Visitor Monitoring as a prerequisite of assessments in Natura 2000 sites

Ulrike Pröbstl

BOKU - University of Natural Resources and applied Life Sciences, Institute for landscape development, recreation and conservation planning, Vienna, Austria
ulrike.proebstl@boku.ac.at

Abstract: Biodiversity is increasingly recognized as an invaluable element of the European heritage. Across Europe, the NATURA 2000 ecological network has been established under the European Community's `habitats` directive and the `bird` directive. The goal of this network is to provide a strong protection for Europe's most valuable wildlife areas. If development plans or projects threaten to deteriorate this network or its favourable conservation status, a special assessment is required (see Art.6 of the Fauna-Flora-Habitat directive, called FFH-assessment).

When planning a new foot-bridge in a NATURA 2000 site, it became obvious that an evaluation of the possible ecological deterioration is only possible when detailed information about the current and the potential future recreational use is included in the assessment. It will be suggested that visitor monitoring and visitor surveys collect essential background information for the FFH-assessment process evaluating the possible impacts on NATURA 2000 sites. Without such data it would be impossible to determine the potential effects of changes to the recreational infrastructure and its associated uses on protected areas. Therefore, a curriculum for protected area planning that strives to accommodate the legal requirements of the European Community should also include recreation research techniques.

Introduction

In the European Community, the various types of protected areas currently in existence (e.g. national parks, nature conservations areas, nature parks, landscape protection areas) have been enriched with one further concept, the NATURA 2000 sites. The legal foundations for this concept are the directive for the conservation of natural habitats and of wild fauna and flora (European Council Directive 92/43 EEC from 1992, "Habitat-Directive") and the directive on the conservation of wild birds (European Council directive 79/409 EEC from 1979, "Bird-directive").

The European Community has designed these directives for the purpose of conserving, and even improving, biodiversity and habitats of endangered species. The directives should lead to the establishment of an European-wide network for nature-conservation, called NATURA 2000. The crucial elements of the network are composed of

- the habitats of endangered species (animals and plants),
- special biotopes, and
- the habitats of endangered birds.

This design is based on the insights that the long-term survival of many species does not only depend on intact habitats, but more importantly requires an interconnected network of adequate habitats.

According to Article 6 of the Habitat-directive, member states must prevent any further deterioration of various biotopes, as well as of the habitats of the endangered species conditions. This principle of no deterioration pertains exclusively to NATURA 2000 sites, i.e. biotopes as listed in Appendix I, the habitats of flora and fauna according to Appendix II, and the protected bird species and their habitats as listed in the Bird-directive. Any evaluation or assessment needs to consider all species and habitats listed in the various appendices, and must be based on the conservation goal, i.e. the maintenance or restoration of a favourable conservation status. The conservation goals are to be established separately for each site by the respective jurisdiction.

The law of no deterioration means that in any NATURA 2000 area all projects, measures, changes or disruptions, which may lead to significant changes or deteriorations of the natural components relating to any conservation goals of the protected area are not allowed. So far, minimal knowledge exists about the potential effects associated with improving access to an area for recreation opportunities (Pröbstl 2001).

The case study to be presented below focuses on the construction of a pedestrian bridge, which will improve access to a NATURA 2000 site located in the floodplain along a river. The issue was if, and to what extent, the bridge would cause direct habitat disturbances, or lead to some indirect deterioration of sensitive habitats. I will start my discussion below

with a presentation of the legal and administrative context, and from that basis I will then argue about the importance of recreation data for the planning process.

The FFH-assessment

Purpose of the assessment

Despite the overall goal to maintain the protected habitats without any deterioration, the EU understood from the beginning that in specific circumstances changes may be inevitable. Such changes may be associated with the construction of roads, railway tracks, or any other infrastructures. Such developments are not necessarily excluded by the directives, but if significant effects are to be expected, then the respective plans and projects need to be subjected to an special assessment. (see Art.6 of the Fauna-Flora-Habitat directive). This assessment is called FFH-assessment. This assessment pertains only to those effects which relate to the specific conservation goals. Furthermore, the evaluation needs to examine if the negative effects are significant, or if mitigating the effects would make the development goals and measures of optimisiation impossible. Therefore, plans and projects that are not associated with significant effects are to be permitted (Europäische Kommission 2000).

Protection of adjacent areas

A FFH-assessment is also required if changes are planned in the adjacent area, and there is potential that the proposed project could have significant impacts on the protected area and its conservation goals. The FFH-assessment also needs to consider these "exogenous effects".

Cumulative effects

The FFH-assessment must also consider cumulative effects, that is, the joint effects generated by a project or any strategic plans. This evaluative component needs to consider both currently existing projects and planned projects, as long as they have advanced to a sufficiently detailed state.

Legal consequences

If the responsible jurisdiction determines that an assessment is required, then the project proponent usually hires a consultant for the FFH-assessment study. The purpose of this study is to describe the project, as well as its potential affects and to provide relevant information in text, tables and maps.

Following the framework of the FFH-evaluation process, the actual evaluation is sole responsibility of the respective jurisdiction. If the study determines that significant deteriorations are to be expected, then the project is inadmissible until further notice. The project may only be granted permission and implementation if

- there are no reasonable alternatives with lower overall deteriorations in a different location, and
- at the same time the proposal is absolutely essential to satisfy public, including social and/or economic interests.

In these situations special compensatory measures are required, which would ensure the overall conservation goals of the NATURA 2000 program, and equally contribute to the establishment of the pan-European conservation network. Under certain circumstances, at sites with especially endangered habitats or species one needs to consult the European Commission before a project may gain approval (European Commission 2000).

The project and the problem

Many citizens of the town of Fürstenfeldbruck in southern Germany requested the construction of a pedestrian bridge across a river. Since the bridge will be located in a NATURA 2000 area, the question of appropriateness of the project arises immediately. The construction requires changes to the shrubs along the river for locating the foundations. Furthermore, construction activities and deliveries require access for large vehicles.

A preliminary investigation determined that the construction constituted an interference, but that given the overall extent of the area, the remaining extent of shrubs and the short term disturbances associated with construction activities, did not constitute a significant impairment, and consequently no deterioration.

However, the administration responsible for nature conservation argued that this footbridge could lead to some deterioration in the adjacent NATURA 2000 sites, because this sensible habitat would now be accessible to many citizens in a very convenient manner. Despite this realization, at the time of the assessment nobody had any information about the current number of visitors, nor their temporal distribution or motivation of visit.

Method

In order to determine if a FFH-assessment is required, we proposed a 2-step process (Figure 1). First, a pre-study should primarily assemble the relevant recreation information and collect the existing ecological data. To that effect, visitor user counts and interviews were undertaken on select days. The purpose of the questionnaire was to obtain a representative description of the current spatial and temporal use patterns, as well as to ask current users about their opinions of the future effects of the planned footbridge.

At the same time, we also undertook an analysis of the spatial use patterns of the larger area, including the current supply of trails, their main characteristics, and their frequency of use.

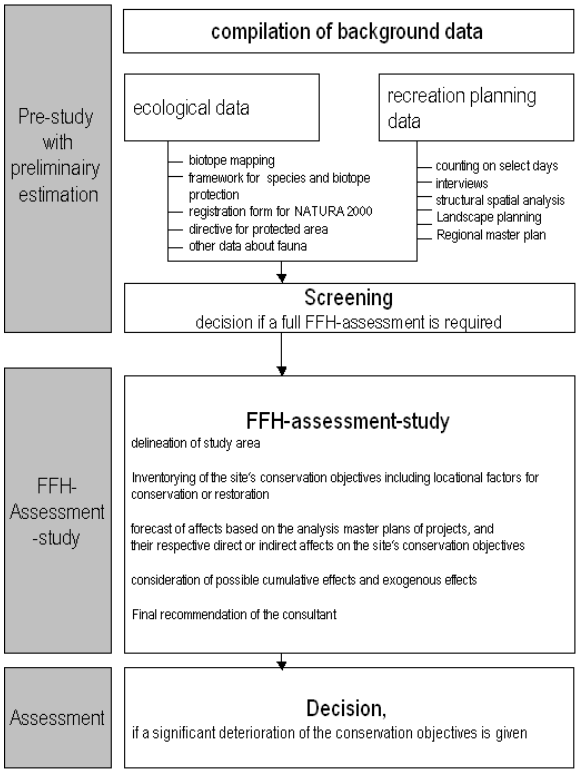

Figure 1. Missing data lead to the suggestion of a 2-step assessment process that included a screening stage.

The goal of this pre-study was to establish the pre-conditions for the "screening" stage, during which the administration responsible for conservation and the municipality could decide jointly if a deterioration is a possible outcome, and consequently a complete FFH-assessment would be required.

The visitor monitoring and interviewing was conducted during the fall of 2002 on several weekdays, representing various weather conditions. The tasks were performed by municipal employees. On every sampling day, visitors were counted during the morning and afternoon. Monitoring was performed separately for the east and the west bank of the river, and a total of 1,336 visitors were observed. They were recorded by activities (pedestrians, bicyclists, bicyclists or walkers with dogs, horseback riders, etc.). These monitoring data represent a lower level of activity, because sampling occurred during the fall only, and one can only suspect that during the nicer time of the year the proportion of regular visitors would be even higher; also these counts missed out on early morning users.

A total of 247 interviews were collected, asking questions about the spatial extent of current activities, the importance of the area, their overall evaluation of the study sites and the area in general. Some questions were asked about the demand for the future footbridge and the likely characteristics of future user groups, as well as their socio-demographic characteristics, and place of residence.

Finally, the pre-study also contained a mapping of current disturbances of the habitats, which was based on selected indicator plants. The potential habitat characteristics could be mapped at the same time.

Results of the pre-study

Counting / Monitoring

The monitoring data documented significant differences between the west bank of the river, adjacent to the community, and the east bank of the floodplain, which so far had only limited access. Even on the most heavily used days, the east bank recorded only about half as many visitors. The visitor structure also differed in the sense that the west side recorded about six to seven times more visitors with dogs (Table 1). Along the east bank, on the other hand, the proportion of bicyclists is almost triple the amount compared to the west bank (35% on the east, vs. 12% on the west side). Especially on nice days, every second visitor is on a bicycle. The reason for this discrepancy is the long distance that needs to be covered to reach the east bank; also, the eastern trail is part of a regional bicycle trail network (Table 2).

Table 1. Proportion of dog walkers (n = 247).

Dog walkers	West Bank	East Bank
Peak value	11%	3%
Average	10%	5%

Table 2. Proportion of cyclists (n = 247).

Visitors with bicycles	West Bank	East Bank
Peak value	21%	50%
Average	12%	35%

Results of the interviews

The interviews (n = 247) revealed that the area is visited predominantly by repeat visitors, who constitute more than 80% of the users. About 60% visit the floodplain at least once a week. More than half of the users stay longer than 90 minutes and visit several times a week (54%). Two thirds of all visitors are urban, mainly from the surrounding communities. These numbers emphasize the importance of the floodplain for routine recreation purposes.

The visitors value the natural resources and the setting of the area. The recreationists listed nature (26%), quietness (24%), landscape (18%), and riparian landscape (15%) as the main attractions of the area. When asked about possible improvements,

most respondents mentioned the pedestrian bridge which has already been under public discussion, and additional information about the trail network and aspects of the natural habitat. They listed the conflict between walkers and bicyclists and walkers and dog owners as the main concerns.

When they were asked directly about the proposed bridge, a clear majority (66%) were in favour. This support is even higher with the local population. Most of the opponents mentioned ecological reasons. They also had concerns that more of the distant visitors would be attracted by the bridge, that the overall number of visitors would increase, and that conflicts between walkers and bicyclists would increase further.

Structural Mapping

Another component of the analysis was a structural mapping process of relevant landscape features, to synthesize information relevant to the decision. During the structural landscape mapping in spring and summer one further visitor monitoring was undertaken. Its purpose was to verify the previous results, and to add information about visitors during another season. For that purpose the trail network and the affected area of the floodplain were divided into homogenous landscape units (for example A1, A2, W1, W2, W3, E1-4, E5-6, E7 as documented in Figure 2). In these units visitor counts were undertaken in 15 - 20 minute intervals (n = 398). The structural mapping provided additional information about visitor behavior and patterns of temporal uses in the various sections.

Most users (45 persons per hectare; n = 398) were observed during the late afternoons, starting at 4pm, and peaking at about 8pm. Similar peaks occurred at around lunch time (39 persons per hectare), while during the early (prior to 8am) and late mornings visitation was rather low with 16 and seven visitors per hectare respectively. Most joggers (from 4 to 7 persons per hectare; n = 398) are active during the mornings (5-9am), and again around lunch time (11am-1pm) and evenings (5-8pm). Most of the bicyclists were observed only after 5pm (31 persons per hectare), while walkers are most prominent during the early afternoons (noon to 3pm, with 9 persons per hectare). The phenomenon of free running dogs occurs over the entire day, with an additional peak during the early morning hours. The spatial distribution and differentiation of the more intensively used areas are documented in Figure 2.

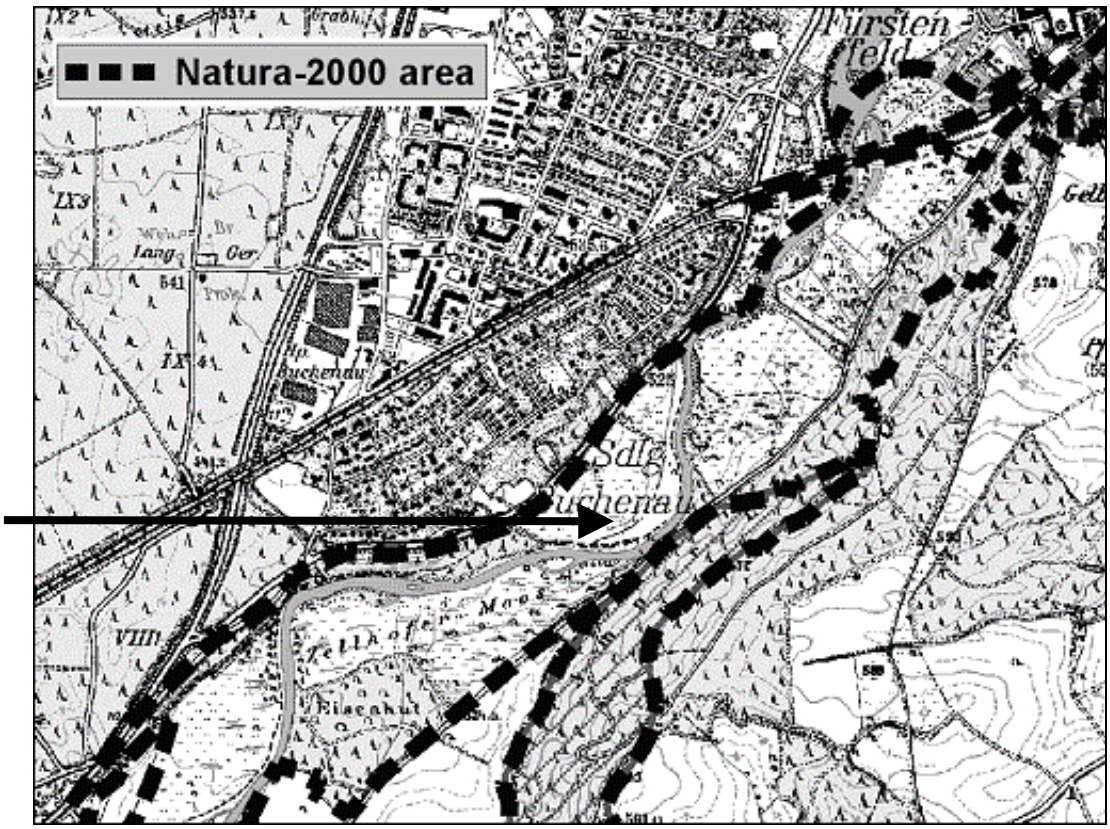

Figure 2. Location of the NATURA 2000 sites close to the city of Fürstenfeldbruck following the river Amper. The arrow points to the location of the planned pedestrian bridge (Pröbstl 2002).

Figure 3. Representative sample of the structural mapping process. Homogenous areas were identified by their natural characteristics (Pröbstl 2003).

Figure 4. During the structural mapping process in a second step the identified homogenous areas were evaluated by their sensitivity and the current intensity of disturbance (Pröbstl 2003).

Predicting future recreational use levels

In order to assess the intensity of use we also needed to predict the expected changes in use patterns caused by the project. Based on the information generated during the structural mapping process and additional user counting, we concluded that the construction of the foot-bridge would lead to the following changes of recreational behavior:

- The proportion of bicyclists will increase, because access from the western sections of town will be improved significantly.
- Walkers will increase especially in the more remote eastern part of the NATURA 2000 sites. As soon as the residential areas in the western parts of the city will have convenient access to these sites, the eastern areas will experience increased uses, especially during the evenings and weekends.
- With the increasing number of bicyclists and walkers, one can expect a proportional increase in the number of dogs. However, one should keep in mind that if the increasing number of dogs is associated with bicyclists, then this will affect the ecology of the area less, because these dogs need to keep up with the higher speed of their owners on bicycles, and do not have many opportunities to stray from the trails extensively. The opposite is true for increases of dog walkers. When more dogs accompany walkers, then more disturbance of adjacent meadows can also be expected.

In order to estimate the spatial context of these changes, we inferred likely affects based on assumptions of the distances that dogs would remove themselves from their owners.

One major factor contributing to the attractivity of this near-urban recreation site for dog walkers is the short driving distance from home (ideally with plenty of parking opportunities), and a trail – ideally a circular route – with changing environment and plenty of open spaces (ideally shortgrass meadows).

Based on these main determinants, we developed likely scenarios for the various components of the NATURA 2000 areas. Table 3 summarizes the kind of changes that can be expected in the main components.

Results of the FFH-Assessment

Detailed results

The compatibility of the project was assessed on the basis of this forecast, as well as the results of previous studies documenting the effects of disturbances on potentially affected species and their habitat requirements (vgl. Schwab 1994, Assmann 1997, DVWK 1997, Hußmann 1997, BfN 1998, Utschick 2001). The analyses and forecasts regarding the species that are likely to be affected are also based on a comparison between the species' current distribution in the study area and the likely future situation. This analysis is based on a detailed bird nesting mapping exercise, which encompassed three rounds of inventorying, identifying a total of 75 bird species and 1934 single birds. Furthermore, the presence of amphibians, reptiles, mammals and invertebrates was also documented. The entire study area included 148,3 ha. Among the affected species and habitats under consideration, and given the above described forecast, the following affects are to be expected:

The disturbances caused by the construction itself will be minimal to the extent that one cannot anticipate any affects or deteriorations on the habitats under consideration.

Based on the above described predictions one can derive several conclusions regarding the affects on the species and habitats listed in the directives. The changes associated with the construction of the

Table 3. Forecasts and evaluation of changes to specific landscape units.

Land-scape unit	Description	Distance to main residential areas		Proportion of residential areas within 10 ha in %		Trails in km for walking		Attractivity for users; potential for letting dogs run free	Forecast: Condition after the construction of the foot-bridge
		before	after	before	after	before	after		
Watercourse and immediately adjacent areas									
A 1, 2, 4, 5	Watercourse, reservoir with riparian area, oxbows	0,5	0,5	50	50	2	2	Mostly closed, Inaccessible	None, or minor disturbances; no changes
A 3	Riparian area	1,5	1,5	30	30	1	1	Circular routes, riparian area accessible to dogs	Major disturbances; no changes
Riparian area along West Bank									
W 1	Intensive grassland; narrow shore	1,5	1,5	50	50	2	2	Circular route with grassland	Major disturbances; no changes
W 2	Riparian forest and valley slope	2,5	2,5	5	5	2	2	Circular route with forest	Minor disturbances, no changes
W 3	Swampy fallow, diches, cane brake, dispersed meadows	2,5	2,5	5	5	2	2	Circular route with grassland	Moderate disturbances; no changes
Riparian area along East Bank									
E 1-3	Riparian forest, fish ponds, dispersed meadows, oxbows, grassland	1,5	0,5	0	50	3	3	Pre-dominantly grassland, partially closed	Increasing number of dogs; minor impacts, see W2
E 4	Dispersed meadows, ditches	1,5	1,5	0	50	4	3	No circular route, grassland	Increasing number of dogs; moderate impacts, see W3
E 5	Dispersed meadows, ditches	1,5	1,5	0	50	6	3	No circular route, grassland	Increasing number of dogs; moderate impacts, see W3
E 6	Forest	1,5	1,5	0	50	6	5	Circular route, forest	Increasing number of dogs; minor impacts, see W2
E 7	Forest	1,5	1,5	0	50	4	3	partially steep slopes	Increasing number of dogs; minor impacts, see W2

pedestrian bridge are so minor, that one does not need to be concerned about affects or deteriorations on any the special habitats. Among these are:

– Alluvial forest
– Waldmeister-Beech forest
– Central European Orchid-Limestone-Beech Forest (Cephalanthero-Fagion)
– Moist tall brush areas of the planar, montane and alpine eco-regions

Significant affects can also be excluded for amphibia, reptilia, invertebrates, and fish.

Considering the potential affects on the conservation goals, i.e. the conservation of the typical species mixes of the Alder-Ash-Elm-alluvial forests as well as the typical types of wet meadows, moist tall brush areas, and other habitats devoid of trees, the analysis of the various bird species, the following conclusion can be drawn:

For fish-eating birds the entire study area is already too stressed. Rail (Fulica atra, Gallinula chloropus) breed predominantly on the east side of the river in the stagnant waters of oxbows and fish ponds. Since these areas will continue to be closed to visitors, and walkers will continue to use the opposing shore, occasional disturbances will be tolerated.

The forests along the valley slopes, and the eastern alluvial areas are feeding- and breeding habitats for the large woodpeckers. Because of the overall extent of this habitat, and the fact that plenty of alternatives are available, one can assume that even an increase in visitor numbers will not cause any deterioration.
However, in the marshy areas the birds are already negatively affected by the high number of visitors to the effect that these birds can establish themselves temporarily only (during migration, and at the beginning of breeding season).

Birds in the cane brake are concentrated on both sides of the planned bridge on easily accessible areas. Since dogs avoid thicker cane brake or dense brush, and even may be called back from those areas by their owners, these areas should not be affected significantly by the proposed project.

With regards to the birds and mammals protected by the Bird-directive and the Habitat-directive, one further differentiation of potential affects is required

in the assessment. It is the concern about the following species which have been documented to exist in the study area:

- Beaver (Castor fiber)
- Kingfisher (Alcedo atthis)
- Grey woodpecker (Picus canus)
- Black woodpecker (Dryocopus martius)
- Goosander (Mergus merganser).

The FFH-assessment produced the following results:

The protection of the beaver depends mainly on large habitats in which the species can maintain its idiosyncratic behavioral dynamic. The project does not affect the areas currently available for the beaver. They are active predominantly during twilight and at night, and therefore their behavior will not be affected significantly by the project. The management goal of permitting dynamic changes to the habitat, as well as to the behavior of the beaver do not suggest any negative affects according to Art. 6 of the FFH-directives.

The kingfisher requires stagnant water especially during winter. At the moment, this area contains a small remnant oxbow between the reservoir and the railway line. The quality of this rather sensitive habitat will remain after project implementation.

For water dependent birds, and several species of ducks there will remain sufficient habitat along the east bank which are closed already.

The areas located along the eastern shore as well as the sloped forests are important feeding habitat for large woodpeckers (Black, Grey, and Green woodpeckers, Dryocopus martius, Picus canus, Picus viridis). The sensitivity of these species of woodpeckers differs with regards to feeding and breeding habitat requirements. These cavity breeders are not very sensitive to the passing of pedestrians and bicyclists, even when accompanied by dogs, as long as these user groups are staying on trails.

However, Black and Grey woodpeckers are much more sensitive to changing locations during feeding, because they require further safety distances.

In the more remote south-eastern area of the alluvial one must anticipate an increase of the proportion of dog walkers, but due to the steeper terrain, as well as the limited accessibility of these walking trails and bicycle paths one cannot anticipate any significant increases in the disturbances for the grey and black woodpeckers. Furthermore, the larger adjacent forested areas provide sufficient alternatives and development spaces.

One also needs to differentiate between feeding and breeding habitat for the Goosander?, a species using stretches of the river for their prey behaviour. They can continue to do so undisturbed during early morning hours. When visitor numbers increase, then the Goosander withdraws to more remote areas. Since their breeding locations are well hidden, there should not be any negative effects expected, as these habitat structures remain inaccessible after the construction.

Concluding evaluation

As long as one can ensure that the already established limited access rules for the east bank continue to be enforced with sufficient rigour (providing information, physical barriers, occasional controls), then one can rule out any significant deterioration of habitat types and protected species in the NATURA 2000 area associated with the construction of the bridge. Under these conditions the proposed project does not represent any deterioration according to the Directives. No cumulative effects, or exogenous affects needed to be considered.

Conclusions

The main purpose of this paper was not to present the findings of the case study in all its details of potentially affected species and habitats and the specific results of the FFH-assessment. The goal was to emphasize the importance of recreation planning and its contribution to biodiversity conservation in Europe. The above example documents the frequently encountered problem of the lack of recreation data for a complete FFH-assessment. The combination of methods applied in this study, i.e. interviews, visitor monitoring, and structural landscape mapping proved to be a suitable approach for this assessment.

This planning process shows that it was essential that the assessment of the proposed construction of the bridge went beyond the mandatory requirements of the assessment by including the following questions:

- to determine the current visitor / user volume;
- to estimate the volume of future users after project completion; and
- to determine the effects of the future user volume and patterns on the potentially affected flora and fauna.

Only after the current volume of visitors was established with a sound monitoring method, and likely changes of the user volume after project completion was estimated based on interviews with users, it became possible to answer the crucial question of ecological affects associated with the new project.

Our experience shows that visitor monitoring and visitor surveys collect essential background information for assessments concerning possible impacts on NATURA 2000 sites. In the absence of such data it would be impossible to determine the potential effects of changes to the recreational infrastructure and its associated uses on protected areas. Therefore, any curriculum for protected areas planning that strives to accommodate the legal context of the European Community also needs to include recreation research techniques.

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