with local residents can be considered future issues.

In FY2020, we worked proactively to lobby each local municipality, which resulted in a dramatic increase in the number of local residents involved in mowing. In hopes of involving even more residents in bush mowing, we plan to continue promotion from a self-defense angle. In parallel with this, we are thinking of conducting public awareness, such as proposing the trial introduction of electric fences. With these two initiatives as a foundation our goal is for residents of Rausu Town to take the reins in conducting bear control and become a town that is taking measures against brown bears together with other communities in the region.