# STUDIES OF RIVER HANS' PLANT COMMUNITY (I)

## A STUDY ON PLANT COMMUNITY IN THE AREA OF YANGSURI

by

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洪元植：漢江沿邊 植物群落의 硏究 (第一報)

兩水里 近處의 植物群落 調査

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## INTRODUCTION

The terrain of KOREA is very steep, and there are 2 different climate seasons, one is the dry season and another is the rainfall season.

The rainy season of KOREA consists of June, July, and August and over the half of the rainfall in the year falls in this 3 monthes.

According to amount of rain in a year of the past eleven years (since 1925 to 1934), the average ratio of the rainfall in the June, July, August is about 54% of it in the whole year.

So there is a heavy rain in the summer season, especially we had 487mm. deep of rain in the 5 days in 1934, and this rain was over of the whole years' rain. If rain continue several days, it is obvious that the rivers are over flood.

Not only swollen waters destroyes the mountains, and plains, but also transports he sands, gravels. These sands and gravels are finally sunk in the downstream. Every year he rivers overflood the bank by a heavy rain, and over the fields, towns, and villages. So we were suffered from great damage by the heavy rain.

The trees in the forest near the rivers were cut by men who lives in the town near tthe forest. So the damage of the flood are great than any other countries.

The original shape of the river are formed by the shape of the land, the nature of the soil, or by the stream powre.

Various species of plants grow in the large area where the water of river does not flow. This area are overflood only in the rainy season and the streamed area are only 1/5 width of rivre.

The growing plants of this region constiute a special plants' association.

Generally this special plants' association not only protect the river bed but also stabled the bank. So it is possible to reduce the damage of flood.

The research of the growth and the change of the riversides' plant association are not only ecologically interesting but also very important matter from the praveation of the flood or sand guards.

This work was done in the area of YANGSURI and initiated in August 1954 and was

continued for approximately one year.

River NORTH HAN and River SOUTH HAN met in the area of YANGSURI.

The author surveyed the riversides' plant which were growing in the area of 8 km length at YANGSURI. When the flood overflood in the rainy seasson, the riverside is completely disturb.

The bed of the riverside are consisted of gravels, but some places are generally covered with much sand soil and little mud.

Since 24 June to 26 June, in 1955 the heavy rain changed the river road and the plant association that in the north part of the River SOUTH HAN riverside are completly immersed.

The width of the River SOUTH HAN is about 600m and the width of River NORTH HAN is about 400m in my surveyed area.

The width of the River HAN where met the River SOUTH HAN and the River NORTH HAN is about 800m.

In this River HAN, the constantly streaming part are destricted only about 200m. When the flood overflows, this broad area fill of muddy water.

The growing condition of the riversides' plant community that grow in the sandy gravel area are resemble with the plant community of the seasides' sandy soil area.

The plant community of the riverside are always influenced with the stream. The stream of the river not only transport the mud and the sandy soil, but also deposit them. So the plant community of the the riverside are extinguish, and sometimes we can found roaming of the seeds.

We can say that the plant community of the riverside lies under the special environments.

It is my great pleasure to record here a debt of gratitude to Dean KI WON CHANG for his very valuable advice during the work and the author also wish to express thanks to Chief Professor TOK SUEN YUN, Holy Ghost Medical College for his very helpful advice.

## METHOD AND RESULTS

The author want to survey the relationship of the plant community in the uncomfortable zone which is influenced by flood and the soil of the riverside. Genrally the upper part of the river constitues the valley, so at there unform a broadly developed riverside, and also it is the same result in the lower part of the river.

It is due to that the stream deposits sand and mud, so in the lower part of the river forms plain.

The uncomfortable zone are developed in the middle part of the river. Especially the area where mets branch rivers and the main river are good place for study of the riversides' plant community, because the area of such a Y shape or T shape are distinctly suffered from the damage of the flood.

The author used the quadrat method along the riverside and repeat the 20 times in every community.

By the result of the survey, I distinguished 5 different communities in this area. These 5 communities are;

(1) Seedling community (2) Reed community (3) River willow community (4) Herb community (5) Pine community.

1. Seedling Community

The part where here the stream is always wet and the soil is constituted with the fine sand. In such place, the stream transports the annual herbs' seed and sometimes transports the various kinds of willow seeds. Such seeds germinated and then developed to the community. The seedling community is lost or covered with the sand by the flood, so the growing season of the community are very short. The growing season is generally from april to June. In this community, the rate of growth, the ability of resistance to flood, and the length of root system are different. In the growing area of seedling community, we found the many Cyperaceae (which contains Cyperus, Bulbostylis, Carex, Fimbristylis) and also the seedling of Persicaria, Eleusine, Capsella, Artemisia, sedum, Equisetum, Stellaria.

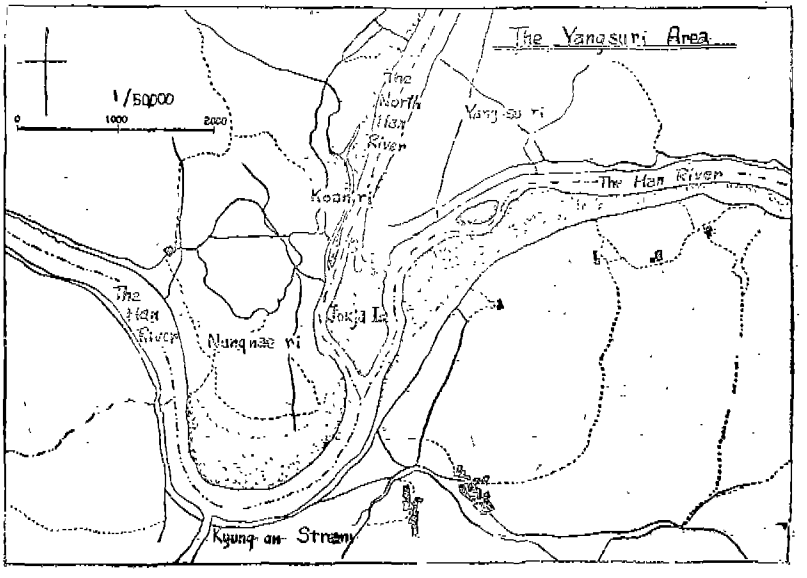



Table 1.

| Name of plants | Cover degree | Frequency (%) |
|---|---|---|
| *Persicaria Hydropiper Spach* var. NAKAI | 2.1 | 100 |
| *Cyperus amuricus Maximowicz* var. LAXU NAKAI | + | 80 |
| *Capsella Brusa-Pastoris Medicas* var. *triangularis* G UNER | + | 50 |
| *Equisetum arvense* LINNE var. *boeale* RUPRECHT | + | 40 |
| *Bulbostylis tenuissima* NAKAI | + | 35 |
| *Carex mollicula* BOOTT | + | 30 |
| *Salix gracilistyla* MIQUEL | + | 30 |
| *Fimbristylis annua Roemer and Schultes* var. *tomentosa* NAKAI | + | 25 |
| *Stellaria aquatica* SCOPALI | + | 10 |
| *Artemisia asiatica* NAKAI | + | 20 |
| *Sedum aijon* LINNE | + | 10 |
| *Chrysanthemum sibiricum* FISHER | + | 10 |
| *Alopeculus amurensis* KOMAROV | + | 10 |
| *Chenopodium album* LINNE var. *centrorubrum* MAKINO | + | 10 |
| *Plantago asiatica* DECAISNE | + | 10 |

Table I indicates the result of the survey. When we use the $1m^2$ quardrat method, we can find that the species of Persicaria, Hydropiper, and Cyperus amuricus are dominant.

In the nearest part of the stream, we also found the young seedling of Polygonum aviculare Linne var. buxifolium Ledebour, Poa strictula Steudel, Mukdenia rossi Koidzumi var. typica Nakai, Artemisia selengensis Turczaninow ex Besser var. seratifolia Nakai and Draba nemorosa Linne var. hebecarpa Ledebour, Stellaria media cyrillus, and Portulaca oleracea Linne.

Sooner or later such seedling community carried away or covered with sand by the flood, but when there is no flood in a long time, the sandy soil plants, such as Persicaria Hydropiper, Equisetum arvense, Chenopodium album looks like invade the behinds' dry sand soil region.

The seedling community which is growing in the nearest part of the stream are well developed. It is due to the various kinds of seeds which are wandering from the upper part of the valley.

2. Reed Community

Rhizome of the reeds dveloped in the sand soil, and occcasionally the length of the rhizome is about 10m. Rhizome of the reed have the branch stem or hair root at the every node and this branch stem or Hair root intimately contact with the ground. Reeds are the pioneer of riverside plant as well as the willow.

Reeds are not only growing in the dry sand or gravel soil but also resistant for the flood. So when the flood flows, the reeds are never die. Occasionally this plants die but the body of the dead plant gathered sand, muddy soil, the leaves and the other organic substances and they provide a invading point for the other plants in the next year.

Table 2.

| Name of plants | Cover degree | Frequency degree(%) |
|---|---|---|
| *Phragmites prosturatus* MAKINO | 0.8 | 80 |
| *Persicaria Hydropiper* SPACH var. *vulgaris* NAKAI | 0.3 | 60 |
| *Artemisia selengensis* TURCZANINOW *ex* BESSER var. *serratifolia* NAKAI | 0.4 | 40 |
| *Artemisia capillaris* THUNBERG | + | 40 |
| *A. rtemisia feddei* LEVEILLE *et* VANIOT | + | 40 |
| *A. rtemisia asiatica* NAKAI | + | 20 |
| *Viola madshurica* BECKER var. *ciliatata* NAKAI | + | 20 |
| *Thlaspi arvense* LINNAEUS | + | 20 |
| *Stellaria uliginosa* MURRAY | + | 20 |
| *Agropyron semicostatum* NEES | 0.2 | 20 |
| *Salix gracilistyla* MIQUEL | 0.4 | 20 |
| *Ranunclus acris* LINNAEUS form. *vulgaris* MAKINO | + | 10 |
| *Cyperus amuricus Maximowicz* var. *laxus* NAKAI | + | 10 |
| *Zoysia japonica* STEUDEL | + | 10 |
| *Vicia amoenea* FISCHER var. *sackaliensis* FR. SCHMIDT | + | 10 |
| *Dianthus chinensis* LINNAEUS | + | 10 |
| *Stellaria aquatica* SCOPALI | + | 10 |
| *Alopecurus-amurensis* KOMAROV | + | 10 |

Reeds' frequency is not 100%. It is due to the curved creeping rhizome. The comparative small average cover degree of the reed is also due to the scattering of growth. Willows grow in the places where have some moisture and the places of some upheavaled sand soils. The upheavaled soil is due to the stopping of the transport soil from the upper part. Reeds developed well in the dry sandy barren area.

3. RIVER WILLOW COMMUNITY

There are 3 kinds of species in the river willow ; (1), Salix gracilistyla Miquel (2), Salix koreensis Anderson (3), Salix integra Thunb. Especially Salix gracilistyla Miquel grow in the nearest part of the stream and act a great role upon the development of the riversides' plant community. Generally the species of the river willows grow in the curve place of S shape. In this area, the surface layer of soil is mostly constituted gravel but lower layer is constituted with sandy soil which contains much water. This sandy soil form the aggregation of the block, and covered completly the whole ground area. Sometimes the root system of the willow expose and many amount of the soil are carried away at there.

Water level in the underground which the willows grow in the much sand deposited upheaval places is generally low and also contains the small amount of water. It is a peculiarity that the soil in such a area is muddy and contains some organic substances. The herbs also grow in this area of willow community. The name of the herbs are (1), Arundinella hirta Tanaka var. ciliata Koidumi (2), Lespedeza cuneata G. Don (3), Artemisia capillaris Thunberg (4), Vicia amoena Fischer var. sackalinensis Fr. Schmidt.

Some places of the north bank of River HAN where mets River SOUTH HAN and River NORTH HAN. We found the 3 kinds of the largest block association. (1), Salix gracilistyla Miquel-Arundinella hirta Tanaka var. ciliata Koidzumi association (2), Salix gracillstyla Miquel-Artemisia Feddei Leveil' et Vaniot associaton (3), Salix gracilistyla Miqel-Miscanthus sinenis Anderson.

Willows had bloomed in the spring, and then scattered the seed before the flood of July and August. The seed of the willow carried away by the flood to every where and can sprout at there.

If we sow the various kinds of willow on the bank, which is suffered greatly from the flood damage, we can reduce the damage of the flood to banks and keep the stability of bank directly.

We can appreciated the scene of the wiollow community which is growing on the nort bank of area PALDANGRI. The flood takes place in every year, at that time the willow community complatly soaked in the water. But the willow still continued to grow and also the erosion of this area is scarcely compared with anoter place.

Table 3

| Name of plants | Cover degree | Frequency degree(%) |
|---|---|---|
| *Salix gracilistyla* MIQUEL | 42 | 100 |
| *Arundinella hirta* TANAKA var. *ciliata* KOIDEUMI | 0.5 | 60 |
| *Artemisa capillaris* TANAKA | + | 50 |
| *Lespedeza cuneata G.* DON | + | 40 |
| *Phragmites prosturatus* MAKINO | + | 20 |

| | | |
|---|---|---|
| *Chrysanthemum indicum* LINNAEUS | + | 20 |
| *Vicia amoena* FISCHER var. *sachaliensis* FR. SCHMIDT | + | 20 |

4. HERB COMMUNITY

Many herb plants grow on the comfortable zone of the bank and the upheavaled places which is deposited muldy soil. We can also find that Herb community develops on the area of the middle zone.

The kinds of Herb community are differented by the geographic shape, soil matter, or the neighbour plants' community.

The bed of river where met Rivr NORTH HAN and River HAN are constituted with the gravel, but the middle zone of River SOUTH HAN appears gravels but remoting from the stream it appeares only sandy soil.

It seems that the size of the gravel or sand is decided by the power of stream. Large gravel zone in the river bed is generally formed in rapidly gvowng part and oppositely the large area of sand zone deposit the sand soil from the upper part by the flood.

The plants of the Herb community except a few rhizomed plants are generally annuals. This annual plants are germinate from the seed which is transported by the stream in every year. When the flood overflows, such plants are carried away or deposit by the flood. It is a interesting fact that some species of Fabaceae; (1), Lespedeza cuneata G. Don (2), Kummerowia striata Schindler (3), Vicia amoena Fischer var. sachalinensis Fr. Schmidt grows well in the middle zone.

The roots of the Fabaceae plants which have a root tuber is genrally short, so the growth of the roots of them are greatly influenced by the size of the glowing soil (consist of the surface layer of riverside).

These 5 groups (below indicate) are divided by the dominant plant and the soil character of the growing area. We can classify the Herb community 5 groups: (1), Artemisia selengensis Turczaninow ex Besser var. serratifolia Nakai—Persicaria Hydropiper Spach var. vulgaris Nakai community (2), Arundinella hirta Tanaka var. ciliata Koidzumi—Lespedeza cuneata G. Don community (3), Oenothera biensis Seringe-Cassia nomame Honda (4), Artemisia asiatica Nakai—Zoysia japonica Steudel (5), Carex pumila Thunberg—Equisetum arvense Linne var. boreale Ruprecht.

Table 4.

| Name of plants | Cover degree | Frequency degree(%) |
|---|---|---|
| *Artemisia selegeneis* TURCZANINOW *ex* BESSER var. *serratifolia* NAKAI | 2.8 | 100 |
| *Persicaria Hydropiper* SPACH var. *vulgaris* NAKAI | 1.2 | 100 |
| *Aremisia capillaris* THUNBERG | 0.2 | 40 |
| *Agropyron semicostatum* NEES | 0.2 | 20 |
| *Ranunculus acris Linnaeus* form. *vulgaris* MAKINO | + | 20 |
| *Phragmites prosturatus* MAKINO | + | 20 |
| *Stellaria aquatica* SCOPLI | + | 20 |
| *S. uliginosa* MURBEY | + | 20 |
| *Themeda japonica* TANAKA | + | 10 |
| *Capsella Brusa-pastoris* MEDICU var. *triangularis* G UNER | + | 10 |
| *Alopeculus amurensis* KOMAKOV | + | 10 |
| *Daeba memorosa* LINNE | + | 10 |

| | | |
|---|---|---|
| *Potentilla chinensis* SERINGE | + | 10 |
| *Aster ageratoides* TU CZANINOW subsp. *vatus* KITAMURA | + | 10 |
| *Humulus japonicus* SIEBOLD *et* ZUCCARINI | + | 10 |

Table 4 indicates the frequency degree and cover degree of plant community. The plant community was the group of Artemisia selengensis Turczaninow ex Besser var. serratifolia Nakai and the plant were dominant. It is clear that the growth form of Artemisia were very strong and resemble the pure community.

Now, when we survey the cover degree and frequency degree of the herb community in the middle zone area, RUNGNAERI (at there many rivers met). We can get the result as follow.

Table 5.
Arundinella hirta Tanaka var. ciliata Koizumi-Lespdeza cuneata G. Don community.

| Name of plants | over degree | requency degree (%) |
|---|---|---|
| *Arundinella hirta* TANAKA var. *ciliata* KOIDZUMI | 3.6 | 100 |
| *Lespedeza cuneata G.* DON | 0.5 | 100 |
| *Salix gracilistyla* MIQUEL | 0.8 | 80 |
| *Pulsatilla cernua* SPRENGEL | 0.1 | 40 |
| *Vicia amoena* FISCHER var. *sackalinensis* FR. SCHMIDT | + | 20 |
| *Phragmites prosturatus* MAKINO | + | 20 |
| *Artemisia capillaris* THUNBERG | + | 20 |

Table 6.
Oenothera odorata Jacquine-Cassia nomame Honda community.

| Name of plants | Cover degree | Frequency degree (%) |
|---|---|---|
| *Oenothera odorata* JACQUINE | 2.3 | 100 |
| *Cassia nomame* HONDA | 0.8 | 100 |
| *Zoysia japonica* STEUDEL | 1.4 | 80 |
| *Lespedeza cuneata G.* DON | 0.3 | 70 |
| *Artemisia capillaris* THUNBERG | 0.2 | 70 |
| *Sophra angustifolia* SIEBOID *et* ZUCCARINI | + | 60 |
| *Setaria viridis* BEAUVOIS | + | 60 |
| *Agropyron semicostatum* NEES | + | 60 |
| *Artemisia japonica* THUNBERG | + | 60 |
| *Erigeron canadensis* LINNAEUS | + | 40 |
| *Commelina communis* LINNAEUS | + | 40 |

Table 7.
Artemisia asiatica Nakai-Zoysia japonica Thunberg.

| Name of plants | Cover degree | Frequency degree (%) |
|---|---|---|
| *Artemisia asiatica* NAKAI | 3.9 | 100 |
| *Zoysia japonica* STEUDEL | 1.8 | 100 |
| *Cassia nomame* HONDA | 0.2 | 80 |
| *Erigeron canadensis* LINNAEUS | 0.1 | 80 |
| *Festuca ovina* LINNE var. *vulgaris* KOCH | + | 80 |
| *Sophora angustifolia* SIEBOID *ex* ZUCCARINI | + | 80 |
| *Carex pumila* THUNBERG | + | 60 |
| *Eleusine indica* GAERTNER | + | 40 |
| *Metaplexis japonica* MAKINO | + | 40 |

When we survey the cover degree and frequency degree of the plant community, we easily find that the dominant plant is Carex pumila Thunberg, at the same time we can get the result as follow;

Table 8.
Carex pumila Thunberg-Equisetum arvense Linne var. boreale Ruprecht community.

| Name of plants | Cover degree | Frequency degree (%) |
|---|---|---|
| *Carex pumila* THUNBERG | 1.4 | 95 |
| *Equisetum arvense* LINNE var. *boreale* RUPRECHT | 0.5 | 95 |
| *E. palustre* LINNE | 0.5 | 60 |
| *Phragmites prosturatus* MAKINO | 0.5 | 50 |
| *Phacelurus angustifolia* NAKAI | + | 25 |
| *Humulus japonicus* SIEBOLD *et* ZUCCARINI | + | 20 |
| *Artemisia japonica* THUNBERG | + | 20 |
| *Imperata cylindrica* BEAUV var. *Koenigii* LUDAN: *et* SCHULTZ | + | 10 |
| *Eleusine indica* GAERTNER | + | 10 |
| *Salix gracilistyla* MIQHEL | + | 10 |
| *Artemisia selengensis* TURCZANINOW *ex* BESSER var. *serratifolia* NAKAI | + | 10 |
| *Arundinella hirta* TANAKA var. *ciliata* KOIDZUMI | + | 10 |
| *Agropyron semicostatum* NEES | + | 10 |

If we inspect the transformed conditions from the community of the streaming to the community of pine, we can easily recognize that a annual herb plants were growing in the near part of the stream.

On the upheavaled places of sand or gravel which is transported by the flood from the upper part, a community of river willow was growing.

The river willow finally transformed to the pine community via the herb plant community. Above mentiond communities were related to the containing water of the sand soil, but the direct cause of chance of the community formation lies in sudden flood. Accoring the stand point of research of the riversides plant, we had to survey the seasonal succetion in the various part of the topography.

## THE STRUCTURE OF THE RIVERSIDES' PLANT COMMUNITY

According to the stand point of the development of riverside plant the most important factor is the flood. The flood are generally transport or erode great amount of the sand, gravel, and mud. So the floods change not only the chemical nature of the river soil, but also topography of the riverside, and destroy the plant community.

The degree of the damage which influenced by the plant community are correlated with the topographical differences of the growing regions.

The author classified the plant community in the riverside 3 large groups; (1), Comfortable zone (2), Middle zone (3), Uncomfortable zone.

The transformed condition from the uncomfortable zone to the comfortable zone is able to pursuit correlated with the influence of the flood. Uncomfortable zone lies in the nearest part of the stream. When the flood overflows, the plant community are soaked in the water of the river.

The developed plant community are not only influenced with the mechanical agency but also the change of the topography. The small gravel and humus material are carried away. The uncomfortable zone are unadequated area for the growt of plants. In contrarily, the comfortable zone are developed only in the remoted places from the stream part, the comfortable zone are not influenced with the flood, and the plant

community is not destroyed and no change of the topography, those places are good to grow the plants, for they contain humus materials. The middle zone lies between the comfortable zone and the uncomftable zone, and the growing plants are soaked by the severe flood. The plant communities grow in these 3 zones. These zones are developed with correlarely.

There are various kinds of spacies in the riverside plants. We can classify the plants 2 grops (1), tree community (2), herb community. The community generally developed to a belt region. The herb community of the uncomfortable zone transfers to the tree community of the comfortable zone.

Main specicies of the herb community are Phragmites prosturatus, Persicaria Hydropiper, Setaria viridis, Artemisia asiatica, Equisetum arvense, Imperata cylindrica, Arundinella hirta, Oenothera odorata. The main species of the tree community are Pinus densiflora(dominant species), Quercus aliena, Quercus dentata, Rhus japanica.

## SUMMARY

(1) An investigation of the riverside plant community was done in the area YANG-SURI(8km of length), where mets River SOUTH HAN and River NORTH HAN.

(2) All plants communities were largely classified 5 groups, these 5 greups are; (1), Seedling community (2), Reed community (3), River willow community (4), Herb community (5), climax Community.

(3) The herb community are also subdivided into 5 communities. They are; (1), Artemisia selengensis Turczaninow ex Besser var. serratifolia Nakai-Persicaia Hydropiper Spach var. vulgaris Nakai community (2), Arundnella hirta Tanaka var. ciliata Koidzumi -Lespedez cuneata G. Don (3), Oenothera biensis Seringe-Cassia nomame Honda (4), Artemisia asiatica Nakai-Zoysia japonica Steudel (5), Carex pumila Thumberg-Equisetum arvense Linne var. boreale Ruprecht.

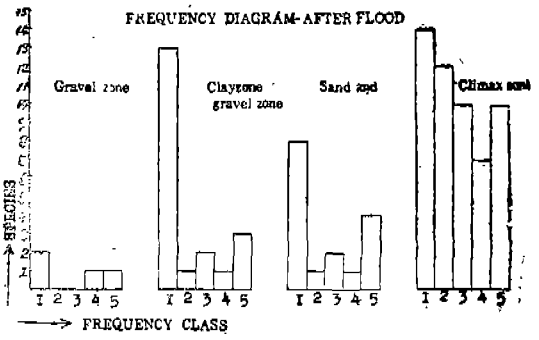
(4) The kinds of riverside plants are generally limited and they are mainly dry plants for example, Poaceae. Fabaceae.

(5) The distributive condition of the riveside plants are influenced by the level of the undergr und water and the nature of the soil. The flora of the riverside looks to have the comfortable character accordingly remote from the stream part.

(6) The flood influenced the development of the riverside plant. The flood divide the developed area the 3 zones. The 3 zones are as follow.

1. Uncomfortable zone.
2. Middle zone.
3. Comfortable zone.

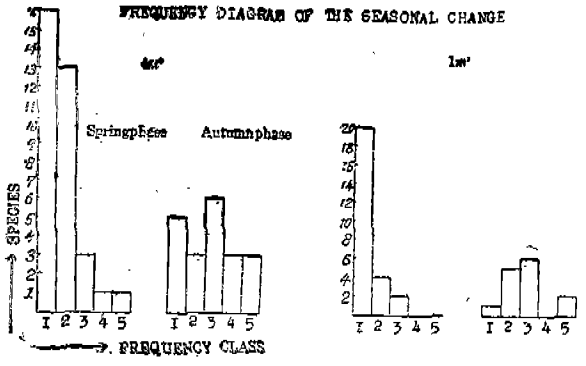
(7) If we made a histgram of vegetation after flood, the plants in the gravel zone appears the different phase and the distributive state of the specices are not equal, so we could not recognize the independent phase. But approaching to the comfortable zone via the middle zone, the

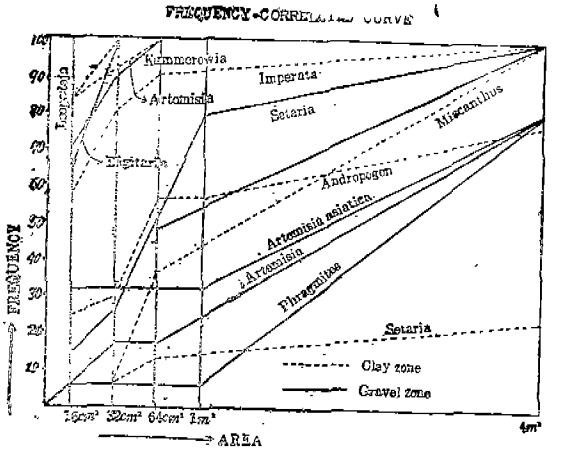


distributive condition are adapted to the law of frequency such as, $N_1 > N_2 > N_3 \geqq N_4 < N_5$,

(8) If we inspected the vegetation of the seasons, expecially bef re and after fl d, we can recognize several differencies between the spring p'ase and the autumn p'ase.

(9) According to the result of the f rmation f frequency degree area c rrelitive curve, the froquency degree of the Poaceae and the Fabaceae were greater than another plants. The frequency degree of Poaceae and Fabaceae indicated over 80% in 16m whic is the small area.




(10) According to the result of the formation of frequency degree diagram, we found that the minimun frequency degree are greater than the maximum frequency degree. It indicated that the invasion of the plant area was comparatively easier. but the competition among the various kinds of plants were severe. In the gravel region of the uncomfortable zone, the competition are more severe than in the middle z ne f the comfortable zone.

CHANGE OF THE FREQDENCY IN SPRING AND AUTUMN

| | 0—20 | 20—40 | 40—60 | 60—80 | 80—100 | Total spcies | Maximmm and minimum frequency species ratio |
|---|---|---|---|---|---|---|---|
| Spring vegetation | 44.4 | 36.1 | 8.3 | 5.5 | 5.5 | 36 | 0.12 |
| Autumn vegetation | 31.8 | 8.0 | 31.8 | 13.0 | 13.0 | 22 | 0·42 |

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## 要 約

1. 1954年 以來 南漢江과 北漢江이 合치는 合流地點인 길이 8*km*에 걸친 兩水里 近處의 植物群落을 調査하였다.

2. 이 地域의 植物群落을 크게 나누워 草本幼苗群落, 달뿌리풀群落, 갯버들群落, 草本群落, 極相木本群落의 5가지로 區分할 수 있다.

3. 草本群落은 다시 (1) 물쑥-명아자여뀌群落, (2) 야고초-비수리群落, (3) 달맞이꽃-차풀

群落, (4) 쑥-잔디群落, (5) 모래사초-쇠비기群落으로 또 區分할 수 있다.

4. 江邊植物의 種類는 大概 限定되어 있으며 大部分이 乾生植物인데 科로 보면 *Poaceae*와 *Fabaceae*가 壓倒的으로 많았다.

5. 江邊植物의 分布狀態는 流水地域을 中心으로 해서 地下水位와 土壤의 影響을 받으며 따라서 그 植物相도 차차 江邊에서 멀어질수록 安定性을 띤다.

6. 江邊植物의 發達에다 큰 影響을 주는 것은 洪水인데 이 洪水를 基準으로 해서 水害의 影響如何로 不安全帶, 中間帶, 安全帶의 3帶로 크게 나눌수가 있다.

7. 水害後의 히스트그람을 作成해 보면 礫地帶는 完全한 異相을 띠고 그 種類의 分布가 고루지 못하며 獨立性을 인정할 수가 없지만 中間帶를 거쳐 安全帶에 이르면 頻度法則인 $N_1>N_2>N_3\geqq N_4<N_5$에 알맞게 된다.

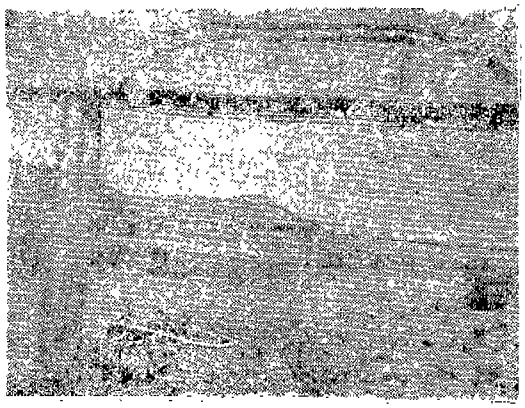
8. 洪水를 中心으로 해서 不完全帶에 있어서의 出水前과 出水後의 季節變化에 따른 頻度圖式을 보면 確實히 다르다는 것을 인정할 수가 있다.

9. 恒存度-面積相關曲線作成의 結果 Poaceae나 Fabaceae의 恒存度는 딴 植物에 比較해서 斷然 크며 16 $dm^2$에 있어서 벌서 80% 이상을 나타내고 있다.

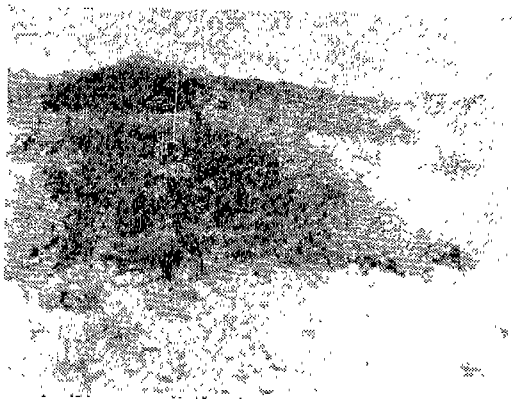
10. 恒存度表에 있어서 最低의 것이 크고 最高의 것이 적은 것은 種類의 侵入이 比較的 容易하며 여러 種類들사이의 競爭이 比較的 激甚하다는 것을 말하는데 江邊植物에 있어서는 不安全帶의 砂礫帶가 딴 中間帶나 安全帶에 比較해서 種類들사이의 競爭이 아주 甚하다.

H ng : Plate

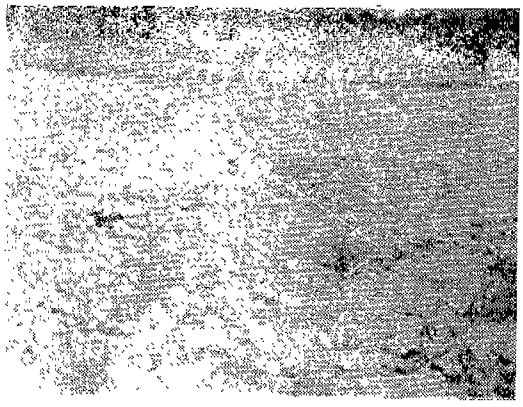
Climax zone and River HAN in the distance (after flood).



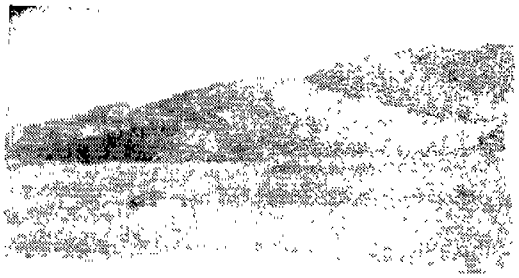
Bridge of River North HAN and the willow community near the stream part.



Block community of the Salix gracilistyla Miq in the uncomfortable zone.



Rhizomes of the reed in the uncomfortable zone.



Carex pumila of the herb community in the uncomfortable zone.

Traces of the flood in the uncomfortable zone.