

**WETLANDS AND AVIATION:  
BETWEEN PROTECTION AND REGULATION**

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**Abstract**

The paper focuses on the evaluation of the current situation of Lithuanian wetlands and the determination of their role in flight safety in civil and military aviation in the region. Lithuania is located on the edge of the last glacial cover, which has influenced the formation of the country's present hydrographic network. Wetlands are exceptionally important in providing birds with suitable habitats all the year round. In 1993, that Lithuania signed the Ramsar Convention, 5 main, the most rich in biodiversity, wetlands were designated national Ramsar sites. In addition, in 1994-1995, 9 areas were recognised as meeting the criteria of potential Ramsar sites. The process is not over yet, and new territories are waiting the designation and protection. 30 staging sites, important for migratory waterfowl, were designated in 1998. New staging and wintering grounds of birds in the region are recently expanding under global climate change. The only aspect of importance and value of wetlands seen and emphasised in Lithuania recently is that of habitat and bird protection. However, new bird strike problems related to wetland protection and biodiversity (birds in particular) conservation management are evident and becoming urgent. In the adjacent territories of the 4 main international civil airports and 3 huge military airports of the former soviet army, are wetlands, containing massive concentrations of waterfowl. Therefore, the risk of bird strikes is recently growing and extending throughout the seasons of the year, covering all the cycles of bird life. Conservation management and a wise use of wetlands as a rule are realised in a close co-ordination with the requirements imposed on environmental protection, agriculture, water management, fishery, and forestry rather than flight safety in aviation. Considering aviation safety requirements imposed on existing airports and those being built or reconstructed, wetland management must be adjusted to multiple aspects of various sectors including air transport and environment. Legislation, harmonisation, and compatibility of laws, legal acts, regulations, public information, as well as awareness promotion, etc. must play one of the most important roles in the matter.

**Key Words:** Wetland, Bird, Aviation, Global change, Flight safety, Staging and wintering areas, Protection, Bird strikes

Wetland is a very specific ecotone, a kind of a transition zone between land and water, which is extraordinary significant for flora and fauna. Wetlands are areas at least seasonally water-sodden. They exhibit physical, chemical, and ecological characteristics subject to the timing and nature of water movements, their fauna and flora being adapted to living in waterlogged habitats. A perfect description of the main elements of wetlands is presented by Mitsch and Gosselink (1983): wetlands are identified by the occurrence of water on the surface or in the zone of plant roots; these habitats exhibit specific soil conditions different from the surrounding upper lands; these areas are overgrown with vegetation adapted to great soil moisture conditions.

Wetlands are the most productive land areas and are of an immense significance for wildlife and humans. Millions of living organisms find shelter and feed in their rich vegetation. These areas provide suitable conditions for valuable species of flora and fauna, including migrating and staging waterfowl. In wetlands, lots of avian species breed, moult, feed, form migratory and non-migratory accumulations, and winter. Throughout the history of Lithuania and that of the world wetlands have been treated as lands of low value and were drained, destroyed, transferred to arable lands, build over or otherwise utilised for economic needs. Since 1990, the world has already lost more than half of the overall area of existing wetlands (Weller, 1981). This process is still going on with different intensity in separate countries. For example, since the times of the Roman Empire, Italy has lost 93.6% of its wetlands (Moser, 1992); the USA has already lost 54% of its former wetlands (Tiner, 1984); since 1960, nearly half (40%) of wetlands have been lost in Bretagne, France (Mermet, Baldock, 1984); during the last 200 years as much as 60% of wetlands were deteriorated in Denmark (Moller, 1992), etc. Lithuania has preserved comparatively great areas of wetlands, which occupy a special position in the system of protected areas. Wetlands are exceptionally important in providing birds with suitable breeding habitats, serving as convenient areas for their spring, autumnal and non-migratory accumulations, giving shelter in winter. In all lakes, total waterfowl concentrations are larger in early spring than in late spring and early summer. However, they are smaller than summer waterfowl concentrations formed after the post-breeding season. Northern arrivals added, summer waterfowl concentrations become the most massive autumn concentrations. The formation of spring concentrations of separate waterfowl species is subject to the climatic situation.

The present-day objective is to form a policy and create a strategy for practical use and reconstruction of wetlands, which would be resolutely based on the variety of human and ecological needs in the context of different-spectrum cultures and environment (Maltby, 1992). In other words, recently a new approach is required to wetlands based on the sustainability of environmental protection and usage. Round-table discussions on the matter were arranged at the Second International Conference on Wetlands and Development organised by Wetlands International in Africa, Dakar, Senegal, in 1998. Problems related to aviation safety in connection with wetland conservation efforts were discussed and attempts to prepare special documents related with practical requirements of human activities showed. Wetlands are intensively used in developing countries, where their protection is related with existing or arising problems in different sectors, including the bird strike problem all over the world.

This paper focuses on the evaluation of the current situation of Lithuanian wetlands and the determination of their current and future role in civil and military aviation, i.e. the solution of the bird strike problem in the Baltic Region. This problem is very urgent in the surroundings of airports and areas of low flights. Lithuania is located on the edge of the last glacial cover, which has influenced the formation of the country's present hydrographic network. One square kilometer of Lithuania's total area holds approximately 0.99 km of rivers and streams: 29,900 of them are longer than 250 m; 28,200 under 10 km; 758 exceed 10 km; 18 over 100 km; 9 longer than 200 km. In Lithuania, there are 400 artificial water bodies with an area of over 5 ha. The largest artificial water body is Kauno Marios (63.5 sq km). This water reservoir has been formed by damming up the Nemunas River and constructing the country's largest hydroelectric power plant. The number of minor man-made reservoirs exceeds 10,000. There are lots of reclamation canals, too. As a result of land-reclamation, over 75% of rivers and streams have been regulated, just some 17,000 km of the overall length of riverbeds (63,700 km) being left untouched. In Lithuania, there are 2,834 lakes with an area of over 0.5 ha (1.5% of the overall territory). It is one of the highest indices on European scale. The total area of lakes is 87,643 ha, or 1.5% of Lithuania's total territory, yet this index differs greatly between districts, the northern ones being the most abounding in lakes. The most changeable element of wetlands is the marsh. We do not have data from early historical periods. Yet in the 1950s marshes made 6-7% of Lithuania's overall area, over 50 ha of marshes making the number of 1530. The peat-bog cadastre of the 1960s already at that time recorded 5.1% of marshes in the country's total area, 792 being larger than 50 ha. Over the last 20 years the number and area of marshes have rapidly decreased in some districts to total absence. About 70% of the total area of marshes have no natural vegetation – merely a peat layer or part of it. The majority of smaller marshes were drained in the 1960s-1970s, while the situation of larger marshes is better as most of them belong to the system

of protected areas of a different type. However, the overall area of Lithuania's marshes is rapidly decreasing. It is difficult to quantify the area of marshes, and only the statistics of peat bogs has been available so far. By Kunskas (1985-1986), marshes have been lost in 8 of 22 Lithuania's physical-geographical districts. Peat formation is still on-going on 146 (18%) lowland marshes and upland moors the area of which is over 50 ha. In Lithuania, there are 800 large marshes. Furthermore, marshes and shallow water bodies have been badly effected by eutrophication resulted in by agricultural pollution. The diversity of plant species and communities has impoverished, marsh vegetation has changed for meadow and forest plants. The best example of this is Zuvintas Strict Nature Reserve. Once the real kingdom of birds, it is becoming a common overgrown marsh with a gradually decreasing number of breeding birds. Birds are occupying other wetlands of Lithuania. The abundance and concentrations of birds recently are changing in space and time.

The Nemunas River Delta and Curonian Lagoon are the largest complexes of wetlands protected within Nemunas River Delta Regional Park. Wetlands are exceptionally important in providing birds with suitable habitats. In 1993, that Lithuania signed the Ramsar Convention, 5 main, the most rich in biodiversity, wetlands were designated national Ramsar sites. In addition, in 1994-1995, 9 areas were recognised as meeting the criteria of potential Ramsar sites. The process is not over yet, and new territories are waiting the designation and protection. 30 staging sites, important for migratory waterfowl, were designated in 1998. The network of protected areas covers about 11% of the country's total area. New staging and wintering grounds of birds in the region are recently expanding under global climate change.

Lithuania has no special law on wetland protection. The main document obliging to preserve wetlands is the signed and ratified Ramsar Convention. In addition, a strategy and action plans regarding wetland protection are foreseen in the National Strategies of Environmental protection, the Conservation of Biodiversity and Implementation of Climate change Convention prepared at the Ministry of Environment in 1995-1997. Conservation management and a wise use of wetlands as a rule are realised in a close co-ordination with the requirements imposed on environmental protection, agriculture, water management, fishery, and forestry rather than flight safety in aviation. Several more laws, by-laws, and enactments have also been adopted on the regulation of protection, management, and rational exploitation of separate elements of wetlands. The following documents almost fully cover the main existing problems of wetland protection: Environmental Protection Law of the Republic of Lithuania (adopted on July 9, 1992, No 5-75 with amendments and supplements), Decree No 343 of the Government of the Republic of Lithuania of May 12, 1992 "Special Conditions for Land and Forest Use", Law on Water (adopted on Oct 21, 1997, No VIII-

474), Law on Protection of Marine Environment (adopted on Nov 13, 1997; No VIII-512), Decree No 1486 of the Government of the Republic of Lithuania of Dec 29, 1997 "On Establishment of New Reserves and Approval of the Lists of Reserves", Law on Land of the Republic of Lithuania (adopted on Apr 26, 1994, No 1-446 with amendments), Law on Forests (adopted on Nov 22, 1994, No I-671), Law on Land Reclamation (adopted on Dec 9, 1993, No 1-323), Law on Wildlife (adopted on Nov 6, 1997, No VIII-498), Law on Environmental Impact Assessment of the Republic of Lithuania (adopted on Aug 15, 1996, No I-1495), Law on Protected Areas of the Republic of Lithuania (adopted on Nov 9, 1993, No I-301), "Hunting Regulation Rules" approved by the Government of the Republic of Lithuania on March 15, 1995, No 371). The legal acts enlisted are the best illustration of the country's attitude to the bird strike problem in aviation. The only aspect of the importance and value of wetlands seen and emphasised in Lithuania recently is that of habitat and bird protection. However, new bird strike problems related to wetland protection and biodiversity (birds in particular) conservation management are evident and becoming urgent. In the adjacent territories of the 4 main international civil airports (Vilnius, Kaunas, Palanga, and Siauliai) and 3 huge military airports of the former soviet army (Panevezys, Kedainiai, and Siauliai), are wetlands, containing massive concentrations of waterfowl. Therefore, the risk of bird strikes is lately growing and extending throughout the seasons of the year, covering all the cycles of bird life. This is of great importance taking into account that bird strike problem is not being solved in the country subject to insufficient financing and low public awareness, lack of knowledge in certain institutions, including the Ministry of Transport, and Lithuania's major airports. Unfortunately, the growing number of bird strikes in the country requires appropriate measures for problem solution (Zalakevicius, 1994). The analysis made by us shows that most collisions between birds and aircraft are recorded in airports and adjacent territories at a certain time of the day and season (seasonal bird migrations), when hatch leave the nests. Small wetlands, water basins, ponds at airports and in their territories accumulate great numbers of birds (Palanga, Siauliai, Nida, and Kaunas airports in particular). The basic measures for bird strike reduction are as follows: regulation of the bird number in airports, various methods of bird catching and scaring away, educating aircraft crews and staff of flight management services, forecasting bird accumulations and migratory flyways, efficient transfer of information, mastering the method of bird recognition by a radar on screens, and so on. It is very important at the moment that Lithuania is in the process of the integration into the EU.

The National Environmental Strategy points out a number of priority actions in one way or another relating to the conservation of wetlands and aquatic areas. The action plan for the protection of coastal ecosystems focuses on establishing a legal-institutional foundation for the protection of these ecosystems. Immediate objectives are: to adopt the law on fishery, develop

regulations on coastal protection, ratify the Bonn Convention, develop legal basis for the protection of fish spawning grounds, identify and give legal protection to fish spawning grounds as well as bird wintering and staging areas, establish a network of strict nature reserves, state managed reserves and Ramsar sites by the Baltic Sea and Curonian Lagoon, to preserve the most ornithologically valuable ecosystems and habitats. The coastal zone of the Baltic Sea and Curonian Lagoon is the hot point where competing interests of many branches of economy (marine navigation, fishery, recreation, transport, energy sector etc) meet, what has an adverse impact upon biodiversity. Proposals on combined management, use and protection of the coastal area will be included into the project on integrated coastal zone management and the general plan of Klaipėda District, which is currently under way. These projects should include measures for preservation of wetlands with their biological significance. An important task is the formation of a scientific basis for the rational use of coastal natural resources and preservation of their biological values.

One of the largest international airports is situated on the coast of the Baltic Sea near Palanga resort. This coastal zone is the territory holding the largest concentrations of waterbird and seabird species, which are the most dangerous groups to aviation. Millions of birds cross the coastal zone, including this airport, during the spring and autumn migration.

Nemunas River Delta Regional Park situated on Lithuania's coastal zone provides breeding grounds for 40 rare and endangered bird species included into the Red Data Book of Lithuania (Greylag Goose, Black-tailed Godwit, Curlew, Bearded Tit, Avocet, Shelduck, Aquatic Warbler, White-tailed Eagle, Eagle Owl, etc). It was determined that during the migratory season this park constantly holds internationally important accumulations of 14 waterfowl species meeting the criteria of the Ramsar Convention. Inshore marine waters at the Palanga coast are extremely important as wintering quarters for several seaduck species, e.g. Steller's Eider, Long-tailed Duck, and Common Scoter. This site regularly supports several bird species, included into the Red Data Book of Lithuania (Black and Red-throated Divers, Red-breasted Merganser, and Goosander). The northwestern part of Curonian Lagoon contains the largest breeding colony of Cormorants in Lithuania, a large colony of Grey Herons, breeding sites of the Shelduck included into the Red Data Book of Lithuania. The site is particularly important for migratory populations of Whooper and Bewick's Swans, migratory Mergansers, and the largest flocks of wintering Goosanders and Smews.

Several Lithuanian areas, particularly certain sites of Curonian Lagoon, the area of the Nemunas River Delta, and large lakes of southern Lithuania are of a major importance as staging grounds for 14 waterfowl species. Geographical location of these areas is essential as they are situated on the

main Eastern Atlantic Flyway which connects the northern breeding grounds with wintering quarters on the coastlines of the White and Baltic seas.

On a relatively small Lithuanian coastal area, there are some major resorts of international importance for wintering waterfowl populations. Lithuanian marine waters and Curonian Lagoon are particularly important to wintering populations of seaducks and divers. These birds frequently perform large-scale weather-induced movements.

Constant numbers of Razorbill, divers, Black Guillemot, Long-tailed Duck, and Velvet Scoter are recorded in offshore shallow waters already in late October-early November. Usually, the major portion of wintering waterfowl and seabird concentrations is formed of Velvet Scoter (about 48 thousand birds in regular winters) and Long-tailed Duck (23.5 thousand birds). Wintering Common and Herring Gull populations in the Lithuanian sector of the Baltic Sea are found to be much more numerous than considered earlier, i.e. amounting at 10-15 thousand birds of each species. During severe winter periods this group of seabirds almost completely abandons offshore waters of the southeast Baltic Sea. A large-scale influx of wintering Velvet Scoter, Long-tailed Duck, and divers occur in far offshore Lithuanian marine waters under severe winter conditions. More than 930 thousand Long-tailed Ducks and over 740 thousand Velvet Scoters were estimated in the study area after the Gulf of Riga was ice-covered in mid-February 1994.

The coastal and offshore marine waters of the Curonian Spit are of a vital importance for wintering populations of Velvet Scoter and Long-tailed Duck. The main wintering areas of both the species in the Eastern Baltic are found just off the average sea-ice limit. It is evident that the extent of the sea-ice distribution and food availability seem to govern their wintering pattern (Zalakevicius, 1995; Zalakevicius et al., 1995).

The other recently obvious and important factor that influences the growth of bird wintering concentrations is global climate change. Under climate change, the number of wintering birds lingering closer to their breeding sites tend to grow, and in recent years increasing numbers of wintering birds can be observed on the Lithuanian Baltic Sea coast and economic zone of the Baltic Sea (Zalakevicius, Svazas, 1997).

In 1999, the Government without the ornithological expertise of the existing situation initiated the enlargement and reconstruction of Nida airport. Nida airport is located on the Curonian Spit on the coast between Curonian Lagoon and the Baltic Sea. The main feature of this airport is the highest degree of danger caused by birds to flight safety in aviation. Paradoxically, it is the motive of environmental protection rather than flight safety that has won to stop the reconstruction of the airport. (Law on Environmental Impact

Assessment of the Republic of Lithuania with amendments provides regulations for the evaluation of a proposed development which may have a negative impact on the environment and also to regulate the relationships between the parties involved in the process. The Ministry of Environment is a competent authority involved in the assessment of the impact of economic activities on wetlands). This is a very good illustration of information gaps in solving the bird strike problem in Lithuania.

Considering aviation safety requirements imposed on existing airports and those being built or reconstructed, wetland management must be adjusted to multiple aspects of various sectors including air transport and environment. Legislation, harmonisation, and compatibility of laws, legal acts, etc. must play one of the most important roles in the matter. Unfortunately, there is a lack of the related legislation in the country. As in all the CEE countries, environmental problems and their solution regarding the sustainable usage of wetlands are predominant in Lithuania. It is protection rather than ideas of sustainable development or regulation that predominates.

Being highly valuable ecosystems, wetlands must be protected on regional and country's scale based on several international conventions. In individual cases, however, they could be regulated on local scale taking into account requirements of flight safety in aviation in certain areas of increased danger, those of land reclamation in agriculture, extraction of natural resources, etc. Protected areas cover about 11% of Lithuania's total territory. The figure could be increased to some extent by protecting the most valuable areas, including wetland ecosystems. This process, however, has its limit. It must be interpreted based on the sustainability of human activities, requirements imposed on various sectors.

The current situation has to be improved. A weighty contribution could be made by the IBSC support, sharing experience of EU countries, and through arranging seminars, conferences, and schools in CEE countries, initiating financing for publishing public-aimed editions, producing educational public-aimed films, public notification, scientific research and monitoring, training and education, promoting public awareness, etc. Insufficient financing, lack of understanding on the part of the government, insufficient public notification, neglecting requirements of international organisations (ICAO), and absence of interest co-ordination are the main obstacles in the problem solution. The existing situation is well illustrated by the list of participants and reports from CEE at IBSC conferences.

## **References**



- Kunskas R. 1985-1986. Peat formation and mineralization of marshes, the state of their stocks. *Geographical Chronicle*. Vilnius, Lithuanian Geographical Society, pp.40-58 (in Lithuanian).
- Maltby E. 1992. Towards practical policies of wetland conservation and wise use. *Proceedings of the Wetland Forum*, Hokkaido, Japan, pp. 270-283.
- Mitsch W.J., Gosselink J.G. 1993. *Wetlands*. Second Edition. New York: Van Nostrand Reinhold.
- Moller H.S. 1992. Conservation of wetlands in Denmark – legislation and administration. *Proceedings of the Wetland Forum*, Hokkaido, Japan, pp. 243-248.
- Moser M. 1992. The conservation of wetlands and wetland biodiversity – an international perspective. *Proceedings of the Wetland Forum*, Hokkaido, Japan, pp.197-204.
- Tiner R.W. 1984. *Wetlands of the United States: Current Status and Trends*. United States Fish and Wildlife Service; Washington DC, USA.
- Weller M. 1981. *Freshwater marshes: Ecology and Wildlife Management*. Minneapolis: University of Minneapolis Press.
- Zalakevicius M. 1994. Bird strike analysis in Lithuania. *Proceedings and Working papers of BSCE-22*. Vienna. p. 189-196.
- Zalakevicius M. 1995. Bird migration. Lithuania's environment. Status, processes, trends. Vilnius, p. 84-85.
- Zalakevicius M., Svazas S., Stanevicius V., Vaitkus G. 1995. Bird migration and wintering in Lithuania. Institute of Ecology, Vilnius, *Acta Zoologica Lituanica. Ornithologia* vol. 2 pp. 252.
- Zalakevicius M., Svazas S. 1997. The impact of global climate change on wildlife in Lithuania: theoretical and practical aspects. Institute of Ecology, Vilnius, *Acta Zoologica Lituanica. Ornithologia* 6:14-19.