



A Biotope for Fireflies – a place for environmental conservation &amp; education

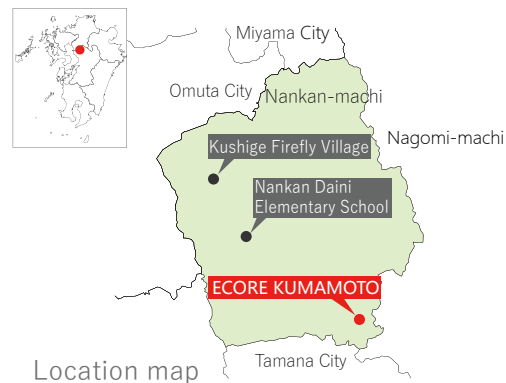
## KEYWORD OF LANDSCAPE DESIGN



ECORE KUMAMOTO is an industrial waste final disposal site constructed and operated by private companies with the involvement of the public sector. The project site is situated in a 'Satoyama' environment surrounded by patches of forests and rice paddies.

Due to the aging and declining nature of both the overall and farming populations, the area was in need of enhanced ecosystem stewardship, as well as a place for environmental education for the community residents.

To address these needs, we created a "biotope for fireflies" and a "garden of cherry and azalea" to enable the locals to conserve and learn from nature and feel proud of their heritage.



Location map

## ECORE KUMAMOTO

Location : Nankan-machi, Tamana-gun, Kumamoto Pref.  
Purpose : Final disposal site  
Client : Kumamoto Environmental Development Corp.  
Greenery Design : Landscape Design Inc.  
Biological Survey : Kajima Technical Research Institute  
O&M : Kajima Environment Engineering  
Civil/Architectural Design : Kajima Corporation  
Construction : Kajima/Ikeda/KOA/Iwashita JV  
Area : Approx. 12ha  
Construction period : July 2013 – Oct. 2015



Waterside Terrace Area



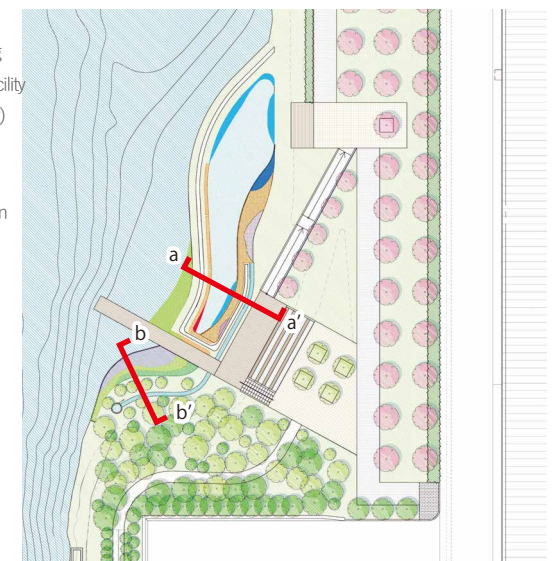
Cherry &amp; Azalea Blossom Garden



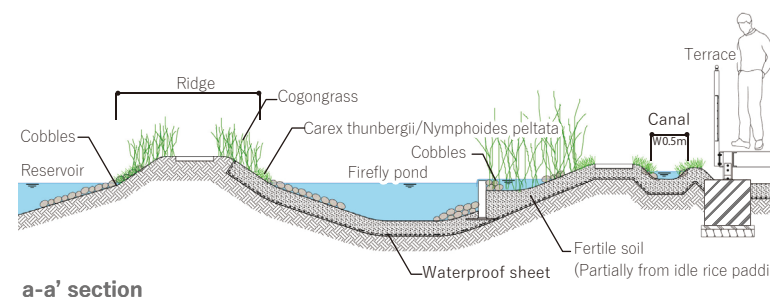
Overall Layout

0 10 20 50 100m

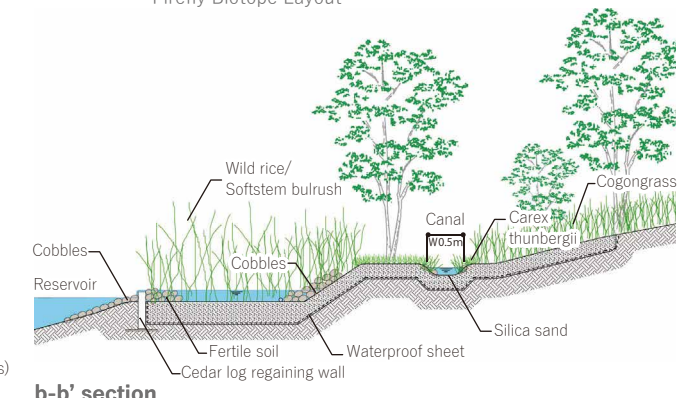
- ① Covered facility
- ② Administrative building
- ③ Seepage treatment facility
- ④ Reservoir (pre-existing)
- ⑤ Firefly pond
- ⑥ Waterside forest
- ⑦ Cherry blossom garden
- ⑧ Walkway



Firefly Biotope Layout



a-a' section



b-b' section



ECORE KUMAMOTO Bird's-Eye View



Water Canal Test



Canal &amp; Firefly Pond

## Creating a Firefly Biotope

A habitat for fireflies requires a water body abundant with black snails, serving as the primary food source for firefly larvae. We conducted a water canal test to determine the optimum flow rate, water temperature, and other conditions for black snails, and incorporated the results in the design and construction of the biotope. We released fireflies and black snails to the biotope, most of which were raised and multiplied using the unique technology of Kajima Technical Institute, while a small portion was collected from their natural habitats in the surrounding areas to minimize the impact on the local ecosystem. Firefly larvae also need tall grass above the ground on which they pupate. As the soil of the project site lacked nutrients to grow such grass, we collected fertile soil from idle rice paddies within the site and used it as surface soil to promote plant growth and pupation.

| Phase                   | Activity                                 | Designer                                                                                                                                                      | Researcher                                                 | Builder                                         | Operator (client)                                                                      |
|-------------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------|
| Tech. proposal          | • Proposal of a biotope                  | Propose a biotope to promote biodiversity and symbiosis with nature.                                                                                          |                                                            |                                                 |                                                                                        |
| Detail design           | • Field survey                           | Site survey after winning the bid.<br>Issues: ease of construction, convenience for holding environmental learning classes<br>⇒ Consider changing the layout. |                                                            |                                                 |                                                                                        |
|                         | • Change of biotope layout               | Reconsider layout                                                                                                                                             | ↔                                                          | Environmental survey                            | Work out solutions to improve ease of construction                                     |
|                         |                                          | Priority: "a place for environmental learning"                                                                                                                | Decision made to modify biotope layout.                    |                                                 |                                                                                        |
| Construction (1st half) | • Firefly habitat survey                 | Firefly habitat survey in the area ⇒ Environmental model                                                                                                      |                                                            |                                                 |                                                                                        |
|                         | • Change of biotope specifications       | Issue: No. of flying fireflies of the predetermined species was fewer than expected.<br>⇒ Select different species.                                           |                                                            |                                                 |                                                                                        |
|                         | • Setting of targets at completion       | Revise biotope configuration                                                                                                                                  | Issues found at the site                                   |                                                 |                                                                                        |
|                         | • Water canal test                       | Modify water canal design.                                                                                                                                    | Decide on the conditions for completion inspection.        |                                                 |                                                                                        |
| Construction (2nd half) | • Breeding of black snails and fireflies |                                                                                                                                                               | Water canal test to determine spec.                        |                                                 |                                                                                        |
|                         |                                          |                                                                                                                                                               | Breeding & multiplication                                  |                                                 |                                                                                        |
|                         | • Use of soil from idle rice paddies     | Visualize the outcome                                                                                                                                         | Seed germination experiment                                | Use soil from idle rice paddies.                |                                                                                        |
|                         | • Construction of biotope                |                                                                                                                                                               | Qualitative attributes<br>Quantitative tests               | Construct biotope based on environmental model. |                                                                                        |
|                         |                                          | Release black snails into water canal.                                                                                                                        |                                                            |                                                 |                                                                                        |
| O&M                     | • Environmental education events         | Share information.                                                                                                                                            | Monitoring survey.<br>Support for environmental education. | Share information.                              | Develop/implement environmental education programs.<br>Collaborate with the community. |
|                         | • Monitoring survey                      |                                                                                                                                                               |                                                            |                                                 |                                                                                        |
|                         | • Collaboration with the community       |                                                                                                                                                               |                                                            |                                                 |                                                                                        |

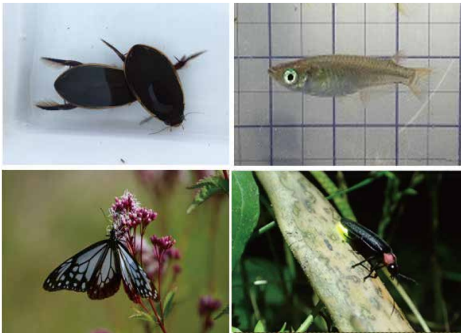
Biotope Creation Process - An adaptive approach made possible through collaboration among the 4 parties in design/construction/O&M phases.



Natural Habitat Survey in the Area  
The designers, researchers & construction firm for the project conducted a survey on firefly habitats.



Monitoring Survey by Researchers  
To assess the environmental status



Species Found Around the Biotope  
184 animal and 190 plant species have been identified

### Adaptive Approach

In green spaces designed with a focus on biodiversity, adaptive management is considered crucial. Adaptive management is a method that is based on the unpredictability of ecosystems and involves revising maintenance practices as needed through continuous monitoring. However, even during the planning and construction phases, unforeseen challenges may arise through environmental surveys and other assessments, necessitating revisions to the initial plans. Therefore, adaptive approaches tailored to the current circumstances are necessary at every stage of planning, construction, and maintenance. To achieve this, it is important to establish a flexible system and mechanism that allows for the feedback of identified challenges from surveys into the planning process. Ecore Kumamoto was able to create a firefly habitat and establish a place that is embraced by the local community through the collaborative efforts of designers, researchers, constructors, and operators.



A Class Taught by Researchers vv



Raising Firefly Larvae in Elementary School



Releasing Larvae to the Firefly Village



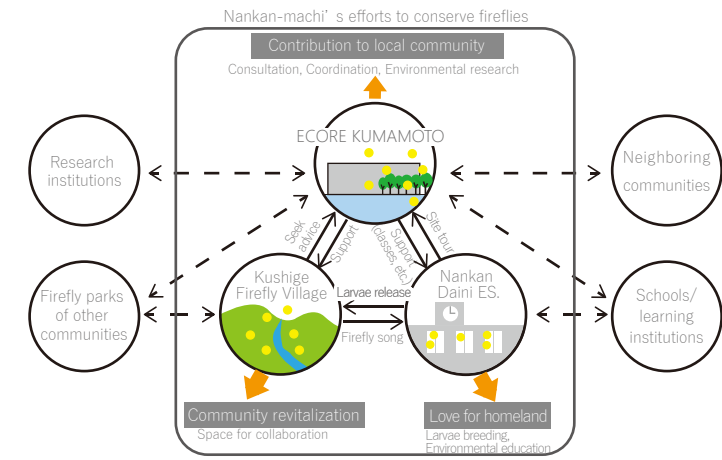
An Environmental Learning Event



An Environmental Learning Event



A Firefly Found in the Project Site



### Community Network Centered on Fireflies

The area inside the rectangle shows activities currently in progress, whereas those outside are future plans.



Waterside Terrace Used for Environmental Education

### Operation & Maintenance

Since its completion, Ecore Kumamoto has evolved into the regional hub for environmental education and conservation, featuring ongoing environmental monitoring. Researchers from the Kajima Technical Research Institute, integral to the project, now teach classes at the local elementary school and actively contribute to the operation and maintenance of the biotope. Kushige Firefly Village in Nankan-machi, another renowned site for fireflies, faced challenges due to a shortage of individuals engaged in environmental conservation. Ecore Kumamoto now extends its support to their activities, including firefly larvae breeding. It serves as a pivotal contact point for environmental affairs, fostering connections between the elementary school and other community members. In essence, Ecore Kumamoto has transformed the disposal site into a thriving biotope for fireflies, harmonizing with both nature and the local community.

## AWARD



JCSE Environmental Award 2016