Oasis soil composition based on high-resolution image and plant landscape design of park

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Abstract
In desert area, the precipitation is less and the evaporation is fast. Groundwater is the main source of oasis development. The balance of oasis environment depends on the rational use of groundwater. Sustainable utilization of water resources and effective irrigation to prevent soil salinization, desertification, and vegetation degradation caused by improper irrigation are directly related to the sustainable development of oasis. In this paper, we take the largest desert oasis as an example. Based on a large number of historical data and high-resolution images, field investigation, sampling, and laboratory analysis were carried out to study the salinization characteristics of oasis soil components. We will analyze the changes of soil salinization and irrigation water quality in the past 50 years of oasis development and provide information about oasis water resources, which will provide scientific basis for management and policy-making and for similar research in other oases. This paper also studies the Wetland Park, which is a combination of environmental benefits, aesthetic value, and social value of the theme park, is an important place for tourism, leisure, entertainment, and popular science education. In the wetland, the beautification of plant landscape directly affects the overall landscape quality of the park. At present, the research on urban wetland plant landscape construction mainly focuses on qualitative suggestions based on subjective evaluation. This study puts forward quantitative suggestions based on the subjective evaluation of establishing relevant system with objective factors as indicators. The research results can provide a theoretical basis for the management of urban wetland park before and after maintenance. In this paper, through the study of high-resolution image, it is applied to oasis soil composition research and park plant landscape design and then to promoting the sustainable development of oasis and plant landscape.

Keywords High-resolution image · Oasis · Soil composition · Plant landscape

Introduction
One of the main causes of land desertification and grassland degradation is soil salinization, which is also an environmental and ecosystem resource problem attracting global attention. At present, the world’s soil salinization area has reached 831 million hm², and the secondary salinization area has reached 4.4 million hm², of which the agricultural soil irrigation area affected by soil salinization and secondary salinization has accounted for about half of the total area (Mokadem et al. 2018). The problem of soil salinization is particularly prominent in desert areas of China. The area of soil salinization is about 36 million hm², which is equivalent to 4.88% of the available area of the country. In addition, the potential saline alkali soil and secondary saline alkali soil also contain 17.3 million hm², of which the six Western provinces and regions account for 69.03% of the total area of the country, the area of agricultural land affected by saline alkali soil is up to 0.2 million hectares. Oasis is also known as “Wozhou.” It is a treasure house of fertile soil with good soil conditions in desert Gobi and an area with active agricultural and industrial development. As a result, most oases have been overfished, which highlights the problem of soil salinization (Morid et al. 2006). Soil degradation and ecological environment deterioration have led to the reduction of agricultural and animal production, the decrease of living income and the aggravation of ethnic conflicts, which has become one of the problems that
have attracted the attention of the whole world. This paper mainly analyzes the characteristics of soil composition and chemical composition of irrigation water using high-resolution image statistical data (Nebi et al. 2020). According to the survey results, the saline soil in the study area accounts for about 80% of the total area, mainly chlorinated saline soil and sulfate soil. The anions and cations in soil irrigation water are mainly sulfate ion, chloride ion, calcium ion, sodium ion, and potassium ion. The chemical properties of irrigation water are closely related to the salt composition of soil (Shahabdar and Eitzinger 2013). Chloride ion, sulfate ion, sodium ion, and potassium ion in irrigation water are the main ions affecting the formation of soil salinization. In addition, in this study, we checked the vegetation of Bay National Wetland Park, adopted the method of field survey, and selected 44 vegetation samples of Bay National Wetland Park according to the travel (Tsakiris and Vangelis 2005). Combining the theory of ecology and Garden Aesthetics, we carried out community survey and data analysis on the plants in the sample area, which mainly included family, genus, species statistics, life form analysis, ecological ecology, and ecological ecology species source analysis, decoration characteristic analysis, and composition analysis at different levels (Salehnia et al. 2017). Based on the data of statistical analysis, the scenic beauty estimation procedure (SBE) method was used to evaluate the beauty of plant landscape in the selected sample plots. According to the score level, different vertical structures and different spatial forms of typical sample plots were compared. According to the analysis results, 13 factors affecting the beauty score were extracted (Quiring 2009).

Materials and methods

Layout of sampling points

Soil sampling In this study, remote sensing images and GPS positioning were used to design and plan the distribution of soil sampling points. The arrangement of sampling points should follow the principle of uniformity, and the nearby borehole should be selected (Tsakiris et al. 2007). The distance between soil samples is about 1.8 km. A total of 197 soil samples were collected in the area, including 44 topsoil samples and 153 samples from 15 typical profiles.

Irrigation water sampling The location of sampling points depend on the location of pumping wells, and the spacing of sampling points should be uniform. The groundwater extracted from oasis well is mainly provided by the second water bearing rock of quaternary system. All the wells are deeper than 100 m, and all the water samples taken are confined water (Wang et al. 2020). A total of 74 groups of water samples were collected about 1.1 km away.

Design of high-resolution image reconstruction algorithm

Image reconstruction includes feature fusion, global residual learning, and upsampling model. The fusion of structural features and texture features can better express the iris image (Wu et al. 2001). Jump connection is a parallel arrangement of features, and the size of features will not change. It can effectively reduce the burden of accurately carrying information in the network and ease the difficulty of network model simulation of nonlinear mapping. In order to reduce the computational complexity, $1 \times$ the convolution kernel of 1 constrains the number of channels. The final extracted feature $F_G$ can be expressed as:

$$ F_G = W_G \left( \left[ F_D, F_D' \right] \right) + F_0 $$

Firstly, the sub-pixel convolution layer adopts the post amplification strategy, which does not introduce error information. Secondly, the sub-pixel convolution layer uses manually fixed convolution kernels but obtains a group of periodically moving convolution kernels through training. These convolution kernels are suitable for the current super-resolution task and can effectively ensure the reconstruction quality. Periodic upsampling (PS) can be expressed as:

$$ 	ext{PS}T_{x,y} = T_{x/y, C \cdot r \cdot \text{mod}(y, r) + C \cdot \text{mod}(x, r) + c} $$

These filters can transform $r \times r$-channel LR function is mapped to $r$-channel hr. The reconstructed high-resolution image ISR can be displayed as follows:

$$ ISR = \text{PS}(F_G) $$

Calculation of oasis soil composition

The hydros 1D model uses Richards’ equation to simulate the movement of bottom water. The Galerkin finite element method is used to discretize the soil profile in space, and the implicit difference scheme is used to discretize the time.

$$ \frac{\partial \theta}{\partial t} = \frac{\partial}{\partial z} \left[ K(h) \left( \frac{\partial h}{\partial z} + 1 \right) \right] $$

The relationship among matrix potential, hydraulic conductivity, and water content of unsaturated soil in Richards equation was solved by equation fitting method, the specific process is as follows:

$$ \theta(h) = \begin{cases} \theta_r + \frac{\theta_s - \theta_r}{1 + |ah|^{m/s}} \theta_r & h < 0 \\ \theta_r & h \geq 0 \end{cases} $$
\[
\begin{align*}
 k(h) &= \begin{cases} 
 K_s S_e^{1/2} & h < 0 \\
 K_s e & h \geq 0 
\end{cases} \\
 S_e &= \frac{\theta - \theta_r}{\theta_s - \theta_r}
\end{align*}
\]

Results

Oasis soil water content and its relationship with plants

One underground water-level observation well is installed inside farmland and shelter forest respectively (Fig. 1). The groundwater level is automatically monitored every 20 min by pressure sensor.

There were significant differences in soil water content between the upper, middle, and lower layers of farmland shelterbelt transect during tree growth (Fig. 2). During the growing period of wheat from May to July 10, due to frequent irrigation, the soil water content of farmland (0–2 m) was higher than that of shelterbelt in the same period and showed periodic fluctuation, but the difference between the upper, middle, and lower layers was obvious. Compared with the shelterbelt, the water content of upper layer soil (0–0.4 m) is the largest and the fluctuation is more obvious, the water content difference of middle layer soil (0.4–1.4 m) is reduced, and the fluctuation is also reduced, and the water content difference of bottom layer soil (1.4–2 m) is the smallest and the fluctuation is also the smallest. From July 11 to July 26, after wheat harvest to before ditch leakage, due to several times of heavy rainfall, the water content of upper soil (0–0.4 m) of farmland and shelterbelt increased significantly, while the water content of middle and lower soil (1.4–2 m) of farmland decreased significantly, while the water content of shelterbelt soil remained basically unchanged. From July 27 to September 30, the ditch began to leak, and the soil water content on both sides of the ditch increased significantly to about 0.4 cm³, indicating almost saturated and showed periodic fluctuation. The range of water content increase of upper soil (0–0.4 m) was about 1.4 m on both sides of the ditch, and that of middle soil (0.4–1.4 m) was about 2.5 m on both sides of the ditch. The increase of subsoil (1.4–2 m) is about 5 m on both sides of the ditch. Except for the soil affected by seepage on both sides of the ditch, the water content of the upper and middle layer soil (0–1.4 m) in the rest farmland and shelterbelt was low and basically unchanged. Due to the influence of the rise of groundwater level, the soil water content in the bottom layer of the shelterbelt increased.

Analysis of salinization components in oasis soil

SO\(_4^{2-}\) (sulfate ion) is one of the main factors of soil salinization, and its content and distribution directly determine the severity and development trend of soil salinization. Figure 3 shows the spatial distribution of SO\(_4^{2-}\) content. In other words, the content of SO\(_4^{2-}\) increases with the flow direction of groundwater. The distribution of SO\(_4^{2-}\) content in the topsoil of the study area covers a wide range. The content of SO\(_4^{2-}\) in the southern and central to eastern parts of the study area was less than 500 mg/kg. SO\(_4^{2-}\) was concentrated in southwest and west saline alkali areas (T2). The content of SO\(_4^{2-}\) is in the range of 1000–2000 mg/kg near T2, but the content of SO\(_4^{2-}\) in the range of 2000 mg/kg is steeper near p6.

Chloride ion is one of the main characteristics of soil salination, and it is also one of the decisive factors determining the trend of soil salinization. Figure 4 shows the spatial interpolation distribution of chloride content in topsoil. The spatial distribution of chloride ions is very similar to that of sulfate ions, and the trading volume of these two regions is increasing. The alkaline salt water area in the southwest of the study area (P6) is the concentrated distribution area with high chloride concentration, the highest content of chloride ion is 10105.3 mg/kg, the lowest concentration of northeast fertilizer field (P11) is 17.7 mg/kg, and the chloride concentration in most soil in the study area is lower than 200 mg/kg.

Figure 5 shows the spatial interpolation distribution of the content of Na\(^+\) + K\(^+\). The spatial distribution of Na\(^+\) + K\(^+\) and Cl\(^-\) in the surface soil is consistent, and the ion content in these

![Fig. 1 Irrigation, rainfall, and groundwater level](image)
two regions increases gradually along the direction of groundwater runoff. Na\(^+\) + K\(^+\) ions range from 6.3 to 9243.6 mg/kg. In all regions, the Na\(^+\) + K\(^+\) content in 80% of soil is less than 100 mg/kg, and the high content of Na\(^+\) + K\(^+\) is mainly near the salt water bottom (T2) in the west and alkaline salt water area (P2) in the southwest.

Calcium ion plays an important role in the formation of soil salinization and is one of the most important chemical components. Figure 6 shows the spatial interpolation distribution of calcium content in the topsoil of the study area. The total variation range of Ca\(^{2+}\) content is 9 – 556.1 mg/kg, and the basic distribution of Ca\(^{2+}\) and Na\(^+\) + K\(^+\) complex ions is similar. Ca\(^{2+}\) content is higher in all areas of the circular island area, which are concentrated in the eastern alkaline saline water area (T2) and the southwestern alkaline saline water area (P6). The distribution range of Ca\(^{2+}\) content is 60 – 500 mg/kg and 50 – 322.6 mg/kg.

Mg\(^{2+}\) content accounts for a small part of the topsoil in the study area, which is relatively low, ranging from 19 to 547 mg/kg. The spatial differential distribution is shown in Fig. 7. The content of Mg\(^{2+}\) gradually increases in the first route, while the content of Mg\(^{2+}\) is lower in the other route, and the content of Mg\(^{2+}\) is usually less than 50 mg/kg. The third route is a zonal concentrated distribution area, which contains a large amount of Mg\(^{2+}\), and the southwest saline alkali land (P6) is still a high-concentration distribution area, ranging from 100 to 547 mg/kg.

Figure 8 shows the spatial interpolation distribution of surface soil salinity, and the spatial distribution of soil salinity is uneven. The high salinity is concentrated in the western saline alkali land (T2) and the southwest saline alkali land (P6), and the salt content is more than 3000 mg/kg. It is a concentrated distribution area with high salinity that distributes around them and spreads out in the form of island. The salinity distribution of T17 route is between 1000 and 2000 mg/kg, which is mainly distributed in saline alkali soil. The rest of the salinity is distributed in non-saline alkali soil below 1000 mg/kg, and the salinity of reservoir is only 680.8 mg/kg, showing a porphyritic distribution.

**Discussion**

**Analysis of plant landscape in different areas**

In order to explore the reasons for the obvious difference of plant landscape beauty, the sample plots with different community vertical structure are analyzed. From the aspects of tree species selection, plant characteristics, ornamental characteristics, and so on, combined with planting methods, line of sight analysis, plane layout, spatial structure, and so on, this paper briefly describes the reasons for the score of plant landscape beauty in each typical sample plot, and extracts the factors affecting the score of SBE (Abbes et al. 2018).

The number of plant communities of this type is the largest in the sample land, and it is distributed in different places. The advantages are that there are abundant plant species, various levels, relatively stable community structure, and higher ornamental and ecological effects than other types. It is necessary to properly configure the level, density, and shape (Bento et al. 2018). The double effect of ecological ornamental is fully
exerted. The landscape of the trees, irrigation, and grass in the sample land is shown in Table 1.

The highest SBE score was in plot 14 and the lowest was in plot 1, with a large difference in evaluation values (Table 1). On the whole, the main factor affecting the tree shrub grass landscape score is not the species richness, but the vitality. The plots with high scores had strong plant vitality, rich vertical layers, many ornamental species, and long viewing period (Besser et al. 2018). The average viability of the plots with low scores was generally low, with more diseases and insect pests. The maintenance of some plots is not enough, and there is little crown pruning work. The tree species of different levels are not harmonious, and the canopy line is incomplete or abrupt. In some plots, the same species were planted in groups, with strong sense of tightness, or chaotic planting patterns, without rhythm and rhythm (Chang et al. 1994).

Although it is an urban wetland park, it emphasizes natural landscape, but it also needs to strengthen the later maintenance management and regular pruning, paying attention to the reasonable space structure and density properly (Dubrovsky et al. 2006).

This type of plant community is mainly set up in the landscape of revetment and garden road, and a small number of nodes or sample plots matched with sketch buildings. In general, grassland occupies a large area and plays a transitional role (Escalante-Sandoval and Nuñez-Garcia 2017). Plant species are less than arbor shrub grass community. It mainly gives people a sense of openness (Hamed et al. 2018). The place of
garden road can increase the sense of ceremony by planting trees and guide the forward extension of vertical vision and horizontal vision. The statistics of arbor grass plant landscape are shown in Table 2.

The plot with the highest score is plot 40 (Table 2). Although the plant species is single, it is better than that of *Metasequoia glyptostroboides* for its obvious seasonal changes, strong ornamental characteristics of branches and leaves, vigorous growth of grass along the terrace, and dotted with red and brown needles of *Metasequoia glyptostroboides* (Jain et al. 2015). The lowest score is plot 34, and the configuration mode is generally single compared with plot 40 (Table 2), but the individual size and vitality are not as strong as *Metasequoia glyptostroboides*. Moreover, the height of *Malus nutans* is too uniform, and the number of *Malus nutans* cannot reach the full extent of the whole field of vision. The height of branching point just blocks the visitors’ field of vision, which can only give people a sense of partial occlusion. On the whole, the plots with high scores had luxuriant plant growth, clean community structure, and clear hierarchy. Most of the planting methods are mixed planting and pay attention to the level of convergence between the various categories (Keyantash and Dracup 2002). Therefore, in the plant landscape configuration of arbor grass community, we can choose tall ornamental tree species and match with neat lawn grass to create artistic conception and ritual sense. One can
also choose to plant 2–3 different trees with different heights, but paying attention to the beauty of the canopy line, and match with the lawn grass which is easy to maintain.

The popularity of grassland plant landscape is very high in the hearts of the public, especially the large lawn with wide vision and spacious area. According to the statistics of grassland plant landscape, the SBE values are quite different (Table 3).

Plant landscape analysis of different vertical structure types

In addition to the irreplaceable ecological and ornamental functions, the plant landscape of urban wetland park can also form space independently or combined with other garden elements. This section compares the SBE values of all kinds of space types to reflect people’s love for all kinds of space forms and provides a reference for the subsequent design of plant landscape at the spatial level (Kostopoulou and Karatassiou 2017).

The semi-open space-type landscape includes two forms: one side enclosed space and the space with sparse plant planting and no influence on the line of sight.

Plot 14 is the most popular plot. It is located in the south of entrance of gate 3 in area A. It is a single side open plant landscape and an important node plant landscape. The plant configuration pattern is: Salix psammophila + Ginkgo biloba + Koelreuteria - osmanthus + Pittosporum + Ligustrum...
lucidum - Chrysanthemum chrysanthemi + Echinacea + Trifolium repens. The flower beds are piled up with warm stones to create a simple style. The front side is decorated with golden chrysanthemum, the middle layer is planted with golden willow with green leaves, and the back layer is decorated with tall Koelreuteria and ginkgo. The overall color is harmonious, there are many color leaf trees, and autumn is the best viewing season.

However, plot 20 got the lowest score and was located beside the garden road. The main plant was Malus pendula, which was planted in pieces. The height was too uniform, and the number was not enough to cover the whole field of vision (Li et al. 2014). The height of branching point just blocked the visitors’ field of vision, giving them a sense of partial occlusion.

Through the comparison of 22 sample plots, it is found that the open plant space is more popular than the sparse plant space. The pattern of planting 1–2 kinds of medium and small trees with colored leaves in the upper layer, using flowers and shrubs to connect in the middle layer and using lawn grass such as terrace grass as the base in the lower layer with flowers and herbs such as Trifolium repens block or strip is more popular with the public. This configuration mode has clear structure, rich plant species, and strong overall sense of space, which can be used as a template for plant landscape matching in semi-open space.
In the open space-type sample plots, the plant landscape is basically grassland type, which is often set on the slope land with large elevation difference near the lake, the garden road, or buildings near the lake viewing area and leisure area. These areas have the largest number of people and stay for a long time. The number of trees on the lawn is only ornament, the coverage is low, and some plots even have no trees.

Plot 42 is the highest scoring plot, which is located in the slope near the lake on the north side of egret in area B. The main plants are *Aesculus angustifolia* + bermudagrass + *Trifolium repens*. *Aesculus angustifolia* has a long flowering period, bright color, and high ornamental value. In a corner near the lake outside the sample plot, reed and *Salix matsudana* are planted to divide the space. The second is plot 8, which is located at the south end of Sishiqiao in the southeast corner of area A (Li et al. 2017). The main plant configuration is as follows: awn + *Trifolium repens* + bermudagrass, awn shape is beautiful and light, with the scenery stone and rest pavilion as the background, with unique flavor, and irregular block distribution of *Trifolium repens* adds fun, breaking the monotonous feeling of flat grassland. Therefore, we can find that *Trifolium repens* + bermudagrass is very common in the grass layer configuration in the park, and the score is generally high. One is that the two plants grow fast, but they are not too messy and need no special treatment, so they can present a natural landscape. Second, because large lawn can
attract people to sit and rest, with 1–2 kinds of herbaceous
plants with long flowering season or light shape, the viewing
effect is better.

No. 22 plot had the lowest score, which was located beside
the garden road. The roadside trees were *Cinnamomum
*camphora *, and the upper space in the green space was mainly
*Gleditsia sinensis*. In autumn and winter, the zonal pods
would fall, and the branches were disorderly, which affected
the beauty. Part of the inner part of the awn was cut off,
causing desolation and affecting the overall score.

On this basis, we can get the following popular plant con-
figureation mode of open space: 1–2 kinds of flower herbs or
light ornamental grass + low lawn grass, leaving enough spa-
cious activity space for visitors. A small number of tall trees
and small trees can be planted in some gentle plots with small
slope, which can provide shade conditions in summer, which
is conducive to creating a beautiful canopy line and leaving
sufficient viewing space.

There are only two sample plots in the park, and the aver-
age score is the highest among all types. The branches of arbor
species are high and the crown width is large. The dense
branches and leaves of *Cinnamomum camphora* and
*Cinnamomum camphora* interweave. With the sunlight, the
shadow mottled undergrowth space is formed. There was little
difference between the two plots.

The number of plot 13 was relatively high, and the config-
uration mode was *Bauhinia* + *Salix matsudana* + cherry blos-
sem - asparagus + *Ophiopogon japonicus* + *Acorus calamus*.
**Bauhinia** is a main ornamental plant in this plot because of its scattered and dense tree shape, good growth and flowering in autumn and winter. Close to egret stream, there are asparagus for shelter. As the photo was taken in autumn, most of the leaves of *Salix matsudana* dropped and the top coverage was reduced. However, it can be seen that the branches on both sides of the road intersected, providing shade space in spring and summer.

The allocation mode of plot 6 was elm + *Cinnamomum camphora* + Podocarpus arvensis + Pushu + *Lagerstroemia indica* - *Echinacea* + *Setaria* + *Trifolium* + *Iris* + *Myriophyllum*. Especially in spring, summer and autumn, and winter, with the withering of elm and park leaves, the space under the forest becomes bright. The seasonal variation of the whole plot is obvious, and the ornamental value is the highest in autumn.

### Table 1 Plant configuration model of arbor shrub grass plot

| Sample number | Score | Configuration mode |
|---------------|-------|--------------------|
| 14            | 8.130 | Golden fragrant willow + *Ginkgo biloba* + Luanshu-Osmanthus fragrans + *Pittosporum vulgar* + *Ligustrum lucidum-Rudbeckia* |
| 20            | 7.685 | Jacaranda + wood hibiscus one sprinkle golden coral + octagonal golden plate and one clover + scallion blue + mother-in-law + along the step grass |
| 17            | 7.528 | Big-leaf *Ligustrum* + dry willow + Maple-*Pittosporum vulgar* + *Safflower* wood-arugula + Miscanthus |
| 27            | 7.398 | Golden jade bamboo + *Luan* tree + *Cinnamomum camphora* + *Ligustrum lucidum* + safflower wood + *Monstera* and horseshoe gold |
| 35            | 7.333 | Jacaranda + yellow *Pueraria lobata*, palm bamboo and clover + *bermudagrass* base grass |
| 28            | 7.287 | Jacaranda + hackberry + smile + ginkgo + dry willow with golden feu + hairy *Rhododendron*-bermudagrass + mother-in-law |
| 26            | 7.241 | *Hibiscus arborescens* + chicken claws + hackberry + broad magnolia + ginkgo-nan sky bamboo-kidney fern + *bermudagrass* + *horseshoe gold* |
| 23            | 7.194 | Ginkgo-schefflera-reed bamboo + warbler tail + false trifolium grass |
| 7             | 7.167 | Neem + chicken feet, safflower wood, reed bamboo + *Calamus* + *wood sorrel* |
| 4             | 6.759 | Honey locust + cedar palm sunflower + palm bamboo + *Ligustrum lucidum-kidney fern* + step grass |
| 38            | 6.722 | Jacaranda + dry willow and umbrella *Rhododendron repetitius* + white *Trifolium* + *Iris* + *Myriophyllum* |
| 15            | 6.672 | Ginkgo + dry willow and *Setasporus vulgaris* + *Ligustrum lucidum* + ten major merit + *safflower* wood-reef step grass + *Iris* |

### Table 2 Plant configuration model of arbor grass plot

| Sample number | Score | Configuration mode |
|---------------|-------|--------------------|
| 40            | 7.426 | *Metasequoia glyptostroboides* |
| 32            | 7.287 | *Lagerstroemia* + pomegranate-canna + yellow crane vegetable + *bermudagrass* + *Selaginella* |
| 37            | 7.287 | Purple leaf plum + ginkgo-*Ophiopogon japonicus* + base grass + white clover + *coriander* |
| 13            | 7.259 | *Bauhinia* + dry willow + cherry blossoms-reeds + step grass + *calamus* |
| 6             | 7.024 | *Elm* + *Cinnamomum camphora* + *Podocarpus* + *hackberry* + *Lagerstroemia sylvestris* + *Setaria* + *Trifolium* |
| 10            | 6.824 | *Luan* tree + camphor-white clover |
| 18            | 6.787 | *Osmanthus fragrans-sorrel* + white clover |
| 25            | 6.759 | *Cinnamomum camphora* + chicken feet and *wood sorrel* + white clover |
| 3             | 6.722 | *Cinnamomum camphora* + *Luan* tree + elm tree + *Podocarpus-Ophiopogon japonicus* + *wood sorrel* |
| 12            | 6.704 | Jacaranda-white clover + *bermudagrass* |
| 33            | 6.509 | Hackberry + octagonal maple + begonia-canna + *bermudagrass* |
| 24            | 6.380 | *Robinia pseudoacacia*-white clover + *wood sorrel* |
The covering space type itself has a strong sense of security and privacy, and the space is sheltered without excessive depression. In the garden road, the appropriate increase of use, with seats and sketches, and other facilities can greatly improve the visitors’ stay time. In the selection of plant species, the tree species with high branch point, broad and beautiful crown, and luxuriant branches and leaves should be used. The average score of this spatial plant landscape is the lowest among all types. In the whole B Bay Urban Wetland Park, it basically appears on both sides of the garden road or path.

Plot No. 40 with the highest score in the vertical space is located in the North Bank of Bailu Lake in area B, and the configuration mode is *Metasequoia glyptostroboides* *Ophiopogon japonicus*. The plant species is single, but it is better than the uniform texture and depth created by the tall *Metasequoia glyptostroboides* planted on the small slope. From the other side, it is also very beautiful. In autumn and winter, the leaf color of *Metasequoia glyptostroboides* is red and brown, which is very beautiful. At this time, some branches and leaves fall off, revealing the looming lake scenery, adding ornamental, making tourists curious about the rear landscape, and then guiding tourists to step into the next section of the garden road to explore the lake color. However, plot 2 had the lowest score, and the configuration mode was *Ginkgo biloba Trifolium + Oxalis Carthami*. The planting method was irregular piece planting. It is worth mentioning that the combination of *Trifolium repens* L. and *Oxalis Carthami* L. grows well, and the effect is regular but not rigid.

Optimization of plant landscape design in the park

Vitality refers to the survival ability of plants, that is, the health status of trees, which is used to reflect the competitiveness, growth rate, development trend, and environmental adaptability of plants.

### Table 3 Plant allocation model of grassland plot

| Sample number | Score  | Configuration mode                                      |
|---------------|--------|--------------------------------------------------------|
| 42            | 7.880  | Qiuying + bermuda + white clover                       |
| 8             | 7.750  | *Miscanthus + Pennisetum + Trifolium*                  |
| 41            | 6.796  | Reed + *Acorus + Myriophyllum*                         |
| 9             | 6.639  | *Miscanthus + Trifolium + zoysiagrass*                 |
| 5             | 6.222  | Zaili flower + fragrant grass + *Polygonum*            |

### Table 4 Methods of creating artistic conception

| Build aspect | Technique | Main building method                                                      |
|--------------|-----------|---------------------------------------------------------------------------|
| “Shape”      | “See the big from the small” | Imitate the beautiful scenery of nature                                  |
| “Color”      | “Individual beauty”           | Utilize ancient woods to show the beauty of individual plants            |
|              | “Group beauty”                | Plant different forms of plants to show different characteristics; sparse planting expresses comfortable and cozy design feelings; dense planting can express different design themes |
|              | “The environment changes with the color” | Different colors express different emotional characteristics. The cold and warm colors of the elements in the plant landscape can be used to compare |
| “Fragrant”   | “Smell beauty”                | With the help of aromatic plants such as sweet-scented osmanthus, mirin, plum blossom, etc., to bring the experience of dark fragrance floating, it can distinguish “strong fragrance” and “light fragrance,” and some plant scents can relieve fatigue |
| “Shadow”     | “Sun moon light and shadow”     | Use natural light to create a contrast between bright and dark landscapes, and use changes in light and dark to reflect the overall mood. Process light and color changes to create a fuzzy feeling. For example, plants such as bamboo and plums can be planted on white walls. The contrast between black and white reflects the poetic and painting beauty of the shadow components |
|              | “Underwater shadow”            | With the help of underwater plant reflections and coastal landscape elements, the combination of virtual and real creates a unique atmosphere. For example, tall metasequoias, cedar trees, and other plants are planted on the edge of a wetland lake as opposed to straight water. |
According to the colocation relationship with various natural elements of plants or other local landscape elements, the artistic concept of plant landscape has a specific meaning through the law of landscape aesthetics, creating a connotative humanistic environment.

According to Gao Zehui’s (2019) three steps to create the artistic conception of plant landscape, the construction of plant landscape artistic conception of Urban Wetland Park is divided into three stages:

1. “View”—bring good visual experience to visitors
2. “Product”—developing the way of thinking of tourists
3. “Understanding”—let visitors get emotional experience from life but higher than life

The methods of creating artistic conception are summarized from the four aspects of “shape,” “color,” “fragrance,” and “shadow” (Table 4).

Conclusion

Through field investigation, data collection, sampling, and laboratory analysis, this study analyzed the soil salinization and irrigation water quality in Y area, analyzed the temporal and spatial changes of soil salinity and irrigation water quality, and determined and checked the relationship between soil salinity accumulation and irrigation water quality in typical soil profiles. It shows the relationship between irrigation water quality and soil salinization and its influence degree. According to the relevant theoretical research on urban wetland and vegetation landscape, the urban wetland in Byssay is studied. The park will be investigated on the spot. According to the investigation route, 44 plant communities are selected for research. The general situation of sample plots and the composition of community plants are recorded in the process of investigation, making plans and taking photos of the scene.

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Declarations

Conflict of interest

The author declares no competing interests.

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