

## The Simulation Software on the Extension and Extinction of Vegetation

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### 【INTRODUCTION】

We developed the software on the expansion and extinction of vegetation. In this software, we focused on the destruction of vegetation by floods, the sedimentation of fine grained soil by vegetation and the expansion and extinction of vegetation caused by the changes in the conditions of location. Here, the process shown in the next page "Scenario on the expansion and extinction of vegetation" is called the expansion and extinction of vegetation. we divided vegetation into three stages according to the conditions of location.

The plant communities can't be forecast because the vegetation is divided into only three stages. And we consider only the action of the river and the conditions of location in this software. However, the user can examine the influence on vegetation by changing in physical environment (flood frequency, tractive force, etc). It is useful in the river management to examine roughly the tendency; the bare ground kept or vegetation growing thickly. For instance, you can use for the following purpose. So this software is practical and useful supporting tool.

#### 【Analysis of the factor of stable vegetation growth】

Inputting the discharge caused actually, the user can examine the effects of the floods on the expansion and extinction of vegetation. So you can analyze the factor of stable vegetation growth.

#### 【Planning river improvement】

Inputting the arbitrary cross-sectional views, the user can examine how the relative height influences on the sedimentation of fine grained soil causing stable vegetation growth. So you can discuss the appropriate cutting down elevation where vegetation don't grow thickly.

### 【DEVELOPMENT HISTORY】

- This software was made based on the thesis on Tama-river, the following publishing.
- We calculate on various rivers, and examining the applicable conditions and limits of this software.
- We improve the operation of this software.

### 【MODEL FEATURES】

- This software targets the segment-1 reach.
- Quasi two-dimensional uniform flow analysis is adopted.
- The operation is very simple; the user can calculate only by inputting constants (for example coefficient of roughness), a cross-sectional view, discharge, etc.
- The secular changes of the expansion and extinction vegetation can be examined, for the calculation is done by inputting the flow discharge actually caused.
- The changes of the coefficient of roughness according to the shift of vegetation can be considered.
- The sedimentation of fine grained soil by vegetation can be considered.
- The calculation result can be output to Excel, so you can analyze easily.
- Vegetation is divided into three stages, and the cycle shown in the next page "Scenario on the expansion and extinction of vegetation" can be expressed. (The following number shows the process of the number in figure. )
  - ① The bare ground or the vegetation which is possible to grow on a severe conditions like the gravel-bed reaches is assumed. This stage is named Type- I .
  - ② After a certain period passes, the vegetation change. This stage is named Type- II .  
Type- II grow denser than Type- I , so the vegetation deposit fine grained soil during floods.
  - ③ After some floods and fine grained soil deposited to some thickness, stable vegetation areas is formed. This stage is named Type- III .
  - ④ Type- II and Type- III returns to Type- I through the extinction by big floods.

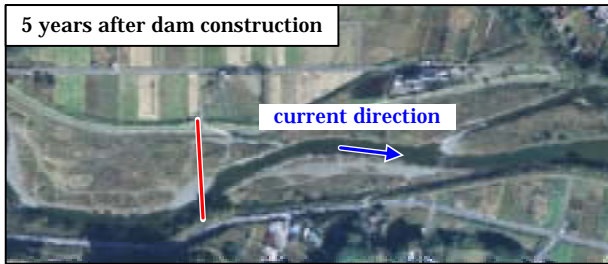
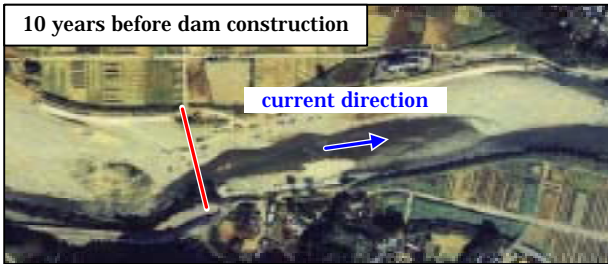
### 【PROJECT REFERENCES】

We apply this software to the following river and examine the applicability in cooperation with Foundation of River and Watershed Environment Management.  
Tyubetsu-river, Watarase-river, Kanna-river, Nakatsu-river, Ooi-river, Tenryu-river, Mibu-river, Tedori-river, Oze-river, Hiji-river

### 【REFERENCES】

Koh-ichi Fujita et al : Mechanism and Simulation of the Expansion and Extinction of Stable Vegetation Areas in a Gravel-Bed Alluvial Fan River, Journal of Hydraulic, Coastal and Environmental Engineering, No.747 ii -65, pp.41-60, 2003.11

# Development of the simulation software on the extension and extinction of vegetation



Before dam construction it was bare ground.  
After dam construction vegetation grew thickly.

- What is the cause?  
 Decrease in disturbance frequency by flood control?  
 Or no flood by chance?
- Will stable vegetation areas be formed?  
 Or it will return to bare ground?
- What is the proper characteristics of the expansion and extinction of vegetation in this river?
- How was the expansion and extinction of vegetation while aerial photograph didn't exist?



## The Simulation Software on the Extension and Extinction of Vegetation

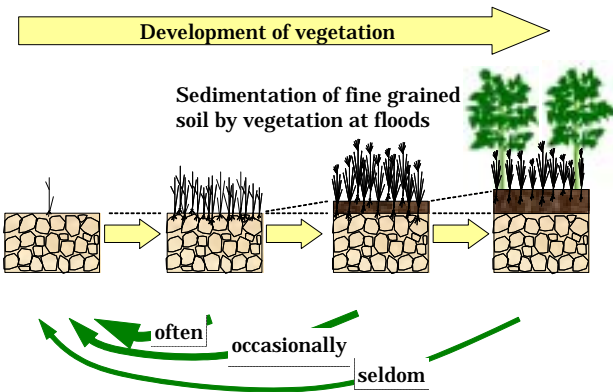
This software was developed as the supporting tool to examine the process of the expansion and extinction of vegetation.

### 【Features】

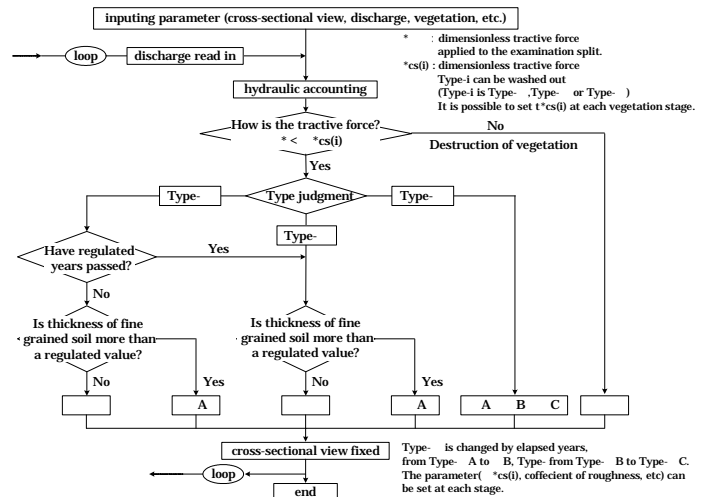
- The effect of the sedimentation of fine grained soil can be considered.
- The expansion and extinction of vegetation is quantitatively predictable.
- The operation is very simple.
- The calculation result can be output to Excel.



## Scenario of the expansion and extinction of vegetation



## Calculation flow



## The example of calculation result ~ at the cross-section of red line in above aerial photograph ~

