

Interaction between nature protection and leisure groups, an example of the largest protected area surrounding Lake Greifensee, canton Zurich, Switzerland

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Abstract: Lake Greifensee is surrounded by the most continuous environmental protection area (sanctuary) within the canton Zurich (Switzerland). The lake shelters many national swamps and other biotopes in distress. On beautiful summer days, however, you will find thousands of people spending their leisure time e.g., on mountain bikes, roller skates or swimming.

In 1994 a new protection regulation became effective, which allows for intensive utilization and protection of the nature and separates diverse demands. With various measures sanctuaries and recreation areas are spatially separated, and the visitors are guided to keep them off the sanctuaries. During the entire year rangers inform visitors on the possibilities of nature observation, explain them where the recreation areas are located and remind them to keep off the sanctuaries. The number of violations such as trespassing of protected shores and sanctuaries continuously dropped thanks to the effective publicity and the presence of rangers. As a consequence, the vegetation is visibly recovering from the burden of trespassing. To further increase the awareness of the sanctuaries, it is, therefore, important that the rangers continue to regularly supervise the protected and recreational area and to inform and guide the visitors.

Introduction

Most habitat conservation efforts typically focused on setting aside lands as parks or reserves, and restricting uses in those areas. More recently, it has become clear that protection of lands is insufficient; we must also heal and restore areas that have been damaged by human use and misuse (Upper Newport Bay Program 2004). Different programs, mainly in the United States with its vast countryside, are working to enlist community support for habitat restoration by engaging the public in hands-on restoration work and teaching them why this work is important. The programs collaborate with local organizations working in ecology, education, and conservation, and provide the leadership, planning, and funding to help connect volunteers and neighborhood groups with the affected ecosystem. In Europe, the different programs and organizations which are responsible for sanctuaries are not yet engaging the public in hands-on restoration work or neighborhood groups. In addition, the national parks and sanctuaries are much smaller, the environmental protection areas need to be protected and conserved as an important part of the national heritage, but at the same time they need to satisfy the demands of the population: intensive utilization for leisure and recreation.

The sanctuary Schliffkopf in the northern Black Forest, Germany, for example, was used to work out a concept to guide and sensitize the visitors. Schlund

(1998), head of the centre of nature conservation Ruhestein, stated that the rangers realized that (1) the closure of a footpath is only accepted if there is information on the spot, and if other interesting alternatives are given. (2) The softly guided footpaths should not represent restrictions but rather enlargements or ameliorations of the recreation areas. (3) A constant presence of rangers and tours increase the awareness of the visitors. Similar results are documented in a study by Grabher (1995): The visitors should be lead to interesting areas with species which are not sensitive to disturbance. Whereas other areas should be kept free of any disturbance (separation of utilization and protection). Further, they realized that effective publicity is important to increase the understanding of the visitors for necessary measures.

The Greifensee district knows similar problems and the most beautiful areas are the sanctuaries. There is no doubt that the peaceful inlets in the swamps with the sandy shores or reeds at Lake Greifensee are the most ideal locations to relax. But to maintain the Greifensee district as recreation area nearby the city of Zurich, restrictions are necessary for everybody. If everyone was allowed to camp, make a fire or go swimming wherever they wanted to, then the damage would be much bigger than everybody's advantage. The aim of this research is to study how to best combine environmental protection and recreation areas at Lake Greifensee close to a densely populated district.

Setting

Lake Greifensee is located southeast of Zurich, Switzerland, and measures 6.5 km in length and 1.8 km in width. The Greifensee district, which is in the surroundings of Lake Greifensee, covers an area of 12.6 km² (Figure 1). Originally, the lake was formed at about 12,000 B.C., when the Rhine-Linth glacier retreated. In those days, the lake level was 20 m higher than today. The end moraine defined the lake, which was several times bigger. Due to the erosion at the outflow of the end moraine, the lake level dropped.

Around 1890 the river Glatt, which is the outflow of Lake Greifensee, was straightened and the lake level was artificially lowered to the actual level. The lake filled up by sedimentation and swamps originated. The entire district developed to a precious area for agriculture and biology. It shelters many birds, which use the district as a wintering, resting, food, and brood area. But the Greifensee district also offers habitat for amphibious animals, dragonflies, other insects, and various kinds of fish. The reed belt, which typically grows in flat-water, is only a couple meters wide. To stimulate its growth, the shores are artificially restored with an ecological engineering method. In the adjacent reeds and swamps, 300 different plants are growing, which are threatened to become extinct.

Origin of protection regulation

The Greifensee region district shelters about 300 different plants. Several of these and about ten times more animals are threatened to become extinct. The Greifensee district contains moorlands of national importance. It is also a place for several birds to breed, to pass while migrating, and in winter to shelter and feed. Furthermore it is a very important recreation area for the people. As the population

growth has increased from about 20,000 inhabitants in 1950 to 68,000 in 2003, a protection of the area has become very important.

The first protection agreement was already signed in 1929 between a bird protection organization and land owners at the lower end of the lake (Schwerzenbacher Riet). Only two years later, the agreement was enlarged by incorporating adjacent reed areas (Fälländer Riet). In 1935 an organization was founded to protect Lake Greifensee. Involved were representatives of different clubs such as fishers, sailors, windsurfers, and nature protection organizations. In a far-seeing action, a protection regulation was released in 1941. Thanks to this regulation, the shores are hardly obstructed. Visitors can hike around Lake Greifensee on a path near the shore and enjoy the beautiful view over the lake and the panorama of the Alps. Motor-boats were prohibited with the exception of one shipping line, the marine police, the marine rescue service, and a professional fishermen. In 1983, the canton Zurich worked out a draft for a new protection regulation, which was limited to the protection of nature and lake. The communities turned the draft down, because the recreational use was not taken into consideration. The communities around Lake Greifensee, which were played off against each other by the canton, joined to a working group. In 1988, they worked out a rough draft of utilization and protection to be used as a constructive basis for a new and complete protection regulation. The regulation incorporated the new recreational demands and the protection of landscape.

In June 1992, nature and lake protection zones were determined based on the inventory for swamps of national importance and based on the ornithological opinion of the bird protection of Zurich (1992). There it says that birds during breeding time and birds traveling through or passing the winter require the same areas. They especially want the big swamps



Figure 1. Protection regulation around Lake Greifensee. Darkly scored: Protection area, brightly scored: recreation areas. The protection area is surrounded by the dashed line.

with the bordering shores at the upper and lower lake end and between Uster and Greifensee at the northern lake side. In January 1994, the communities handed the draft of the protection regulation of Lake Greifensee over to the construction management. And only three months later, on March 3rd, 1994, the regulation was released. The entire district underlying the protection regulation now contains 12,6 km², of it the sanctuaries measure 2 km², the recreational areas 0.278 km². The regulation further contains for example forest, orchard, and landscape protection as well as settlement borderland. Sanctuaries in Switzerland are rather small. The reason being that Switzerland itself is pretty small, it is about eight times smaller than Finland (41,285 km²; Finland 337,030 km²) but counts 10 times more inhabitants/km² (176 versus 17.1). Consequently, only small sanctuaries can be established and small actions are taken for protection.

Methods of protection

1. Basis for the protection of the Greifensee district: In 1997, the Greifensee foundation was founded to realize the regulation to protect Lake Greifensee in collaboration with the office of regional planning and nature of the canton Zurich. The foundation board is made up of executive members of the seven communities bordering Lake Greifensee. The purpose of the foundation is the publicity (e.g., information, guided tours, courses, contact to regional groups of nature protection and recreation), the organization and realization of projects to revalue the sanctuaries and recreation areas. The separation of protection and utilization must always be kept in mind to minimize conflicts. The office of nature protection is responsible for all sovereign duties such as to grant permission and to organize or pay maintenance work.

2. Marking of sanctuaries: The sanctuaries at Lake Greifensee are to be kept off. To clearly define, where sanctuaries are located and what is allowed, they are marked with notice boards and special colophons – which are used in the entire country. At Lake Greifensee the idea of separating recreation and protection area is strictly followed. In revalued areas, the paths are displaced as far away as possible from the sanctuary and restricted with specially planted barriers such as hedges and ditches.

3. In Switzerland, the supervision of rangers is arranged individually by each canton. Some cantons have no supervision at all. Others have honorary collaborators, part-time collaborators as at Lake Greifensee, or fulltime supervisors with police authorizations. The rangers at Lake Greifensee are instructed on the subject and trained in communication, but they do not have the function of the police and do not take a solemn oath. Hence, they are not allowed to issue a fine, to stop visitors, and the visitors do not need to name personal data. Repeated violations, however, are reported and forwarded to

the police. In such case, the stay in the sanctuary with a dog and a fishing rod can be penalized with up to 200 Euros.

Two rangers are usually working together riding their bikes around the lake and controlling the protected areas. They register all infringements such as entering a protected area, or fishing in a protected area. All infringements are catalogued and analyzed. A second group of rangers called “service rangers” are supporting the rangers in all technical works: They are building fences, replacing destroyed information panels etc. Nevertheless, the most important job of the rangers is to inform visitors without stirring up aggressions against nature protection but asking for some understanding.

At Lake Greifensee, seven rangers are sharing a full-time job: (1) they inform visitors of the extent of the sanctuary, of biologic aspects, of possibilities to observe nature and wild life, and to show them the closest recreation area. (2) They control whether visitors enter sanctuaries, and if so, they remind them to keep off. (3) They control barriers and notice boards. Since summer 1995, the rangers of Lake Greifensee are supervising the sanctuary on weekends, on holidays, and once or twice during the week. Rangers control all protected areas, shown here are three areas: Storen/Platten, Uessikerdelta and Aabachdelta (Figure 2).

4. Maintenance work is restricted and only allowed at certain times. Without maintenance work, the swamps and other shore areas will very soon be supplanted by bushes and trees. Especially alders and willows are quickly taking over the reeds. The farmers mow the reeds every autumn in September or October and remove the bed of straw to reduce the enrichment of nutrients. The reed vegetation is adapted to low nutrients. If farmers remove the bed of straw in spring, then 2/3 of the biomass is already decomposed. An increase of nutrients would automatically lead to a change in vegetation – adapted to more nutrients.

The young trees are pulled out with the roots and removed in tiresome handwork, (1) to prevent the reeds from being supplanted by bushes, (2) to only remove the undesirable plants without doing a lot of damage to the existing vegetation, and (3) to ensure the growth of closed reed vegetation. To diminish the areas with a lot of bushes, the following two measures were verified: (1) to cover the bushes with a canvas cover. The vegetation under the cover burns off and is dying. (2) To mill cut the bushes, whereas the roots are cut subsurface. The undesirable vegetation can then be eradicated and removed.

5. The data taken by the rangers are statistically analyzed using the Kruskal Wallis Test.

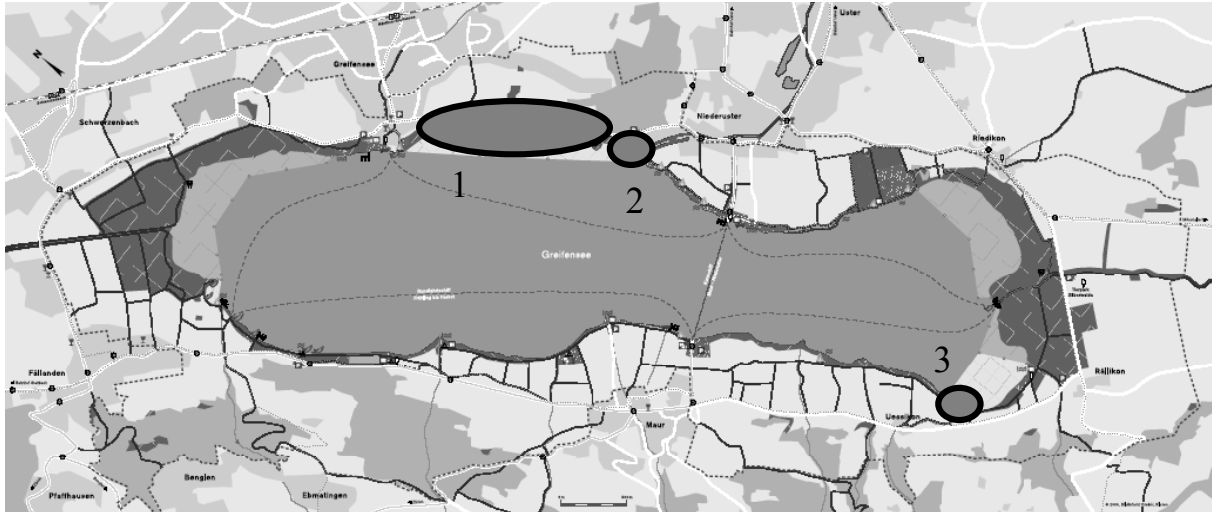


Figure 2. Locations of three sanctuaries controlled by the rangers: 1 = Storen/Platten, 2 = Aabachdelta, 3 = Uessikerdelta. The areas 1 and 3 are closed since the introduction of the protection regulation. Consequently, the infringements decreased, as expected. The Aabachdelta (2), however, is only closed since 2002. Unfortunately, people first have to get used to the new regulation before a decrease in infringement can be expected.

Data and results

Potential for conflict and collaboration with interested parties

The protection regulation is fundamental for the utilization and conservation of the Greifensee district. Considering the intense utilization, the district rather represents a leisure park than a sanctuary, and, therefore, is a hotbed for conflicts.

On a sunny day, thousands of people from the vicinity spend their leisure time at Lake Greifensee. 75 % of the visitors arriving by car are living within 10 km. They are coming for a walk, to observe nature and enjoy the fresh air, to sail, to wind surf, to fish, to go swimming, to gill, to play, to sun bath, to bike, to skate, to hike, and to stroll about. Most people are riding some kind of bicycle and there are only few pedestrians (Table 1). Pedestrians especially group around those places on the lake side with the availability of car parking and buses, such as Niederuster, Greifensee and Maur (Figure 3) The visitors are either coming alone, with kids, with their family, in groups, or with their dog. They are looking for

silence, rest, relaxation, entertainment, fun, adventure. There are so many visitors expecting so many different things, that sooner or later they are complaining about each other: pedestrians, bikers, cyclists, joggers, dog owners, young people, old people, skaters, fishers, swimmers, people observing nature, rangers. Everybody wants to satisfy his demands. Everybody has the right to do so. But there is not enough room available, unless one shows consideration for others.

The Greifensee foundation regularly organizes meetings with nature protection and leisure organizations. The meetings are used to inform the participants on actual topics such as measures of reevaluation (in favor of the nature or the recreation). The meetings involve lectures, answering the questions of the participants, listening to their comments and critiques, and talking about their fears and doubts. That way both sides have confidence in each other. Further, the foundation annually invites cultivators of restored areas and informs them on the spot on special animals or plants occurring in the area. The cultivators also have the opportunity to discuss

Table 1. Different types of slow traffic (not motorized) using the Greifensee district (destinations in Fällanden, Riedikon, Greifensee and Uster) on Sundays and Wednesdays. The numbers represent the average counts per hour of eight locations (mobility concept leisure transport Greifensee, Gossweiler engineers, 10.11.2003).

	Sunday, average of 8 locations	Wednesday, average of 6 locations
Pedestrians (people going for a walk, in wheel chairs, babies in a stroller etc.)	28	24
Other vehicles (inline-skates, roller-skates, mini scooters, kickboards, kids' bikes, skate boards etc.)	89	85
Cyclists (e.g., mountain bikes, racing bikes)	179	174
Total	296	283

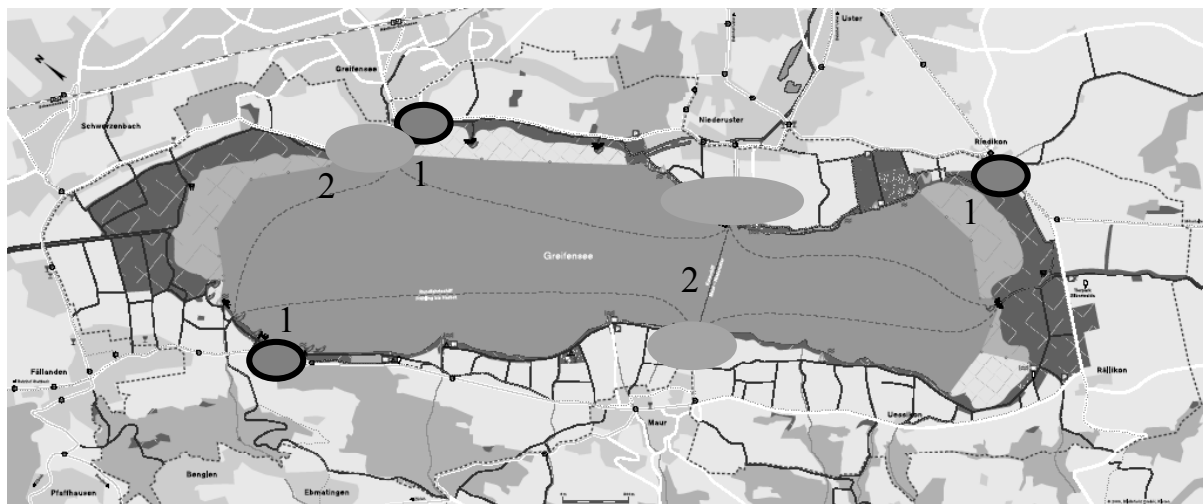


Figure 3. The counting of the slow, not motorized traffic (cyclists and other vehicles) took place at three destinations (black circles). Pedestrians usual group at Greifensee, Uster and Maur at the lake sides (lighter circles).

uncertainties or how to optimize the cultivation, e.g. time to mow, or tract of fallow. Such collaboration motivates the cultivators to follow the guidelines of the canton in favor of the nature. In addition, all cultivators of the Greifensee district are annually invited to be informed on the maintenance and discuss them. Another important part of the publicity involves excursions with classes, companies, and organizations but it also involves maintenance work. The participants of maintenance work are informed on the necessity of maintenance and protection. And because they get to know the areas, which are usually restricted, they are becoming fond of the sanctuaries and protect them.

Marking of sanctuaries and examples of successfully guiding visitors

At the beginning, when the protection regulations were introduced in 1994, the sanctuaries were restricted with fences. This restrictive method led to strong resistance and damage on the infrastructure. Since the visitors are softly guided using other footpaths and restrictions with natural barriers (such as hedges and ditches), the damage has strongly reduced. There are no numbers to document the amount of damage done, but the financial effort to repair the damage strongly reduced (about 30,000 € in 1994 versus about 5,000 € in 2003).

Before the introduction of the protection regulation, the area Storen/Platten (Greifensee) was intensively used as bathing resort. Today the footpaths are generally limited with piles of wood, so that the visitors cannot get into the area. Consequently, the infringements are declining since 1999 (Table 2). Except in 2003, there is an increase of people sunbathing, which can be explained by the very hot summer. For all analyzed datas there is N 1999= 416, N 2000=1118, N 2001= 1391, N 2002= 1196, N 2003= 1339.

The Uessikerdelta (Maur) used to be a camping place. It was closed 10 years ago in 1994 when the protection regulation was introduced. From then on, the area was restricted with a hedge against the footpath to keep people off. Unfortunately, such changes always need a couple years until they are respected by the majority of the visitors. Nevertheless, the infringements are declining (Table 3). The strong increase in 2003 is again related to the hot summer. Since the Uessikerdelta is a romantic, small and well shielded bay, it was used for sunbathing and swimming.

The first project of the Greifensee foundation helped to revalue 1 km² of rich meadow (field) to reed-lands. Additional shallow ponds and an abandoned course of a river were set up. During the restoration, the footpath was placed back and a bridge was displaced to create a better connected and

Table 2. Amount of infringements at Storen/Platten per 50 control days listed in the years 1999 to 2003.
¹⁾d: infringements are decreasing.

Storen/Platten	1999	2000	2001	2002	2003	P
Entering sanctuary	35	45	31	36	31	<= 0.05 d ¹⁾
Offence with dog	8	13	13	5	2	<= 0.05 d
Fishing in sanctuary	8	2	2	1	1	<= 0.05 d
Swimming/sunbathing	12	30	14	16	18	Not sign.

Table 3. Amount of infringements at Uessikerdelta per 50 control days listed in the years 1999 to 2003.

Uessikerdelta	1999	2000	2001	2002	2003	P
Entering sanctuary	33	21	10	8	17	<= 0.05 d
Offence with dog	5	5	3	3	3	<= 0.001 d
Swimming/sunbathing	9	14	6	4	13	<= 0.1

undisturbed area. A special attraction represents the observation tower with its magnificent view over the lake (Figure 4) and the restored area, where different birds can be observed such as wading birds or migrants.

At many locations, the shores are being eroded due to the missing reed belts. Using ecologic constructions it is possible to fill up the shorelines and, hence, to create flat-water areas, but also to stimulate the growth of reed and cane brake. From then on, these shorelines are closed for visitors. Instead, additional inlets are arranged, which are separated from the protected areas by osier stakes.

At the mouth of the stream Aabach (Niederuster), for example, the shoreline was restored in 2002. The footpath, which originally led along the lakeshore,



Figure 4. View from the observing tower overseeing the restored Riediker-/Rällikerried.

was placed back and an observation platform was added. On the platform one can view the delta and the lake. The lakeshores were partially flattened to allow the stream to branch. On land, new wetlands were created, which immediately were occupied by greenbacks. Although the lakeshores always represented a part of the sanctuary, it was accepted to fish, swim and sunbath. In 1999, lack of the missing clear guiding route only few people were informed that they are not allowed to enter the place. Whereas several infringements have been accepted (Table 4). Since the restoration in 2002, the area is controlled and the visitors are sent off. The increase in infringements in 2002 and 2003 is related to the fact, that the area has been restored and people for the first time consequently dismissed. We are expecting that the infringements will decrease in the following years.

When summarizing infringements over all controlled areas (Table 5), it clearly shows that the measures to keep visitors off the sanctuaries are successful: there are fewer offences with dogs, less fishing; there generally are less swimming and sunbathing, and less boats. The protection regulation finally seems to be accepted.

Maintenance work

In order to prevent growing bushes and trees in the reeds, the continuous care such as the regular cut of the reed (once a year in autumn) is very important. The examined measures to remove young trees have shown that if the young trees are pulled out with the roots and removed in tiresome handwork, damage to

Table 4. Amount of infringements at Aabachdelta per 50 control days listed in the years 1999 to 2003.

Aabachdelta	1999	2000	2001	2002	2003	P
Entering sanctuary	14	14	no data	60	61	<=0.001 i
Offence with dog	8	1	no data	18	15	<=0.001 d, i
Fishing in sanctuary	9	1	no data	6	13	<=0.001 d, i
Swimming/sunbathing	2	0	no data	7	16	<=0.001 i

Table 5. Total amount of infringements of all sanctuaries per 50 control days listed in the years 1999 to 2003.

Total infringements at Lake Greifensee	1999	2000	2001	2002	2003	P
Entering sanctuary	131	142	87	146	157	<=0.001 di
Offence with dog	195	158	147	158	134	<=0.001 d
Fishing in sanctuary	94	44	20	14	22	<=0.001 d, i
Boats driving in protected lake and shore zones	no data	45	31	14	7	<=0.001 d

the existing vegetation, and to ensure the growth of closed reed vegetation is smallest. Neither the method to cover the bushes nor to mill cut the bushes was successful. They were both dismissed as they are counteracting. These interventions are destroying large parts of the ground and the vegetation. And at the same time they leave open areas, which are not only colonized by undesirable ruderal plants but they also form the basis for the seeds of trees, which then start the process of natural succession, building forests in the end. The additional removal of individual groups of trees in the reeds helps farmers to better care about the reeds. As a consequence the reed vegetation becomes richer in species.

Conclusions

The sanctuaries and recreation areas are spatially separated to take into account the protection as well as the utilization. Barriers with fences, however, were contra productive. If the measures to separate the sanctuaries and recreation areas are clearly visible, then they provoke and lead to vandalism. All measures that contain a prohibition (all kinds of fences, notice boards, and new barriers) lead to aggressions among the opponents and then to damage. Consequently, the visitors are now softly guided and included: they are informed on the possibilities of nature observation, where the recreation areas are located, and reminded to keep off the sanctuaries.

Another method of separating sanctuaries and recreation proved effective, although violations are still occurring years later: visitors are guided around a sanctuary, but at the same time see into it. If reshaping has to be done within the sanctuary, then the path is placed as far away from the sanctuary as possible and on the other hand the path is restricted through natural obstacles. Such obstacles include wetlands, ditches, hedges, or fences made of willows. To further prevent people from entering sanctuaries, platforms are built. They are created to allow the visitors to view the areas which are not accessible.

The continuous care of the reeds led to a reed vegetation that is richer in the species. The care involves (1) a regular cut in the autumn, (2) the removal of individual young trees, (3) the removal of older groups of trees, and (4) the removal of trees along the shores (to reduce the shadow on the ground and, therefore, promote the growth of reed). Further, the decreased pressure by visitors leads to less disturbance of the vegetation. Consequently, the vegetation already recovered in areas, which originally have been frequently used and now are restricted. The typical reed vegetation and reed belts are spreading again.

Finally, it was the publicity, interesting restorations and ameliorations of the recreation areas that led to a different behavior of the visitors. Thanks to the continuous information and presence of the rangers, the acceptance of the protected areas increased whereas the infringements, violations and vandalism decreased.

To encourage the visitors to accept the protection regulation also in future, we will keep the following crucial points: (1) discussions with different people and groups, (2) public relations, guided tours, and maintenance work, (3) notice boards on the spot, (4) ameliorations of the infrastructure within the recreation areas, (5) distinct separations of the sanctuaries without provoking the visitors, and (6) constant information and controls of the rangers

To guarantee the protection of the sanctuaries, good publicity and information on the spot is necessary, but it also requires sufficient recreation areas. Especially in densely populated areas, the sanctuaries represent nature parks and are, therefore, rather used as recreation areas. The big crowd further needs appropriate infrastructures and activities without stressing nature. Equilibrium must be found between protection and utilization. The two areas must be separated without patronizing and provoking the visitors.

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