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Methods and results of wetland management for waterfowl*

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The management of a given locality may be divided into: 1. phrasing of the object, 2. organization, 3. active efforts on the basis of research achievements as regards the maintenance and improvement of the area and 4. utilization in relation to the object. In the article the principles of the object phrasing and the organization are shortly described. The active efforts (such as the restoring of a lake, clearing of bushes and trees, control of reed and bulrush, construction of breeding and loafing islands, water level control and the improvement of the wintering grounds) are presented on the basis of the results of projects that have been carried out in Denmark, England and Sweden. Some remarks on the multiple use of a marshland and the engineering of the nature are added.

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тоды и результаты формирования и сохранения благоприятных условий среды для водных птиц.

Создание и сохранение на данной территории благоприятных для птиц условий должно проходить следующие этапы: 1. определение предмета и цели охраны, а также диапазона работ, которые необходимо выполнить, 2. организация деятельности, 3. проведение работ, 4. освоение и дальнейшая опека над созданным объектом. В статье кратко обсудили принципы определения предмета и цели охраны, а также планирование и организацию работ. На примерах работ, выполненных в Дании, Англии и Швеции обсудили способы проведения и результаты различного рода мероприятий (напр., реституция уничтоженного озера, устранение тростника и камыша, устранение излишних деревьев и кустарников, конструкция искусственных островов, регулирование уровня воды, создание кормовой базы для зимующих птиц), целью которых является создание или сохранение благоприятных условий для птиц. Статья содержит также некоторые замечания о многофункциональном использовании образованных биотопов и экологическом инжинирстве.

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INTRODUCTION

The meaning of the nouns wetlands, waterfowl and management ought by way of introduction to be explained, as an ordinary dictionary does not quite give the ecologist's interpretation of the matter.

As defined by the Ramsar Convention, **wetlands** are areas of marsh, fen, peatland, or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt, including areas of marine water, the depth of which at low tide does not exceed six metres.

Referring to the Ramsar Convention, **waterfowl** is birds ecologically dependent on wetlands.

Wetland management is one of the aspects included in the very broad conception of nature conservation. To manage means to direct or to control. In my view the management of a given locality may be divided into: 1) phrasing of object; 2) organization; 3) active efforts on the basis of research achievements as regards maintenance and improvement of the area; 4) utilization in relation to the object.

Before further reference to the management problems, however, the significance of the wetlands for birds may briefly be commented.

HOW DO THE BIRDS USE THE WETLANDS?

The waterfowl make use of the wetlands for breeding, moulting, resting during migration and wintering. Different species often require different conditions from the surroundings. That is why the composition of the avifauna as regards species and numbers varies from place to place. If a universal avifauna is to be preserved, it is therefore necessary to maintain a varied range of wetland types. As birds do not respect frontiers when — in the course of a year — they seek their respective breeding, moulting, resting and wintering places, the management of wetlands is not only a local and national affair, but also an international.

OBJECT

We return to the management process itself and presume that an analysis of the actual contents of natural resources of the locality and its use for man has been made.

The object of managing a wetland for waterfowl should of course be defined in relation to those particular bird species one wishes to establish, maintain and/or improve the conditions for. Thus it should be decided whether the locality is to serve primarily as a breeding, moulting, resting or wintering area, or a combination of these; to which human utilization (commercial use, recreation, research, education) the area will be subjected; whether the avian

interests are to be given priority, so that only human activity which in no way affects the bird life will be tolerated; or whether the human activity in the area will have a greater importance. The object or aim is often badly defined or too vague when the management of a new established wetland reserve or an area to be protected is considered.

ORGANIZATION

Irrespective of the ownership of wetlands (private properties or state-run), it is necessary to establish an organization that actually looks after the wetland and the observance of the objects. Who is going to have the final responsibility for it? Who is to be charged with the task of drawing up the concrete working plan? Who is going to realize it? Who is going to be the warden? These are some of the organizing questions under consideration in each individual case.

ACTIVE EFFORTS

Almost every landscape is affected by human activity. Therefore, the well-being of the birds is determined not only by climate, soils etc., but also to a large extent by human activity. Furthermore, human influence is no less static than the natural factors. The traditional methods of protection do not suffice if certain flora and fauna are to be maintained in a particular area. It is necessary to follow up with active management to maintain, improve and renew the environment of the waterfowl. In the sequel I shall draw the attention to just a few examples of active management in different countries.

Restoring a lake

Lake Hornborga (Västergötland, Sweden) is a shallow lake, 2 500 ha, that has been drained or lowered to a great extent in 1802–1933 (“The mistakes of the past are all around us, remember Hornborgasjön”, a quotation from Liquid Assets). The aim of lowering the water level was to gain farmland, but it has been impossible to cultivate the area. After the last lowering an almost complete overgrowth of emergent macrophyte vegetation has taken place. In the past the lake was important for breeding and resting waterfowl, but the lowerings have resulted in a rapid decrease in the avian value. The Swedish Government found that a restoration of the lake was an urgent conservancy project. Therefore, in 1967 the Swedish National Nature Conservation Board organized a team to determine whether the lake could be restored and again function as an important bird lake. The answer was that restoration was realistic for quite a large area. The above mentioned data are from BJÖRK et al. (1971). The authors further state: “Before a definitive raising of water level

is undertaken it is necessary to ensure, among other things, that the accumulated masses of coarse *Phragmites* detritus are reduced and that the qualitative composition and quantitative development of the vegetation are redirected. The primary production must be redistributed from emergent to submerged plants. The methods for doing this have been worked out in large-scale field experiments".

The team found it possible to restore 1 000 ha overgrown by reeds to open water, but 1 500 ha were so damaged through the development of a thick root felt of *Carex acuta* and *Calamagrostis canescens* (following *Phragmites* in the succession) that mechanical treatment used to eliminate reeds could not work.

BJÖRK (1972) has described the experiments of the restoration. A large area of *Phragmites*-jungle was removed, as in the first place the reeds were harvested and burned. Afterwards a rhizome destruction was carried out with a rotor cultivator. For the different working processes both pontoon-equipped and amphibious mowing machines were used. The growth of the submerged vegetation occurred rapidly, and bottom fauna communities with high species diversity and dense populations are developed. At the same time ornithological registrations have shown that the number of both the breeding and the resting birds has increased considerably. In 1977 money was granted for the restoration of the whole lake on the basis of the results mentioned.

Clearing of bushes and trees

The forest has invaded considerable areas in Lake Hornborga's marginal zones, as a forerunner of the general raising of the water level that they are to carry through, considerable areas have been removed. Also in peatland tree growth, for instance alder, willow and birch, often threatens to form so dense scrub that the conditions for resting and wintering waterfowl are reduced. Here it may be relevant yearly to clear a certain part of the area of scrub and trees. Where it is wanted not only to improve the area for resting and wintering birds, but also to have species like Purple Heron and Spoonbill breeding, on the planning of the removal of trees we have to think of the possibilities of placing of nests of these birds. In the Netherlands I have heard an ecologist instruct in cutting of trees so that in an easier way the Purple Heron could use them for placing nests.

Control of reed and bulrush

Overgrowing with bulrush and many other species threatens peat bogs which no longer attract ducks when the whole water area is covered with vegetation. In summer in certain places it is possible to cut the vegetation under water level with a scythe. In other places mechanical cutters are helpful,

for instance in de Weerribben in NW-Overijssel, Netherlands, where a boat is provided, with a vertical mower-knife in the stern and a corresponding knife mounted in horizontal plane 20 cm under the water surface. The first clears the way for the boat through the weeds, the other cuts off the vegetation. In certain situations open water may be recreated in smaller peat bogs by means of explosives, which in other respects also sometimes may be used when artificial ponds are being established. Dynamite or trinitrotoluene (TNT) may be used as blazing agents, but as mentioned in "Manual of Wetland Management" and in "Wildlife Management Techniques", ammonium nitrate is an effective agent. "It has recently been discovered that the best results are obtained with commercially prepackaged ammonium fuel charges".

In a publication in Swedish, "Metoder för Behandling av icke önskvärd Vattenvegetation" published by Statens Naturvårdsverk the following methods for elimination of unwanted vegetation in lakes etc. are described: Biological treatment, chemical treatment, mechanical treatment and burning.

Along the western Jutland fiords and the Limfjord (Denmark) we have often low cattle-grazed areas with breeding conditions for Dunlin, Oystercatcher, Blacktailed Godwit, Ruff, Avocet and other waders, and spring and autumn resting possibilities for both wading birds and Teal, Wigeon, and other

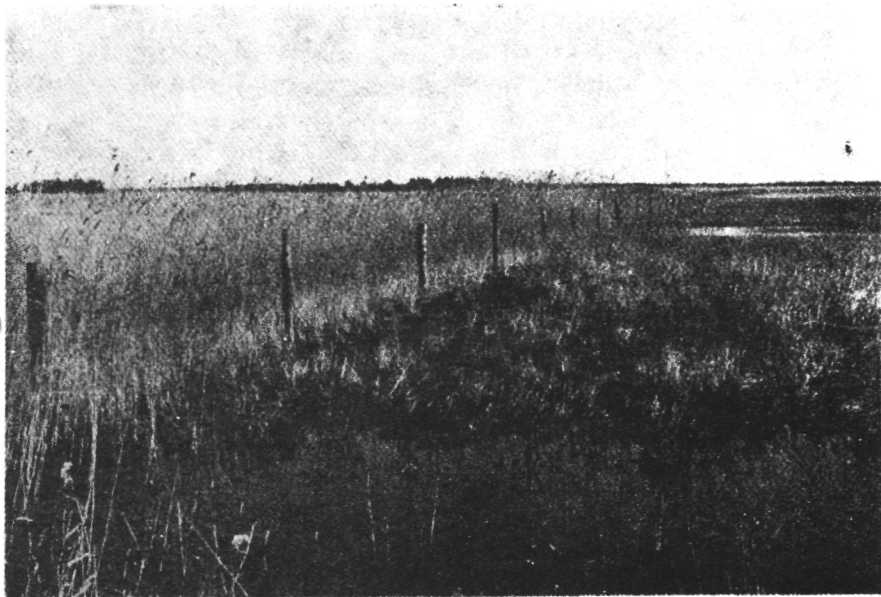


Fig. 1. Until 1967 the whole of this salt marsh in Vejlerne (Denmark) was grazed. By means of a barbed wire fence the cattle was in 1967 cut off from the section on the left, and *Phragmites communis* and *Scirpus maritimus* were quickly forming a dense and high cover. Not only the breeding conditions, but also the environment for resting waterfowl was changed drastically by this (April 10, 1973).

ducks, and some species of geese. If the grazing stops in such an area, reeds often will be dominant. The breeding birds in question are replaced by other species, for instance Gray Lag-Goose, Bittern and Marsh Harrier while the number of the resting birds falls rapidly. Thus some fencing posts and a roll of barbed wire may change a landscape radically. A concrete example from Vejlerne should be mentioned (Fig. 1).

On 27 ha that had not been grazed since 1967 I found in 1973 the following nests: Coot 34, Black-headed Gull 27, Mute Swan 4, Grey Lag-Goose 4 and Bittern 1 (on 85% of the area the reeds were harvested before the winter). Since the late summer of 1973 there has been cattle on half (14 ha) of the area. In 1976 these 14 ha looked like the other grazing areas of the locality. The following breeding pairs were observed from a dam nearby: Redshank 5-6, Black-tailed Godwit 5 and Lapwing 3-4. Furthermore 2 bleating Common Snipe and 3 Ruff (2 ♀ + 1 ♂) were observed.

In large, monotonous reed beds habitats for breeding wading birds and resting ducks may be recreated by cutting reeds and letting in of cattle. But also in another way more variation in the landscape may be established with increase of the number of species and individuals as a result. In Minsters Bird Reserve (Suffolk, England) (AXELL 1973) in certain parts the reeds are killed by means of the herbicide dalapon which is primarily effective, when it is applied to green active growth. According to the conditions of the water level, a pond or a mud area in the reed bed is obtained. Both in Lake Hornborga and in Vejlerne (North Jutland, Denmark) we have learned that driving with heavy machinery, for instance a Seiga transport vehicle over and over again in the same track makes the reed disappear. By driving on more dry terrain the reeds are replaced by grasses, while a canal with submerged vegetation appears when the reeds disappear on a water covered area.

In some countries it is a good piece of business to harvest and sell reeds. On the planning of the harvest it must be remembered that Grey Lag-Goose, Mallard, Bittern and many other species begin the egg-laying so early in the spring that they are dependent on old vegetation from the previous year as nesting cover. Therefore, larger and smaller reed beds should be left unharvested. Registrations in Vejlerne in the spring of 1973 showed that there was a rather dense population of breeding Grey Lag-Geese in a reed area where the majority of the reed beds left behind was quite small.

Breeding and loafing islands

It appears from many investigations that a range of waterfowl species prefer to breed on islets in lakes and fiords instead of the bank or the shore. On a 2.1 ha big island in Vejlerne one year there were about 200 nests of Grey Lag-Goose and ducks (Mallard, Tufted Duck, and Redbreasted Merganser), about 2 500 nests of Black-headed Gull and a smaller number of nests of Her-

ring Gull and other species. As described by JEPSEN in "The Manual of Wetland Management", in 1971 a 600 m² big island was established in the Danish reserve Hjarbæk Fjord. In the spring 1972 about 50 pairs of Avocets, some Black-headed Gulls and one Mallard were breeding on the island. At the Danish reserve Bönstrup Sø the lake shore was turned into three islands by digging a 500 m long canal system.

In the game reserve Ulvedybet, Game Biology Station has an experimental area where some salt marshes and reed areas are separated from land by canals, while new land in the shape of islets is made, where earlier — according to wind direction and fall of rain — there was shallow water or bare bottom of the lake. The islets are surrounded by "moats" (Fig. 2).

Larger and smaller islets are used not only as breeding places, but to a high extent also for loafing. In the "Manual of Wetland Management" HARRISON (1972) has described the construction and the effect of floating small islands, rafts, placed in the Gravel Pit Waterfowl Reserve (Sevenoaks, England) for loafing and breeding. In the lakes at the Swedish School for Game Keepers and Game Consultants at Öster Malma, timbered, dead spruces are anchored as loafing "islands" for ducks. On breeding rafts usually living vegetation, sprigs of spruce, nesting baskets, or duck houses are placed. AXELL (1973) reports that the establishment of forty acres of shallow, brackish water with many islands has added some 1 500 pairs of breeding birds to the population of Minsmere Bird Reserve. Some islands are grass-covered, others are covered with stones, some have rich vegetation, others sparse. Growth of vegetation may be prevented if a layer of plastic foil is placed some centimetres down in the earth.

In a part of Minsmere Bird Reserve the salinity of the water is regulated to meet the requirements of the food items of the Avocet.

VIKSNE (1977) has described the establishment of breeding islands for ducks in Lake Kanieris (Latvia) before the restoration of its water level. He recommends to improve the development of meadow vegetation on the islands by covering the surface with a layer of fertile soil and grass sowings. He shows that as regards ducks it is an advantage when terns and gulls are breeding on the islands.

Water level manipulations

Especially in the Netherlands manipulations are made in many places with the water level to meet the requirements of the birds at different times of the year. In Princenhof, a Frisish peat bog area, a part of which is owned by It Fryske Gea, there is, for instance, a large island that is grazed in summer, but from about October 1st till spring part of it is flooded artificially (just shallow water) in the interests of the wintering geese. In the Meadow Bird Reserve Kievitslanden (de Jong 1977) the water level is controlled by means

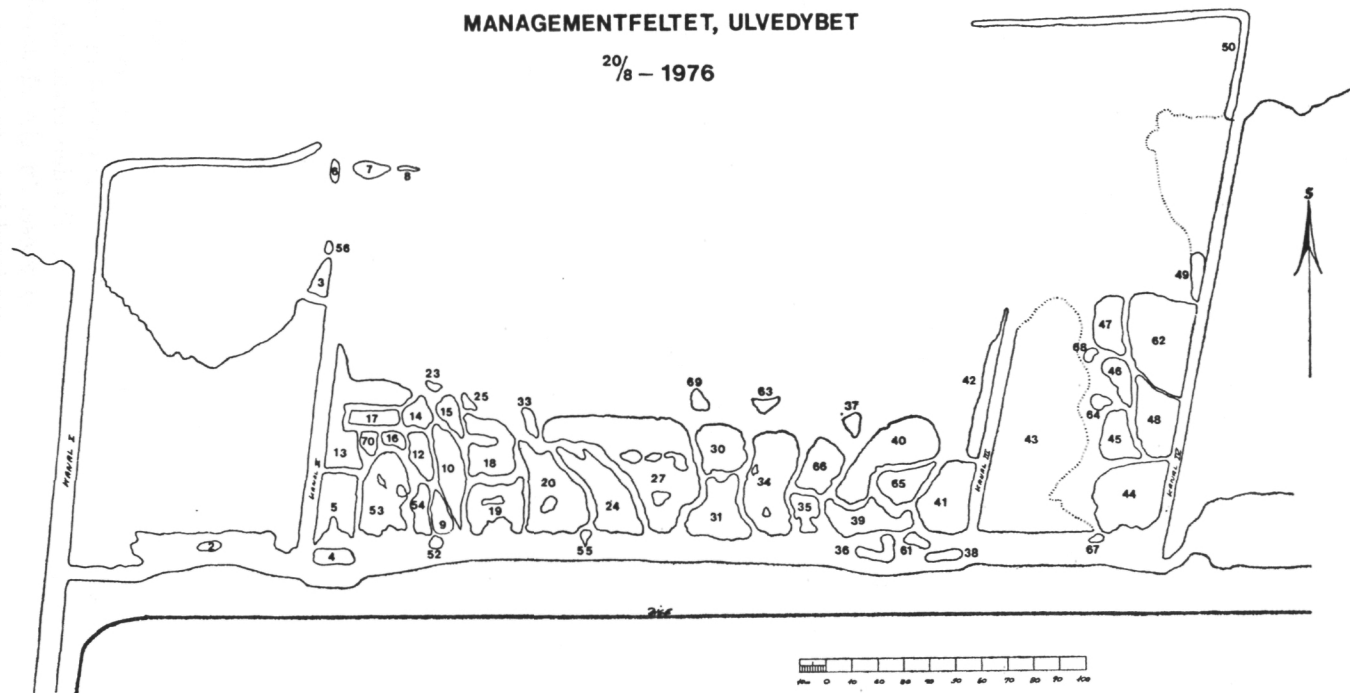


Fig. 2. The experimental area in the Danish game reserve "Ulvedybset". The numbered sections are islets. Towards land and to the right, and to the left canals are dug to prevent foxes from entering. Because of water level fluctuations in the lake, foxes are nevertheless sometimes coming to the islets in the breeding season to the inconvenience of the birds (e.g. Avocet). From 1978 the outflow conditions of the lake will be changed to maintain an appropriate water level in spring and summer.

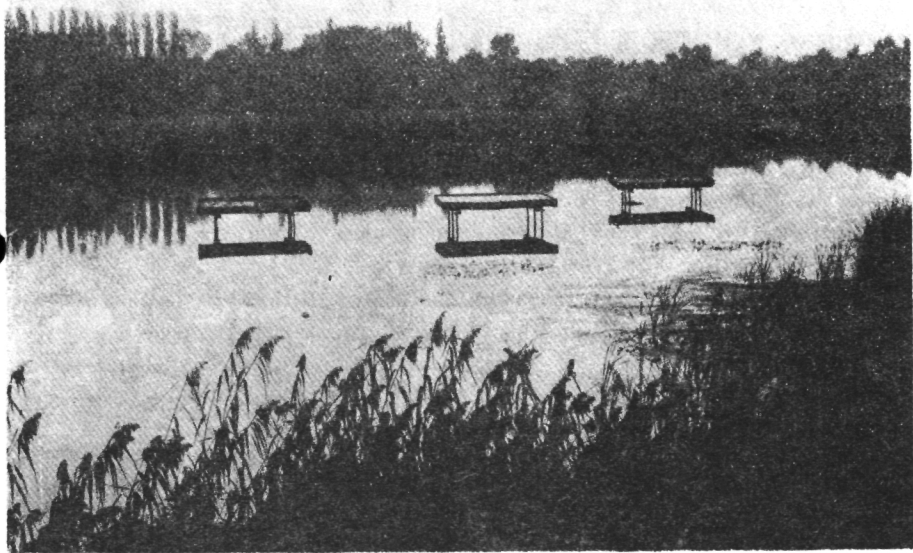


Fig. 3. For breeding and loafing waterfowl not only actual islets and floating rafts are made, but also "tables". The reproduced "tables" are covered with shingle and they attract breeding Common Tern. The system is preventing the landing of the Mute Swan. HARRISON (1972) points out that the edges of a breeding raft for terns are to be raised about 0.30 m so that the youngs cannot leave the raft until they can fly. (Switzerland, September 1977).

of pumps. For breeding wading birds de JONG found the optimal spring water level about 20 cm below ground surface.

The construction of dams, weirs and sluices is described in "Manual of Wetland Management" and in „Waterways and Wetlands”.

While quite a lot is known about the requirements of the water level of breeding and resting birds the knowledge of the right conditions on the moulting areas is extremely poor. In Vejlerne where several species of ducks are moulting, we get an idea of the fact that to a high extent the species require different waterdepths. In the interests of the possibilities for realizing improvements it would be important if further knowledge of the requirements of the moulting populations as regards the abiotic, as well as the biotic environments was obtainable. Therefore, the Wetland Management Research Group tries to inspire research of the moulting environment of the different species. In reply to this a paper by KORTEGAARD (1974) appeared in *Wildfowl*, describing the conditions where Teal drakes are moulting in Vejlerne.

The wintering grounds

Large numbers of birds which during the summer have scattered on huge areas, often concentrate on limited localities during the winter. It is necessary to maintain the carrying capacity of these localities. In Denmark the conditions of both wintering and resting geese are reduced concurrently with the partial change of the agriculture from farming with great grazing areas to barley-growing, which leaves the earth ploughed from September to April. It would be suitable in the reserves to grow crops for geese and other visiting birds, while by nature protection of wintering places we should build in definitions on the exploitation of the land according to the food requirements of the birds. Farming for waterfowl is put into practice in many places in the US (see for instance in "Waterfowl Tomorrow").

OWEN (1975) states that late summer and autumn grazing pressure was limiting factor to the food amount in winter for White-fronted Geese at the New Grounds, Slimbridge, England. Controlled livestock grazing increased the goose carrying capacity.

UTILIZATION

Multiple use of a marshland

Management for waterfowl should always include freedom from excessive disturbances. On the other hand, it is far from necessary always to turn nature into a museum where nothing can be used. Often wetlands and the flora and fauna of these, as well, may be subjected to multi-usage without much harm taking place from a purely bird-point of view. As it appears from the information given here, certain forms of human exploitation of an area are often a necessity for the maintenance of good conditions for birds. Multi-usage means usage for more than one purpose, but it should absolutely not be practised as usage for most possible purposes. The system requires a wise planning and current registrations of the effect on habitats, flora and fauna.

The marshland Vejlerne (FOG 1975) is mentioned. The area is privately owned and includes nearly 6 000 ha which consist of lakes, reed beds and grazed marshes. The owners have entered into a voluntary agreement with the Danish State for securing the environment for the waterfowl. It is a question of multi-usage as the following activities are possible according to the wording of the agreement:

1. Reed harvesting from September 1st to February 29th.
2. Cattle grazing.
3. Commercial fishing.
4. Wildfowling. No more than 20 shooting renters are allowed and each of them may go hunting not more than 10 times yearly.
5. Traffic in the breeding time of the birds can take place only with the per-

mission of both the owners and the Nature Conservation Council. The rest of the year the acceptance of the owners is required.

In addition to the regulations of the agreement other statutory instruments should be mentioned, which the owners and the shooting renters maintain: motor boat can be used only by the official who looks after the fishing and by the warden. The season for geese opens 2 weeks later than according to the Danish Game Act. In a large grazed marshland of 695 ha, shooting is never practised.

For many years Game Biology Station has been permitted to carry out ringing of waterfowl and other investigations in Vejlerne, and the owners and the officials of these are greatly interested in the research. Students of biology, nature game consultants and other people in process of training have been involved in the investigations and have become acquainted with the multiple use system.

Every year exemption is granted to groups of those interested, for instance teachers of biology and ornithologists, who together with the warden get outdoor education.

The engineers of nature

It is only natural that people wish to visit the wetlands, because in many countries wet localities are scarce. During the past century, enormous wetlands have been drained and the soil laid out for farming, planting or housing.

However, a new epoch has begun and the development in many countries goes in the opposite direction. In France, e.g. the Barrage-Réservoir Marne and the Barrage-Réservoir Seine may be mentioned.

Whenever, water reservoirs, construction of dikes, admission of cooling water for power stations and so on are being planned, ecologists should be a natural element in the planning organization. Ecologists must function as engineers of nature and contribute with their knowledge so that artificial wetlands, besides their primary purposes, make allowances for waterfowl and recreational activities for man.

Inspired by the Wetland Management Research Group, the Dane Niels MOES has analysed a potential plan for an atomic power station in East Jutland (MOES 1975). If occasion should arise, the cooling water will be let in from the sea and sent out again far into the Kattegat. He has drawn the attention to the fact that through various changes of the project on the basis of the cooling water, it is possible to create resorts for fish and birds. There are also widespread possibilities for commercial fishing, sport fishing, shooting and bird-watching.

West Germany and Denmark might choose to safeguard their coastal areas against danger of flood along the Waddensea, by building a new dike parallel to the existing one and 1–1.5 km seawards from this. But at the designing of the area between the two dikes, a new kind of Eldorado for birds

could be created. Hauke-Haien Koog, a little south of the Danish-GFR frontier may serve as a model for this vision. Ecologists must urge the authorities to have their interests taken into account at the planning stage — otherwise this potential area will end up as a barley field.

In this lecture on methods and results of wetland management for waterfowl I have mainly spoken of the active efforts as regards the maintenance and improvement of the habitats. I will end by pointing out that I have not recommended colleagues and authorities to carry out active management on every locality. In this forum it is naturally unnecessary to point out that we must take care not to come into conflict with laws and other decisions, and further we have to know our responsibility for other natural resources than waterfowl and for historical monuments.

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AXELL (1973), HARRISON (1972), JEPSEN (1971), OWEN (1975) and VIKSNE (1977) refers to chapters in "The Manual of Wetland Management".

STRESZCZENIE

[Metody oraz wyniki ochrony i kształtowania mokradeł dla ptaków wodnych]

Zgodnie z definicją podaną w Konwencji Ramsar, mianem mokradeł obejmuje się obszary bagien, zalewów, torfowisk oraz wszelkich wód śródlądowych, a także wody morskie, których głębokość w czasie odpływu nie przekracza 6 m. Ptaki wodne to ptaki ekologicznie zależne od mokradeł.

Ochrona mokradeł jest zadaniem międzynarodowym i powinna objąć szeroki wachlarz siedlisk, celem zapewnienia przestrzeni życiowej wszystkim gatunkom ptaków wodnych na całym areale ich występowania.

Projektując ochronę określonego terenu, należy wpięrw bardzo dokładnie określić jej przedmiot, cel i zakres, a także rodzaj gospodarki, która będzie na terenie tym prowadzona. Należy także sprecyzować, kto będzie odpowiedzialny za realizację robót oraz za dalszą opiekę nad utworzonym obiektem.

Działalność człowieka stała się jednym z głównych czynników warunkujących możliwość życia ptaków i dlatego tradycyjne metody ochrony nie są już wystarczające. Konieczne jest aktywne utrzymywanie, ulepszanie i renowacja siedlisk. Działania tego rodzaju zostały już podjęte w szeregu krajów i obejmują szerokie spektrum poczynąń.

Renowacja jeziora (przykładem są prace przeprowadzone na osuszonym jeziorze Hornborga w Szwecji) ma na celu odtworzenie lustra wody, usunięcie nagromadzonego detrytus i zastąpienie oczeretów roślinnością zanurzoną.

Gęste zarośla drzew i krzewów ograniczają możliwości wykorzystania terenu przez ptaki wodne. Niszcząc zarośla należy pamiętać o pozostawieniu części drzew dla ptaków budujących na nich gniazda.

Zarośla trzciny i sitowia, zajmujące znaczną część lub całość powierzchni mokradła, uniemożliwiają wykorzystanie tego terenu przez większość ptaków wodnych. Usuwanie szuwarów może odbywać się na drodze mechanicznej, chemicznej, biologicznej oraz przez ich spalanie. Zaniechanie wypasu bydła na terenie uprzednio wypasany może w szybkim tempie prowadzić do zarośnięcia go trzcina (rys. 1). Prowadząc przemysłową eksploatację trzciny, należy pamiętać o pozostawieniu kęp, służących jako miejsce gniazdowania wcześniej gniezdzącym się gatunkom ptaków.

Sztuczne wyspy, tworzone drogą kopania kanałów (rys. 2) lub budowy różnego rodzaju platform (rys. 3), znacznie zwiększają liczbę gnieźdzących i odpoczywających na danym terenie ptaków. Prace tego typu wykonane były m.in. w Anglii, Danii, Szwecji, Szwajcarii i na Łotwie.

Regulacja poziomu wody, prowadzona szczególnie często w Holandii, ma na celu dostosowywanie poziomu wody na mokradle do zmieniających się w ciągu roku potrzeb ptaków.

Zmiana rodzaju gospodarki (np. z pastwiskowej na uprawę zbóż jarych) na terenach stanowiących masowe zimowiska ptaków, pozbawia je bazy pokarmowej. W sytuacji takiej należy tworzyć zastępczą bazę pokarmową w rezerwach, drogą wysiewu zbóż ozimych. Na pewnych terenach należy zmniejszyć liczbę wypasanego bydła.

Mokradła objęte ochroną powinny być wykorzystane wielofunkcyjnie, lecz nie należy dążyć do maksymalnego ich wykorzystania na wszystkie możliwe sposoby. Projektując nowe mokradła lub nowe sposoby wykorzystywania już istniejących, należy — oprócz bezpośrednich celów gospodarczych — uwzględnić potrzeby życiowe ptaków oraz potrzeby rekreacyjne ludzi.

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