The English translation of the

Hungarian National Action Plan for Lesser White-fronted Goose (*Anser erythropus*)

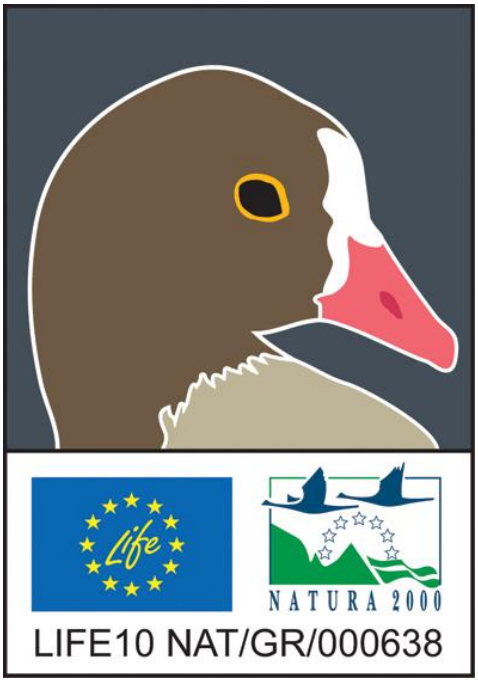
Originally published online by the Ministry of Rural Development, Hungary in 2013 and as a Special Edition of the Calandrella journal in 2014

Translation: Hortobágy National Park Directorate, Balázs Deák

Suggested reference to the original title:

Bogyó, D., Ecsedi, Z., Tar, J., Zalai, T. (2014): A kis lilik (*Anser erythropus*) magyarországi fajmegőrzési terve. [Hungarian National Action Plan for Lesser White-fronted Goose (*Anser erythropus*).] Calandrella. Special Edition 17: 1-92.

The present EU Life+ project "Safeguarding the Lesser White-fronted Goose Fennoscandian population in key wintering and staging sites within the European flyway" (LIFE10 NAT/GR/000638) is coordinated by the Hellenic Ornithological Society, from 2011 to 2016, in collaboration with the Forest Research Institute of the National Agricultural Research Foundation - Greece, the Ministry of Environment, Energy and Climate Change - Greece, the Bulgarian Society for the Protection of Birds (BSPB), the Hortobágy National Park Directorate - Hungary, UNEP/ African - Eurasian Migratory Waterbird Agreement Secretariat (AEWA), WWF Finland and the Natural Heritage Services of Metsähallitus - Finland, with the financial support of the European Commission and the co-financing of the Directorate of Nature management (Norway).



Editor: Ministry of Rural Development, State Secretariat for Environmental Affairs, 2013

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Contents

Hungarian National Action Plan for Lesser White-fronted Goose (*Anser erythropus*)

0. Summary

The Lesser White-fronted Goose (*Anser erythropus*) is a Palearctic, globally vulnerable species with a declining population trend. The conservation of the species requires international cooperation because it is a long-distance migrant. The aim of the Hungarian National Action Plan (NAP) for the Lesser White-fronted Goose is to collect all the current knowledge (national and international) about the species, and to describe the actions required to protect the species effectively in Hungary. By implementing the actions described in the NAP, Hungary will substantially contribute to the international conservation target to save the species, and especially the critically endangered Fennoscandian Lesser White-fronted Goose population. This NAP was prepared in the framework of an EU LIFE+ Project – coordinating beneficiary: Hellenic Ornithological Society (LIFE10 NAT/GR/000638) – in the cooperation of the Hungarian National Lesser White-fronted Goose working group.

Population monitoring data and other recent research shows that practically the entire Fennoscandinavian Lesser White-fronted Goose population concentrates in Hungary during the spring and autumn migration periods. The Hortobágy National Park with adjacent areas is an international hot-spot area for the conservation of the species, while scattered, sporadic occurrences of the species are registered all over the country at traditional goose stop-over sites during the migration and wintering periods. We believe that these scattered single individuals or small numbers of Lesser White-fronted Geese registered in various parts of country outside Hortobágy are mostly originating from the Western main population of the species, breeding in Russia.

Based on the Hungarian Lesser White-fronted Goose Database, produced during the NAP preparation process, the numbers of migrating Lesser White-fronted Geese have been declining in the period between the 1960's and the 2010's by 90%. During the latest 3-5 years the population seems to have been stable or even slightly increasing.

The diet analysis of the Lesser White-fronted Goose, based on literature data and recent research (both field botany and seed germination analysis from droppings), is an important part of the NAP. In the Carpathian Basin in Hungary, the Lesser White-fronted Geese prefer alkaline steppe areas, adjacent alkaline wetlands and fishponds. It is important that these grasslands are managed by grazing and that the wetlands have shallow water level during the migration periods of the Lesser White-fronted Goose.

The Lesser White-fronted Geese of the Fennoscandian population prefer natural habitats, and only rarely feed on agricultural lands. Therefore, effective protection and adequate management of the natural biotopes at the Hortobágy National Park is of vital importance for the conservation of the species. On the contrary, the individuals supposed to be originating from the Western main population mainly feed on agricultural lands, mixed with large flocks of White-fronted Geese (*Anser albifrons*).

The NAP lists and ranks the current threats for the species in Hungary: transformation of roosting and feeding sites (critical), inadequate management of roosting and feeding sites

(high), postponement of the reconstruction of former roosting and feeding sites (high), agricultural disturbance (medium), hunting activity (medium), disturbance of animal origin (low), uncontrolled visitors of roosting and feeding sites (low), controlled visitors of roosting and feeding sites (low), poisoning (low), genetic impoverishment (low).

The most important part of the NAP document is the Action Plan which describes the relevant conservation actions to tackle the main threats for the species in Hungary. The Action Plan describes conservation actions both for the Fennoscandian and Western main population.

1. Preface and history

The Lesser White-fronted Goose (*Anser erythropus*) (hereafter LWfG) is a vulnerable species (BirdLife International 2012), its conservation needs international joint efforts. The LIFE programme is an intention of the European Union, which provides financial resources for nature conservation and environmental protection since 1992. This type of support is available since 2001 in Hungary. Until now, 48 Hungarian LIFE projects were supported – 31 of this projects targeted nature conservation issues. In the framework of the LIFE+ project structure a new project – titled: „Safeguarding the Lesser White-fronted Goose Fennoscandian population in key wintering and staging sites within the European flyway" (LIFE10 NAT/GR/000638) - started from 2011 and lasts to 2016 to protect the LWfG. The main beneficiary of the project is the Hellenic Ornithological Society (Greece), while the Hortobágy National Park Directorate (Hungary) (hereafter HNPD) participates as a co-beneficiary (WWF Finland 2013). The prelude of this project happened between 2005 and 2009 as a LIFE Nature project: „Conservation of Lesser White-fronted Goose on the European migration route" (LIFE05 NAT/FIN/000105). The main beneficiary of this project was the WWF Finland, while HNPD participated also as a co-beneficiary (Petteri *et al.* 2009).

The Action A.8. of the current project mentioned above sets a goal of the assessment of three national action plans (Bulgaria, Greece, and Hungary). These plans need to evaluate the actual status of the species in the different countries through the analysis of the main threats and need to determine the species conservation actions. During the elaboration of the action plan national (both on governmental and NGO level) and international stakeholders must be involved, especially the Secretariat of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA). According to the description of the Action A.8., the HNPD established a national LWfG species conservation expert group. The communication platform of the species conservation expert group is an email list (kislilik@lists.hnp.hu), created and maintained by the HNPD. 22 experts of this group held a meeting between the 3rd and 5th April 2013 in Balmazújváros (Hungary). The species conservation expert group actively participated in the assessement of the National Action Plan. The finalisation of the plan ends with attaining the declaration of endorsement by the Ministry of Rural Development.

The LWfG has an international single species action plan (hereafter ISSAP) (Jones *et al.* 2008), and has national action plans in the following countries: Estonia (Toming 2012), Finland (Ministry of the Environment 2009), Greece (Kazantzidis & Nazirides 1999, the competent

Ministry has not endorsed the document and needs actualisation, too), and Norway (The Norwegian Directorate for Nature Management 2011). In Hungary, there are three national action plans targeting birds (Red-footed Falcon, Great Bustard, Kentish Plover) (Ministry of Rural Development 2013), while regarding migratory species, the LWfG National Action Plan is the first example.

2. Biology of the Lesser White-fronted Goose

Taxonomy

Phylum: *Chordata*

Class: *Aves*

Order: *Anseriformes*

Family: *Anatidae*

Tribe: *Anserini* (Vigors, 1825)

Species: *Anser erythropus* (Linnaeus 1758)

In spite of the wide distribution area of the species, no subspecies are recognised. However, the latest genetic studies described three distinctive wild populations (Ruokonen *et al.* 2004; Ruokonen & Lumme 2000), which need to be treated separately from a nature conservation perspective. More about the three distinctive populations can be found in the *Population dynamics* chapter.

Identification

During field observation, the separation of the LWfG and the Greater White-fronted Goose (*Anser albifrons*) (hereafter GWfG) is very difficult. The similar colour, the white blaze, the behaviour and the co-occurrence in mixed goose flocks makes the identification even more difficult.

The bill of the LWFG is vivid pink with a bone coloured point at the end of the bill. The bill is short and thick, its length is maximum the half of the diameter of the head. The head is round shaped with steep forehead. The white blaze of the LWfG goes high up to the crown and ends pointed there. From the side, this white blaze goes up to the line of the eyes in a straight line, then brakes to the direction of the eyes, from where it goes up to the crown (in the case of the GWfG this is always a straight line, without any curve). The eye of the LWfG is dark with a vivid yellow eye-ring around. GWfG also can have a pale yellow eye-ring, but never as bright and thick as the eye-ring of the LWfG. The neck is short, from the middle with a chestnut-brown tone, which goes up to the lower part of the head. The colour of the body is brownish with a lighter tone at the bottom part. The end of the contour feathers are lighter coloured, which makes the birds a bit striped. On the belly of the adult birds you can find irregular black patches, which are not going upwards on the side of the body. These belly patches are different on every

individual, two same coloured birds could not be found. At the edge of the side of the body and the wing you can see a thin white stripe, which clearly differs from the darker body side. From greater distances, the most useful identification key is the length of the bill and neck, which do separate the two species mentioned above. The end of the folded wings are clearly longer than the tail, however there are individual differences during moulting or because of other reasons, thus this key might be misleading. The legs are short and vivid orange coloured. There is only a very slight difference between males and females. Males are usually stubbier with thicker neck, more vivid colours and larger white blaze on the head. Separating sexes is usually possible only during the observation of pairs or families. The size and shape of the juvenile birds (first winter plumage) is similar to the adults. They do not have belly patches or white blaze on the head, their eye-rings are paler yellow and the body colour is not as vivid. The white blaze on the head starts to develop by late autumn or winter, when juvenile birds move together with the adults (parents). During spring, the 2cy birds can be identified based on the coverts of the contour feathers, however, because of the general field conditions, there is a little chance to observe these keys on the birds in Hungary. Most of the keys are not visible during flight, in this case the short neck and bill, the smaller size and the higher-pitched call can help to identify the species (Tar & Ecsedi 2001). The most important key during flight is this high-pitched call, which should not be mixed up with the unusual high-pitched call of some GWfG (xeno-canto 2013).

In general, finding an LWfG in a dense waterbird flock is very difficult, because they usually move separately or in smaller groups between thousands of geese. The smaller LWfG can be covered by GWfG or even by mallards (*Anas platyrhynchos*) easily. The yellow eye-ring of the LWfG should be visible by normal field conditions from a distance of 200-300 metres. Because of the difficulties of the identification, taking the keys of the GWfG in account, it's very important to see all the important key before final identification. The round shaped head, the steep forehead, the short bill and neck, the small size are the most typical keys, as well as the yellow eye-ring and the white blaze running up to the crown by the adults. On the other hand, these keys on their own are not enough for proper species level identification (Tar & Ecsedi 2001).

Because of the bad weather and light conditions during migrations, and also because of moving in mixed flocks, the species level identification of the LWfG requires long time experience and good quality optics. Therefore, Hungarian unaccepted data (not revised yet) from the 19th century and the first half of the 20th century, need to be handled with reservations. The work of Tar & Ecsedi (2001) can help species identification on the field with many figures and more detailed descriptions.

Population dynamics

The previously remarkable LWfG population showed a rapid decline since the middle of the 20th century on a global level. The total European population (together with the European parts of Russia) was estimated 100 000 individuals during the 1960's. The excessive hunting and the degradation of the natural conditions of the habitats at breeding and stopover sites had a harmful

effect on the species (Toming 2012). Based on field data the total Russian LWfG population was estimated 100 000 individuals, however in the 1980's only 30 000 individuals were found on the wintering sites of the Caspian region. At that time experts suspected that the Western and Eastern Main populations declined drastically. In February 1996, during the partial count in Azerbaijan, only 1085 individuals were found by the experts (Madsen 1996). According to the survey of the BirdLife, between 1998 and 2008 a population decline of 30-49% was observed (Jones *et al.* 2008).

Summarizing the information above it is evident, that during the 20th century the LWfG population declined severely. This decline was estimated more than 90% in the Western Palearctic, which resulted the division of the population into three subpopulations. The migration and wintering sites of the three subpopulations are well localised.

The recent global population estimate is about 20 000-25 000 adult individuals, from which 8 000-11 000 individuals are found in the autumn period in the Western Palearctic (Marchant & Musgrove 2011).

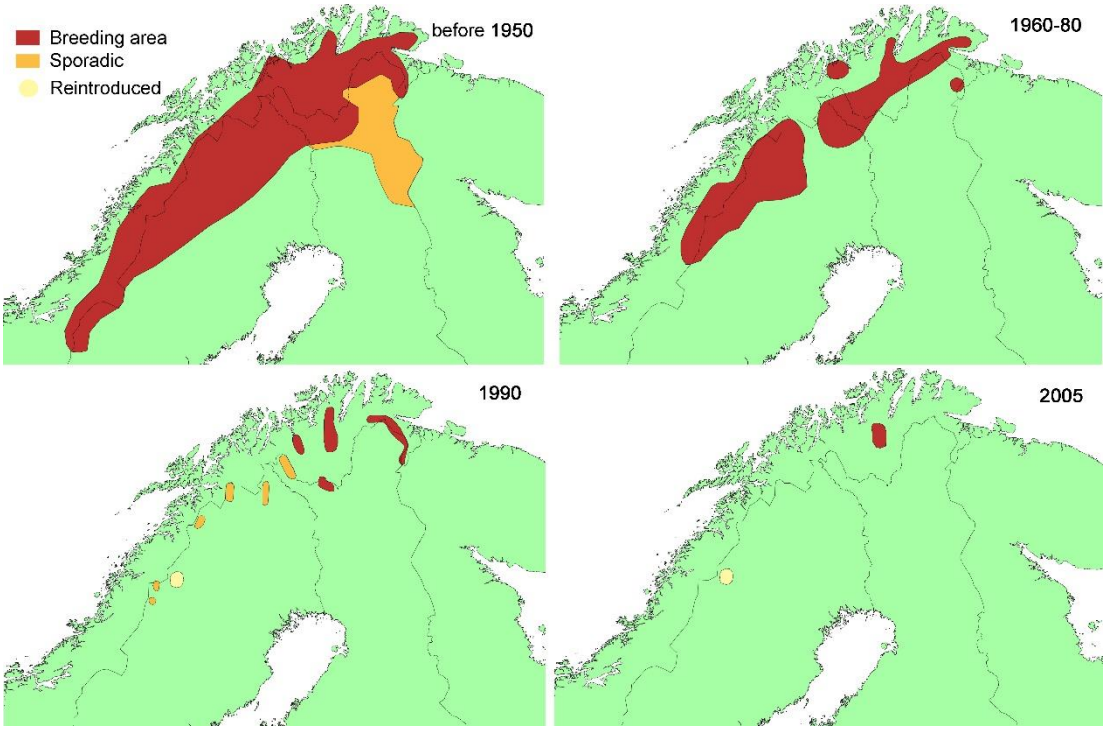

Figure 1. The dramatic decrease of the Fennoscandian Lesser White-fronted Goose population (source: BirdLife Norway).

Studies revealed, that the productivity of the LWfG is higher compared to other goose species breeding on the arctic tundras. To safeguard the population, it is essential to protect the juvenile and 2cy individuals, because of the highest mortality in these age groups (Jones *et al.* 2008).

Fennoscandian population

The Fennoscandian population, breeding in Scandinavia and on the Kola-peninsula is estimated about 20-25 breeding pairs (Marchant & Musgrove 2011). The population estimated about 10 000 individuals in the first part of the 20th century collapsed, in 1992 the total population was estimated 50 pairs. In Sweden, breeding of the original wild population was observed in 1991, while in 1996 footprints of adults and goslings were observed, and later in 1998 a male showed signs of breeding behaviour in the same area. In Finland, the last nesting was observed in 1995. Today, breeding grounds are only known in the northern part of Norway (Jones *et al.* 2008).

The decline of the population was also observed along the migratory routes. In the Hungarian staging areas, the population was estimated about 100 000 individuals during the 1950's, while a decade later 5 000, and in the 1980's only 200-600 individuals (Madsen 1996). Later, during the winters of 1992/93 and 1993/94 a growing number, 1 200 individuals were recorded from Hungary (Madsen 1996). These data should be handled with reservations, because of the quality of the available optical devices and great distances on the field. It is also worth to note, that in many cases, these data were based on the observations of the hunters. In the 1990's 55-160 individuals were observed at the Hortobágy, while after 1998, the number of individuals significantly dropped (Kovács & Tar 2004). During the 1950's in the spring staging sites in Finland hundreds of individuals were observed, while couple of decades later only 50 individuals were recorded (Madsen 1996).

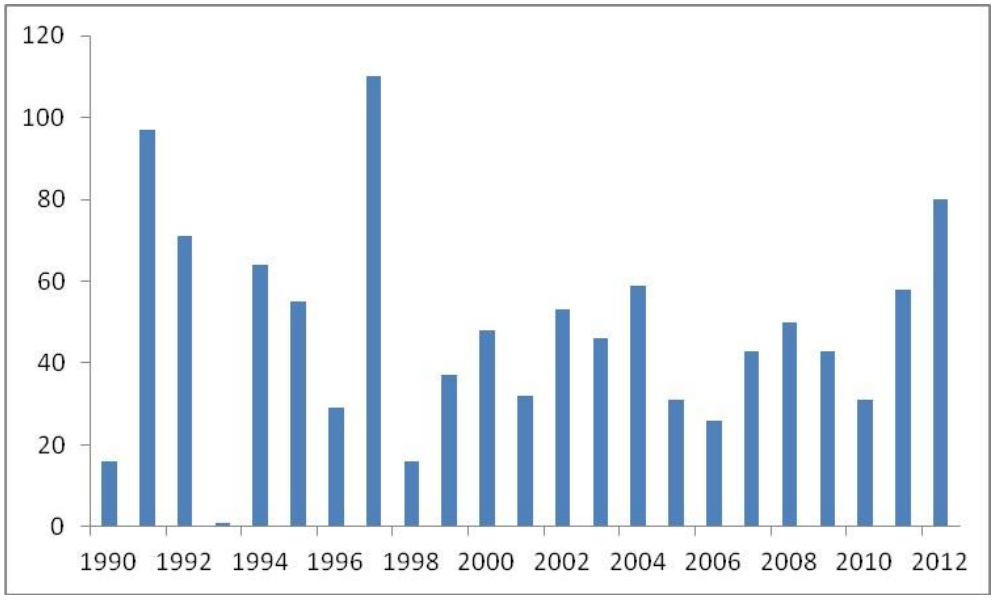

Figure 2. Maximum spring numbers of Lesser White-fronted Geese at the Hortobágy area in the years 1990-2012.

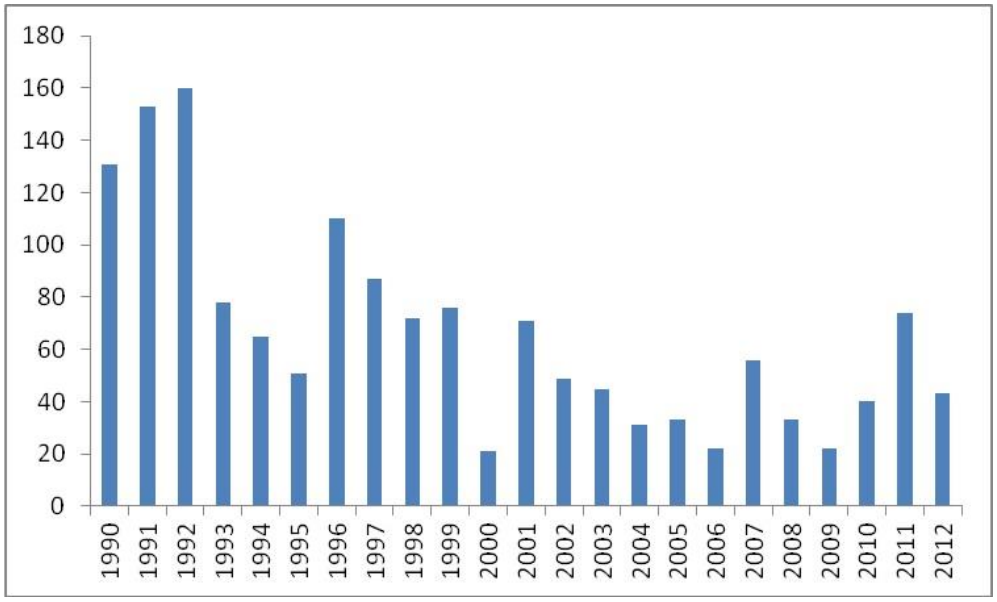

Figure 3. Maximum autumn numbers of Lesser White-fronted Geese at the Hortobágy area in the years 1990-2012.

The percentage of the juveniles migrating through the Hortobágy is changing depending on the annual productivity rate, but basically shows a declining trend.

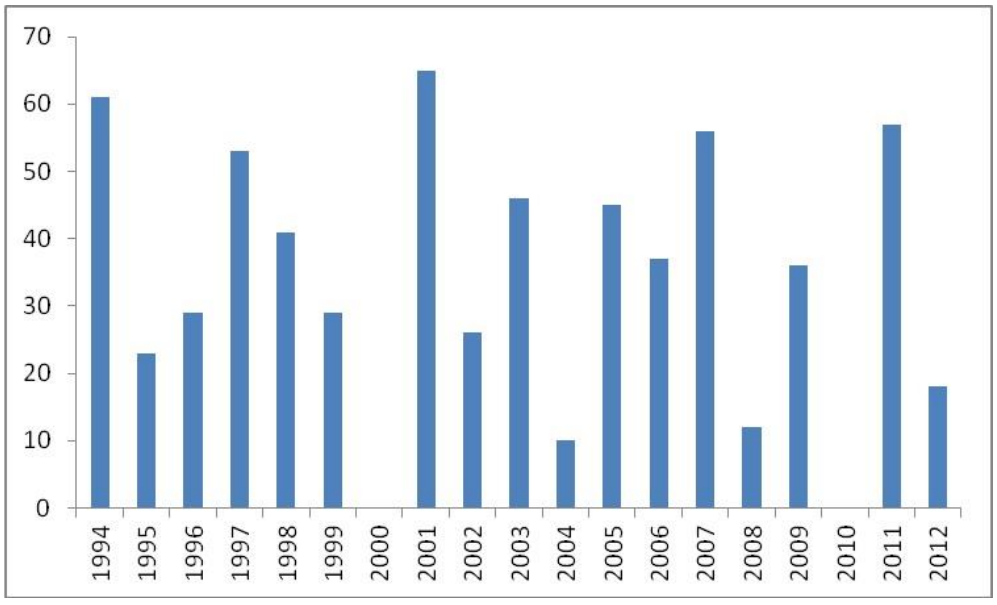

Figure 4. The percentage of juvenile Lesser White-fronted Geese at the Hortobágy area in the years 1990-2012.

Western Main population

The Western Main population consists of 8 000-13 000 individuals. The majority of the population is breeding north from the Ural Mountains on the Jamal and Taymyr peninsulas (Jones et *al.* 2008). The most recent estimates indicate 1 750 -2 550 breeding pairs. The number of the breeding pairs between the White Sea and the Ural Mountains, and the tundra areas

around the Urals is 250-400, while 350-500 pairs at the southern part of the Jamal Peninsula, 1 000-1 500 pairs at the southern part of the Taymyr Peninsula and 150 pairs along the Putorana Mountains (Marchant & Musgrove 2011).

Eastern Main population

The population estimation of the Eastern Main population is about 1 050-1 850 pairs, breeding in the Indigirka and Abyiskaya tundras of Yakutia, Eastern-Siberia. The Eastern Main population is estimated by other experts about 20 000 individuals, based on wintering site counts (Toming 2012).

Reintroduced populations

Previously the LWfG conservation projects established captive-breeding programmes, without any major results. By the end of the 1970's a captive-breeding programme was run in Swedish Lapland. The first release took place in 1981. The individuals of the breeding stock originated from waterbird collections of the UK, as foster parents Barnacle Geese were used. The goslings followed the Barnacle Geese to their wintering sites in the Netherlands, avoiding the hunting pressure. The programme was later stopped, because of the alien genes originated from GWfG and the genetic distance of the birds from the Fennoscandian population. Another captive-breeding programme was started in 1986 in Finland, but the birds released to the wild showed no breeding activity and high mortality rates. Supported by Germany a new captive-breeding programme was started in 2005, with the same goal as was in the former Swedish project: to alter the migratory route. In this project only wild-caught Russian birds were used with „clean genetic background".

Breeding

The LWfG breeds in the tundra with tundra birch forests and coastal zones of rivers and delta areas (BirdLife International 2004). They also prefer higher grounds, where wetlands/water bodies are located nearby. The nest is often built close to predators. In some years, the predation by red fox is very high. The birds mature by the third or fourth years and start breeding by then. The nest is built on the ground in a small, carefully lined hole. They lay 3-7 eggs between the end of May and the middle of June. Hatching is mainly carried out by the female birds, they seldom change with the males. During the hatching, the males are mainly guarding close to the nest. The hatching parents often visit the same feeding site during this period, usually close to wetlands/water bodies. Incubation lasts for 26-28 days. After the egg hatched, young leave the nest as soon as their plumage is dry and start to follow their parents. The young birds became able to fly after 4-5 weeks. The diet of the young birds consists mainly plants, first of all grasses. Occasionally, their diet may consist of animals. Adults start moulting when the youngs are two weeks old. After the goslings developed the flying ability, they start the migration (Toming 2012).

Migration

LWfG is a long-distance migrant, currently breeding discontinuously from northern Fennoscandia to eastern Siberia. The wintering and staging areas and the migration routes are only partially known (Jones et al. 2008).

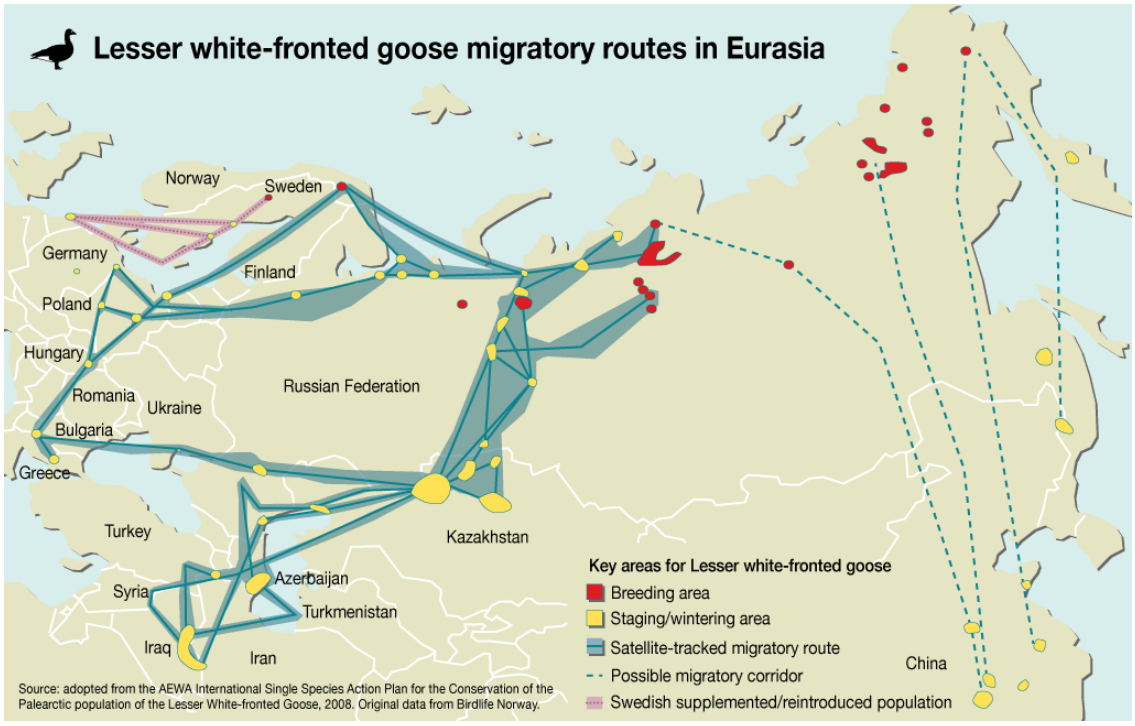

Figure 5. Key sites and migratory routes of the Lesser White-fronted Goose (source: AEWA Lesser White-fronted Goose International Working Group).

Migration of the Fennoscandian population

Satellite tracking studies revealed, that during the autumn migration non-breeding or unsuccessfully breeding birds are heading to the east to Northern Russia, to the Kanin Peninsula, to the Kolguyev Island or sometimes to the Taymyr Peninsula. The successfully breeding pairs moult at the breeding site. After moulting, the birds could follow two migration routes. Some birds head to southwest: they reach their wintering sites in the Evros-delta (Greece) through Western Estonia, Poland, Eastern Germany, Hungary and Greece (Lake Kerkini) (Ecsedi & Tar 2008). Other birds are heading to the east and turn to the south, east from the Urals. From here they follow the Ob river to Northwestern Kazakhstan and onwards to presumed Black Sea and Caspian Sea wintering areas (Jones *et al.* 2008). The most recent satellite tracking studies (2006/2007) showed, that the three tagged birds extended the wintering site in Greece through the Ob valley. During the spring migration, they extended the breeding grounds through Hungary (Hortobágy), Lithuania (Nemunas delta) and Estonia (Matsalu and Haapsalu Bay) (Toming 2012).

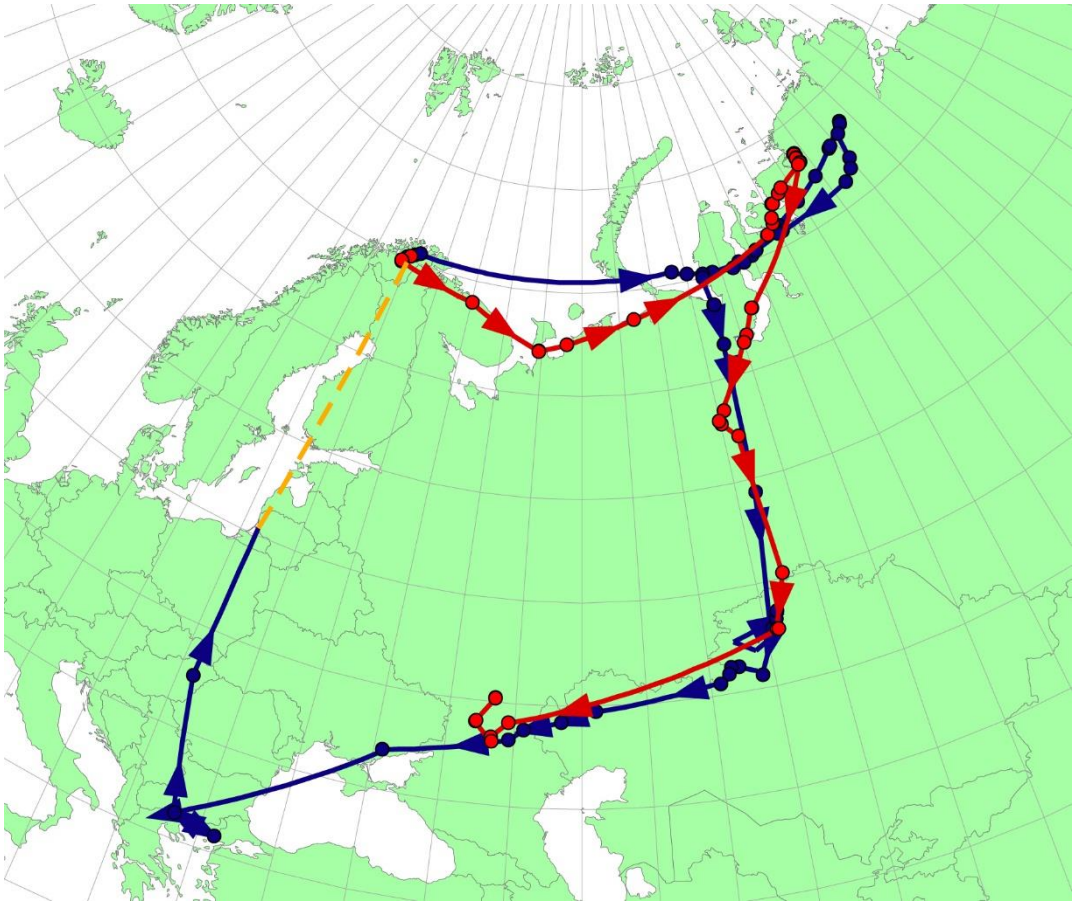

Figure 6. The migration of the Fennoscandian Lesser White-fronted Geese mapped by satellite telemetry in 2006 - 2007. The birds were captured at the Valdak marshes, Porsangen Fjord, Finnmark, Norway. The lines show the migration of two male birds („Finn" – blue, „Imre" – red) (source: BirdLife Norway).

Migration of the Western Main population

The migration of the LWfG Western Main population is still unknown, because of the difficulties of field observation. Some satellite telemetry studies provided useful results, although there are still significant gaps in the knowledge of the exact migratory route of this population. Known staging areas for birds from the Western Main population include: the valley of Ob river (Russia); the Lake Kulykol and the Sultan-Aksuat lake system (Kazakhstan). The main wintering areas are unknown but thought to be around the northern coast of the Black Sea, the southern part of the Caspian Sea, inner Azerbaijan, and the inland of Iran and Iraq. Small numbers of vagrant LWfG regularly occur in Germany among flocks of GWfG. At least some of these birds likely to belong to the Western Main population (Jones *et al.* 2008). Vast majority of the LWfG occurring among GWfG in Hungary and in the Carpathian Basin also belong to the Western Main population (MME NB 2008c).

Status and migration of the Lesser White-fronted Goose in Hungary

The LWfG is a rare migratory species in Hungary with declining number of individuals. During autumn migration, it is the earliest *Anser* species to arrive. The birds arrive to the Hungarian stopover sites in the second half of September. Some individuals regularly overwinter, first of all during mild winters. By the end of the winter, they arrive just after the melting of the snow. Majority of the individuals stays in the Carpathian Basin from the beginning of March until the middle of April. At the beginning of the 20th century, LWfG was a common migratory species with great number of individuals. Due to excessive hunting, the number of individuals decreased drastically, and since the 1980's, the LWfG is considered as a rare visitor with few individuals (Kovács & Tar 2004).

The Hungarian status of the species before the World War II can be learnt from hunting data and descriptions. Most of this information are originated from the Hortobágy. In the 1920's the species was common, but the number fluctuated yearly (Tarján 1926). According to the hunting bag data back then, the rate of the LWfG compared to all other geese was around 5-10%. Some authors described, that the species arrives and leaves very early the Hortobágy (Szomjas 1926). In spite of this, the hunting bag data from different months shows no significant difference in the rate of the LWfG (compared to other geese) (Szomjas 1935; Graefl 1934). Without exact data, the migrating LWfG population at the Hortobágy was about a couple of thousands of individuals in the first half of the 20th Century (Kovács & Tar 2004; Sátori 1938). There is no available data from this period from other parts of the country, so we can only suppose that other key sites were: Southern Great Hungarian Plain (Kardoskút, Fehér-tó (Szeged)) and the rest of the wetlands of the Great Hungarian Plain (e.g. Kiskunság, Kis-Sárrét, Vajdaság (currently part of Serbia)) (Beretzk 1947; Tarján 1908). Before the World War II, observations from other parts of the country were declared very rare (Keller 1921). There are no reliable data or analyses around the World War II, but the decline of the migrating LWfG population, together with the decline of the Fennoscandian population, could be started in Hungary, too.

Some sources report exaggerated number of individuals between 1950 and 1974 from Hungary. The reported flock sizes of thousands of LWfG individuals cannot be considered as valid data, considering the decline of the breeding popultion. On the other hand, some publications report contradictory data, too (Sterbetz 1968; Sterbetz 1976; Sterbetz 1982a; Sterbetz 1982b; Sterbetz 1985). The reason of these invalid data might be the lack of or the quality of the optical devices. During the 1960's and 1970's the number of the migrating LWfG can be estimated about some hundreds of individuals at the Hortobágy region (Kovács & Tar 2004).

From the establishment of the Hortobágy National Park (1974) until 1990 the data collection became more accurate, but still remained casual at the Hortobágy region (Kovács 1997; Kovács 1984a; Kovács 1984b; Kovács 1998; Kovács 1995). Between 1984 and 1995, the database of the Hungarian Waterfowl Monitoring Group reports exaggerated number of individuals, which are not in line with the rapid decline of the Fennoscandian population. Because of this reason, the data from this source and period are considered as invalid (Faragó 1996; Faragó 2012b).

According to the decision of the Hungarian Checklist and Rarities Committee of the Hungarian BirdLife, between 1995 and 2009, the LWfG was listed as a species, which needs to be reported. Following the international standards, LWfG data outside the Hortobágy area is only accepted after the decision of the Hungarian Checklist and Rarities Committee (Magyar 1995; MME NB 2011a). Accepted data from the period mentioned above are listed in the yearly reports of the Hungarian Checklist and Rarities Committee (Magyar 1997; MME NB 1998a; MME NB 1998b; MME NB 1999; MME NB 2000; MME NB 2001; MME NB 2006a; MME NB 2006b; MME NB 2006c; MME NB 2008a; MME NB 2008b; MME NB 2010a; MME NB 2010b; MME NB 2011a; MME NB 2011b). According to this protocol the data from the Hungarian Waterfowl Monitoring Group from the same period were not accepted (Faragó & Jánoska 1996; Faragó 1996; Faragó 1997; Faragó 1999; Faragó 2001; Faragó & Gosztonyi 2002; Faragó 2002; Faragó & Gosztonyi 2003; Faragó 2005; Faragó 2006a; Faragó 2007a; Faragó 2007b; Faragó 2008; Faragó & Gosztonyi 2009; Faragó 2010a; Faragó 2010b; Faragó 2011a; Faragó 2012b). The Hungarian Waterfowl Monitoring Group recorded data from the Hortobágy region (no need of obligatory report) in the same period, which were also not accepted, because of the exaggerated flock sizes.

Year	Date	Max. no. ind.	Area
1990	20/03	16	Nagyiván, Mérges
1991	02/04	97	Hortobágy, Hortobágy-fishpond
1992	10/04	71	Hortobágy, Hortobágy-fishpond
1993	08/05	1	Tiszacsege, Cserepes-puszta
1994	04-02/04	64	Tiszacsege, Kis-Kecskés-puszta
1995	01/04	55	Hortobágy, Hortobágy-fishpond
1996	08-09/04	29	Hortobágy, Hortobágy-fishpond
1997	22/03	110	Hortobágy, Hortobágy-fishpond
1998	31/03	16	Hortobágy, Hortobágy-fishpond
1999	11/04	37	Hortobágy, Hortobágy-fishpond
2000	04-06/04	48	Újszentmargita, Dinnyés-lapos
2001	13-19/03	32	Újszentmargita, Dinnyés-lapos
2002	27/03	53	Hortobágy, Hortobágy-fishpond
2003	13/04	46	Hortobágy, Hortobágy-fishpond
2004	09/04	59	Hortobágy, Hortobágy-fishpond
2005	04/04	31	Hortobágy, Hortobágy-fishpond
2006	26/02-09/04	26	Hortobágy, Hortobágy-fishpond
2007	27/03-05/04	43	Tiszacsege, Nagy-Kecskés-puszta; Hortobágy, Hortobágy-fishpond; Újszentmargita, Dinnyés-lapos
2008	08/04	50	Hortobágy, Hortobágy-fishpond
2009	08/04	43	Hortobágy, Kungyörgy
2010	29/03-03/04	31	Hortobágy, Hortobágy-fishponds/Ludas-rét
2011	30/03	58	Tiszacsege, Rókás
2012	05-06/04	80	Hortobágy, Hortobágy-fishpond

Table 1. Maximum spring number of Lesser White-fronted Geese at the Hortobágy area in the years 1990-2012.

Year	Date	Max. no. ind.	Site
1990	12/10	131	Hortobágy, Hortobágy-fishpond
1991	07/10	153	Hortobágy Hortobágy-fishpond
1992	10/10	160	Hortobágy, Hortobágy-fishpond
1993	30/09	78	Hortobágy, Hortobágy-fishpond
1994	10/11	65	Hajdúszoboszló, Angyalháza
1995	29.10	51	Hortobágy, Hortobágy-fishpond
1996	22/10	110	Hortobágy, Hortobágy-fishpond
1997	06/10	87	Hortobágy, Hortobágy-fishpond
1998	20/10	72	Tiszacsege, Cserepes-puszta
1999	20/10	76	Hortobágy, Hortobágy-fishpond
2000	25/09-16/10	21	Újszentmargita, Dinnyés-lapos/Hortobágy, Hortobágy-fishpond
2001	22/10	71	Hortobágy, Hortobágy-fishpond
2002	20/10	49	Újszentmargita, Dinnyés-lapos
2003	27/09	45	Hortobágy, Hortobágy-fishpond
2004	18/10	31	Tiszacsege, Rókás
2005	27/10	33	Hortobágy, Hortobágy-fishpond
2006	25/10	22	Hortobágy, Hortobágy-fishpond
2007	17/10	56	Hortobágy, Hortobágy-fishpond
2008	09/28-10/22	33	Újszentmargita, Dinnyés-lapos/Hortobágy, Hortobágy-fishpond
2009	02/10	22	Folyás, Hortobágy-fishpond
2010	24-25/09	40	Tiszacsege, Rókás/Hortobágy Hortobágy-fishpond
2011	01-03/10	74	Tiszacsege, Rókás/Hortobágy, Hortobágy-fishpond
2012	11./10	43	Hortobágy, Hortobágy-fishpond

Table 2. Maximum autumn number of Lesser White-fronted Geese at the Hortobágy area in the years 1990-2012.

The reason of this invalid data collection is the lack of or the quality of the optical devices and/or the lack of experience of the observers (Faragó & Jánoska 1996; Faragó 1996; Faragó 1997; Faragó 1999; Faragó 2001; Faragó & Gosztonyi 2002; Faragó 2002; Faragó & Gosztonyi 2003; Faragó 2005; Faragó 2006a; Faragó 2007a; Faragó 2007b; Faragó 2008; Faragó & Gosztonyi 2009; Faragó 2010a; Faragó 2010b; Faragó 2011a; Faragó 2012b). We consider the data of the Hungarian Waterfowl Monitoring Group valid from 2010 (Faragó 2011a; Faragó 2011b; Faragó 2012a; Faragó 2012b).

The accurate and regular data collection started from 1990 at the Hortobágy region (Kovács & Tar 2004; Tar 2001; Tar 2004), while invalid data were still reported from the same period from the Hortobágy and from the other part of the country, too (Sterbetz 1985, 1990).

According to the recent and valid data, since 1990 the Fennoscandian LWfG population is using only the Hortobágy (first of all the northern part of the area) as a stopover site during migration.

The LWfG individuals originated from the Western Main population can be observed all around the country at the typical geese stopover sites. This might be in accordance with the growing intensity of the monitoring work (MME NB 2008c).

Recently, the following sites have key importance regarding the occurrence and conservation of the LWfG in Hungary (alphabetical order, does not represents priority or the frequency of occurrences):

- Balaton and Kis-Balaton and surroundings;
- Bihari-sík;
- Dinnyési-fertő and surroundings;
- Felső-Kiskunság;
- Fertő and surroundings;
- Hanság;
- Hortobágy and Nagykunság and surroundings;
- Kardoskút;
- soda pans of the Kiskunság;
- Kis-Sárrét;
- Pusztaszer Landscape Protection Area;
- Tata and surroundings;
- Tisza-tó and surroundings (Tisza-tó, Hevesi-sík, Borsodi-mezőség).

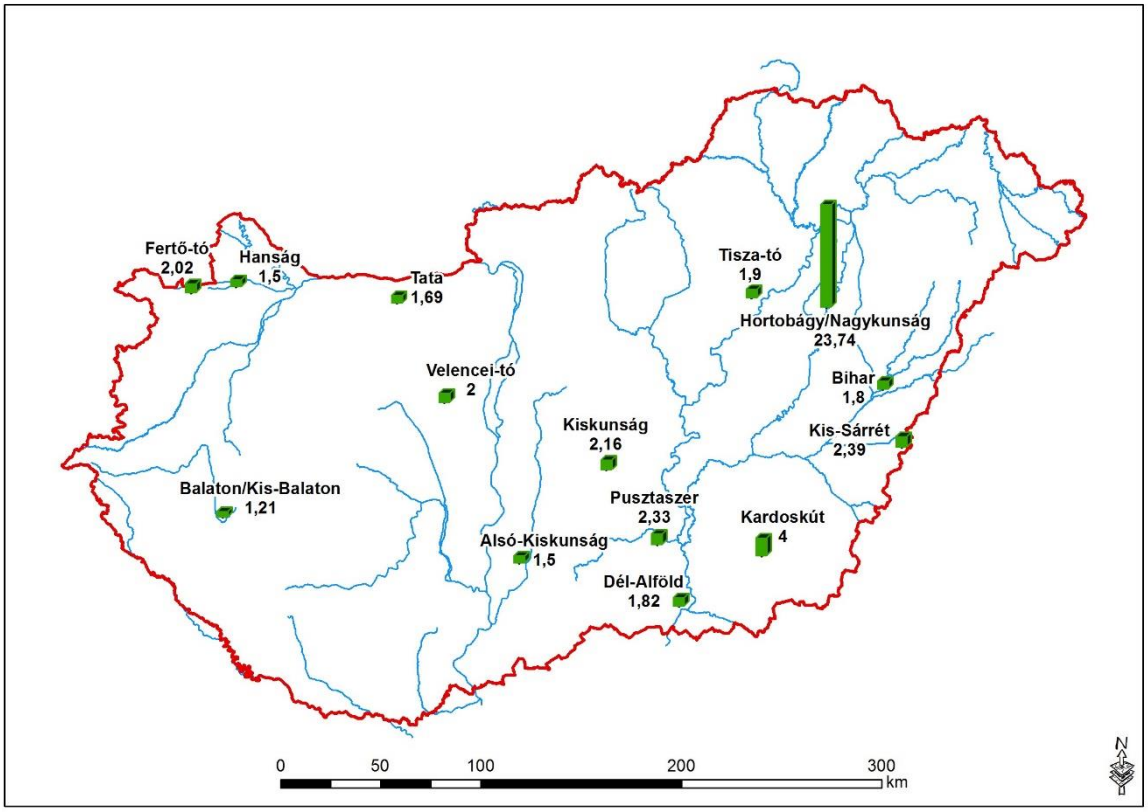

Figure 7. The average of the confirmed occurrences of the Hungarian Lesser White-fronted Goose National Database by region.

The LWfG occurs more or less regularly at the sites mentioned above. The annual counts might depend on the monitoring activity and success (Kovács & Tar 2004). Beside these sites, the LWfG has vagrant occurrences from the following sites: Rigács, Sárvíz valley, Rétszilas-fishpond, Ipoly floodplain, Bátya, Miske, Homokmégy, Tiszasüly, Kígyóspuszta, Pitvarosi-puszták, Csanádi-puszták and the Fehér-tó (Szeged).

Spring migration

The individuals of the Fennoscandian population usually arrive by the 20th March to the Hortobágy and stay there until the middle of April. Sometimes they stay until the end of April or occasionally some individuals stay until the first days of May.

Year	Spring		Autumn	
	First data	Last data	First data	Last data
1990	02/02	20/03	15/09	30/12
1991	03/01	13/04	14/09	10/11
1992	15/02	14/04	14/09	23/10
1993	26/04	08/05	25/09	30/10
1994	07/01	30/04	24/09	27/11
1995	13/02	16/04	17/09	31/10
1996	17/03	09/04	27/09	16/12
1997	25/02	03/04	14/09	09/11
1998	15/03	31/03	24/09	16/12
1999	27/02	17/04	20/09	07/11
2000	07/02	22/04	15/09	18/12
2001	13/01	30/03	25/09	25/11
2002	04/02	16/04	17/09	18/11
2003	02/02	28/04	19/09	18/11
2004	13/01	12/04	18/09	31/12
2005	13/03	18/04	22/09	29/11
2006	22/02	22/04	21/09	27/12
2007	26/01	24/04	16/09	12/11
2008	21/01	09/04	18/09	13/12
2009	28/01	10/04	02/10	22/12
2010	04/01	03/04	24/09	08/12
2011	25/01	16/04	21/09	07/12
2012	05/01	21/04	13/09	22/12
All time	03/01	16/04	13/09	31/12

Table 3. The duration of stay of the Fennoscandian Lesser White-fronted Geese during spring and autumn migration (in the years 1990-2012).

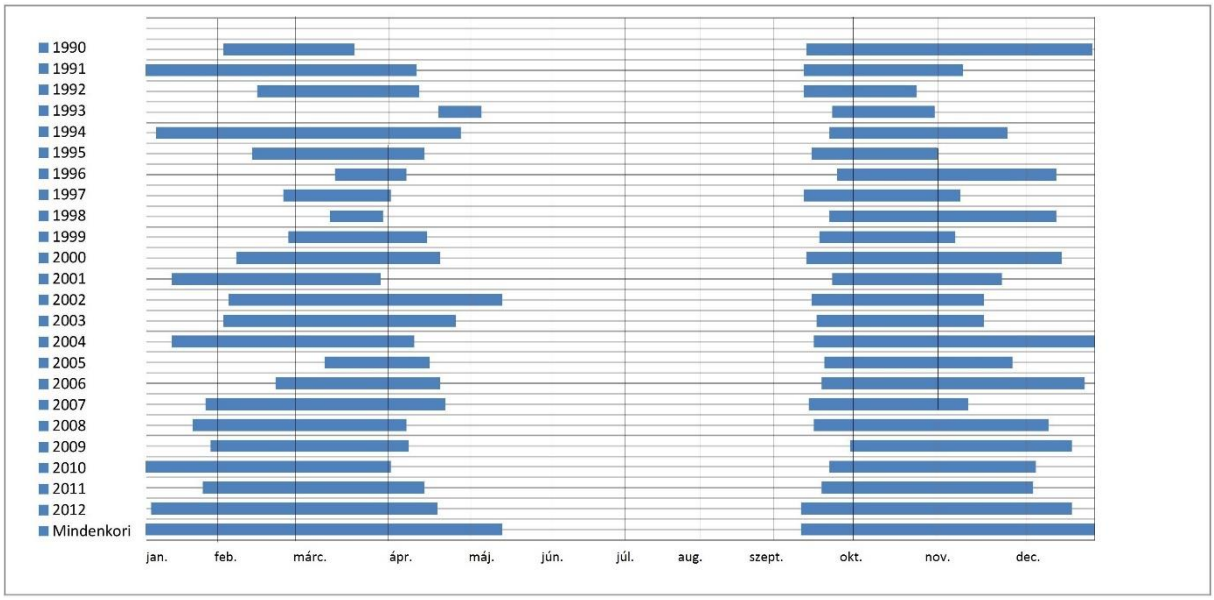

Figure 8. The duration of stay of the Fennoscandian Lesser White-fronted Geese during spring and autumn migration (in the years 1990-2012) (Mindenkori = All time).

Latest observations of the Fennoscandian population at the Hortobágy:

- 27/04/1979, 1 *ad.* pair, Nagyiván, Kismező (Kovács, G.);
- 28/04/2003, 13 ind., Tiszacsege, Kis-Kecskés-puszta (Tar, J.);
- 30/04/1994, 1 *imm.* ind., Hortobágyi-halastó (Fishpond no. III) (Zeke, T.);
- 08/05/1993, 1 ind., Tiszacsege, Cserepes-puszta (Gyüre, P.);
- 16/05/2002, 1 *imm.* ind., Hortobágy, Hortobágyi-fishponds (Kondás-fishpond) (Konyhás, S.).

Autumn migration

The LWfG is the first goose species to arrive to Hungary. The first flocks of the Fennoscandian population usually arrive around 20th September. The migratory peak is between 10th and 25th October (Kovács & Tar 2004).

The earliest autumn observations of the Fennoscandian population at the Hortobágy:

- 14/09/1991, 21 ind. (9 *ad.*, 12 *juv.*), Hortobágy, Hortobágy-fishponds (Fishpond no. XI) (Zeke T.);
- 14/09/1992, 5 ind. (2 *ad.*, 2 *juv.*), Hortobágy, Hortobágy-fishponds (Fishpond no. XI) (Kovács G.);
- 14/09/1997, 7 ind., Hortobágy, Hortobágy-fishponds (Kondás-fishpond) (Tar J.);
- 15/09/1990, 10 ind., Hortobágy, Hortobágy-fishponds (Gyüre P., Zeke T., Zöld B.);
- 15/09/2000, 6 *ad.* ind., Hortobágy, Hortobágy-fishponds (Zöld B.);
- 16/09/2007, 31 ind. (20 *ad.*, 21 *juv.*) Hortobágy, Hortobágy-fishponds (Fishpond No .VI) (Oláh J., Simay G.);
- 17/09/1995, 1 ind., Hortobágy, Hortobágy-fishponds (Fishpond no. VI) (Harangi M., Tar J.);
- 17/09/2002, 19 ind., Hortobágy, Hortobágy-fishponds (Tar J.);
- 18/09/1988, 6 ind., Hortobágy, Hortobágy-fishponds (Gál A.);
- 18/09/1989, 20 ind., Hortobágy, Hortobágy-fishponds (Fishpond no. V) (Kovács G.);
- 18/09/2004, 22 ind., Újszentmargita, Dinnyés-lapos (Ecsedi Z., Tar J., M. Watson, Oláh J., Tihanyi G.).

The arrival of the individuals from the Western Main population is usually about the beginning of November, however some birds might arrive at the end of October. The length of their stay depends on the weather conditions. They leave the Carpathian Basin usually after the first hard frosts and/or permanent snow coverage, together with the GWfG flocks.

Wintering

Wintering could be interpreted only in the case of the Western Main population, because by that time the fennoscandian birds leave the region. During mild winters, LWfG could be observed at almost all of the important goose stopover and wintering sites. We assume that these individuals originated from the Western Main population. Usually single individuals, pairs, occasionally juvenile birds and families overwinter in Hungary.

Diet

In Hungary, the LWfG feeds at three habitat types. First and foremost: short grazed, and freshly grown, alkaline grasslands. Secondly, pioneer/temporary mud vegetation of the lakebeds of the roosting sites. The third type of habitats are freshly sown arable-field and stubble fields. Data on the diet of the species were collected through field observations, stomach content analyses and special research (e.g. seed germination from droppings). We present this data by the collection method.

The names of the associations follow the work of Borhidi (2003), while species names follow the work of Simon (2000).

Field observations and field research

LWFG feeds on plant, mainly grasses (*Poaceae*). During the breeding period the diet is dominated *Empetrum nigrum* and sedge species (*Carex sp.*). At the sites in Finland and Norway, the most important food sources were the grasses (*Poaceae*), *Phragmites australis*, and bulrush (*Cyperaceae*). At other staging sites of the migratory routes, the species visits large sized, opened and grazed alkaline grasslands and marshes to feed (Toming 2012).

The LWfG is connected to the alkaline short grassland associations (Festucion pseudovinae) during their stay in the Carpathian Basin. This kind of steppe habitat is mainly located in Eastern-Hungary, which explains the frequent occurrence of the species in this region (Sterbetz 1968; Sterbetz 1978).

The Fennoscandian LWfG population usually uses a smaller area during the stay in Hungary than other goose species do, and they mostly feed in a single homogeneous flock (Lengyel *et al.* 2012). In Hortobágy, Biharugra and Kardoskút LWfG usually feed within a circle of 5-6 km (diameter). During early spring and wet autumn periods – when freshly grown grasses are available in a big quantity - LWfG do not leave their night roosting areas and feed on the freshly grown mud vegetation of this habitats. LWfG require steppe habitats and come together at this areas. Because of this reason, for LWfG it is unnecessary to leave their roosting sites during their daily movements. The only case when LWfG fly further than the distances mentioned above is when they are mixed with other geese with higher abundance. On the contrary, at the same time and place GWfG were feeding within a circle of 10-20 km (diameter), sometimes up to 20-70 km (Sterbetz 1978).

Summarizing his 200 observations between 1940 and 1970, Sterbetz (1990) also concluded that LWfG were feeding mainly on alkaline short grasslands (64%) and also on freshly grown mud vegetation of fishponds (18%) and freshly grown cereals (18%) in Hortobágy, Biharugra and Kardoskút.

Kovács (1990) summarized his observations of the feeding habit of the Fennoscandian flock (20-82 individual) staying at the Hortobágy-fishpond no. V between 18/09/1989 and 6/10/1989. The daily routine of the birds was as it follows: they grazed mainly on the alkaline short grassland associations near the fishpond, but before the daily rest around noon they also fed on the drier mud surfaces of the pond (*Echinochloa crus-galli*, knotweed - *Polygonum spp.*). It was also observed, that the regular feeding outside of the fishpond(s) was replaced by grazing on the mud vegetation of the fishpond no. V, which offered enough food for the whole day.

According to Kovács & Tar (2004) the Fennoscandian LWfG population prefers to feed at the drained fishponds, surrounded by short grazed alkaline grasslands, and littoral zones of alkaline wetlands with freshly grown vegetation. In the Dinnyés-lapos wetland LWfG preferred the littoral zone dominated by sand-spurrey (*Spergularia* spp.). The autumn rains support the regrowth of the alkaline grasslands (dominated by *Festuca pseudovina, Puccinellia limosa, Poa bulbosa*) and attract LWfG flocks. In the case of drier seasons, they also prefer the pioneer mud vegetation (e.g. knotweed - *Polygonum spp.*, sorrel/dock - *Rumex spp.*, *Echinochloa crus-galli*).

Sometimes the Fennoscandian LWfG also feed at croplands (maize stubble, autumn cereals and rape), but only if they are mixed with other geese (mainly GWfG).
Between 2005 and 2009, in the framework of the former LIFE project Action D.1. geese were supported through providing crops (maize and wheat) and managing extensively cultivated croplands (maize and wheat) by stem-crushing within the borders of the Hortobágy National Park. These places attracted mainly Greylag Goose (*Anser anser*) and Common Crane (*Grus grus*) flocks, LWfG visited these sites occasionally. These findings are in accordance with the former observations of Sterbetz (1978). In 2012 and 2013, within the framework of the new LWfG LIFE+ project (LIFE10NAT/GR/000638) a new study was carried out about the botanical aspects of the diet and droppings of the LWfG at the Hortobágy (Valkó et al. 2013). The study summarizes the habitat types of the feeding sites at the Hortobágy as it follows:

- Alkaline short grasslands dominated by *Festuca pseudovina* and *Artemisia santonicum* (Artemisio-Festucetum pseudovinae association)
- Alkaline short grassland dominated by *Festuca pseudovina* and *Achillea collina* (Achilleo- Festucetum pseudovinae association)
- Heavily grazed, species-poor alkaline wet meadows (Agrostio-Alopecuretum pratensis association
- Open vegetation patches characterized by forb species (*Rumex cripus, Rorippa kerneri, Polygonum lapathifolium*) in alkaline wet meadows
- Open alkaline grasslands (Puccinellietum limosae association) dominated by *P. limosa* and annual forbs (*Matricaria chamomilla, Lepidium ruderale, Myosurus minimus*).
- Temporal mud vegetation (Nanocyperetalia) characterised by pioneer weedy species (*Polygonum lapathifolium, Chenopodium* spp.) and aquatic plants (*Nymphoides peltata*)

Cover scores of vascular plant species in the different associations were recorded in 2x2-m sized plots:

	ARF/1	ARF/2	ARF/3
Total vegetation cover (%)	35	40	75
Alopecurus pratensis	0	0	0,5
Artemisia santonicum	10	12	13
Camphorosma annua	0	0	15
Carex stenophylla	2	1,5	0
Descurainia Sophia	0,3	0	0
Festuca pseudovina	22	25	40
Juncus compressus	2	1,5	0
Lepidium perfoliatum	0,3	0,7	0
Matricaria chamomilla	0,1	0,3	7
Podospermum canum	0	0	0,7
Polygonum aviculare	0,3	0,3	0

Table 4. Plant cover data in the *Artemisio santonici-Festucetum pseudovinae* association at the Rokas site at the Hortobágy.

	ACF/1	ACF/2	ACF/3
Total vegetation cover (%)	70	80	75
Achillea collina	5	9	3
Achillea setacea	1	0,7	0
Agropyron repens	0	0	0,7
Alopecurus pratensis	20	15	5
Artemisia santonicum	0,3	0	0
Carduus nutans	0,5	0,7	1
Carex stenophylla	0,3	0,1	0
Descurainia Sophia	0	1	0
Festuca pseudovina	40	50	55
Lepidium draba	0,3	0	0
Podospermum canum	2	1,5	1,5
Stellaria graminea	0,1	0,1	0,1

Table 5. Plant cover data in the *Achilleo setacea-Festucetum pseudovinae* association at Rokas site at the Hortobágy.

	AA/1	AA/2	AA/3
Total vegetation cover (%)	70	75	70
Agropyron repens	5	4	2
Alopecurus pratensis	55	60	53
Carduus nutans	4	2	3
Carex vulpine	2	2,5	4
Cerastium dubium	0,5	0,3	0
Epilobium tetragonum	0,3	0	0,3
Gagea pratensis	0	0,5	0,3
Inula Britannica	2	1,5	3
Polygonum lapathifolium	0	0,1	0,7
Rorippa amphibian	3	1,5	1
Rumex crispus	5	8	7
Taraxacum officinale	0	0,5	0

Table 6. Plant cover data in the *Agrostio stoloniferae-Alopecuretum pratensis* association in Lesser White-fronted Geese feeding area at the Hortobágy.

	RU/1	RU/2	RU/3
Total vegetation cover (%)	95	90	75
Agropyron repens	1,5	0	0
Agrostis stolonifera	0	2	0
Alopecurus geniculatus	0	0,5	0
Atriplex hastate	55	55	23
Carduus nutans	0	0,5	0,3
Cirsium vulgare	6	0	17
Lotus corniculatus	0	1	0
Matricaria chamomilla	25	3	1
Plantago major	0	1,5	0
Polygonum aviculare	2	0	2
Potentilla argentea	0	0	2
Rumex crispus	4,5	17	30
Xanthium spinosum	0	10	0

Table 7. Plant cover data in the *Agrostio stoloniferae-Alopecuretum pratensis* association with degraded *Rumex* patches in Lesser White-fronted Geese feeding area at the Hortobágy.

	PL/1	PL/2	PL/3
Total vegetation cover (%)	5	10	8
Artemisia santonicum	0,7	1,5	1
Camphorosma annua	0,5	0,5	0,3
Juncus compressus	1,5	2,5	2
Lepidium perfoliatum	0,3	0,3	0,7
Matricaria chamomilla	2,5	4,5	3
Podospermum canum	0	1	0,3
Polygonum aviculare	0	0,3	0,3
Puccinellia limosa	0,5	0,7	1,5

Table 8. Plant cover data in the *Puccinellietum limosae* association in Lesser White-fronted Geese feeding area at the Hortobágy.

	N/1	N/2	N/3
Total vegetation cover (%)	60	10	70
Agrostis stolonifera	1	0	18
Chenopodium album	0,3	0	0,7
Chenopodium strictum	0,5	0	0
Cirsium vulgare	0	0	0,7
Crypsis alopecuroides	6	0	0
Cynodon dactylon	0,5	0	0
Epilobium tetragonum	2	0	25
Juncus articulates	0	4	2
Matricaria inodora	1	0	8
Nymphoides peltata	0	4	2
Peplis portula	1	0	0
Phragmites communis	0	0	2
Polygonum lapathifolium	50	2	16
Potentilla reptans	0,3	0	0,1
Sonchus arvensis	0	0	0,3
Trifolium angulatum	0,7	0	1

Table 9. Plant cover data in drying lakebed (*Nanocyperetalia* association) at Kondás-fishpond (Hortobágy-fishponds)

All of these plant associations are differently grazed (mostly intensively with cattle or sheep) feeding habitats of the LWfG, characterised by different levels of moisture and salinity.

Plant species with the highest cover scores could serve as the most important natural food resources of the LWfG: *Festuca pseudovina*, *Alopecurus pratensis*, *Atriplex hastata*, *Artemisia santonicum*, *Matricaria chamomilla*, *Polygonum lapathifolium, Rumex crispus* (where the seeds of the species should serve as a food source).

Recent field observations confirm, that LWfG prefer to feed at the short grazed alkaline grasslands dominated by *Festuca pseudovina* (Festucion pseudovinae). In these plant associations they frequently graze on the *szikpadka* (berm alkaline slope/small erosion form) habitats and the small grasses of the *szikér* (tiny alkaline water courses) habitats (Ecsedi Z., Oláh J., Szilágyi A., Tar J. & Zalai T. ex verb.).

Special diet analyses

a) Stomach content analyses of individuals shot before 1990

Sterbetz (1978) analysed the stomach content of 100 LWfG individuals collected between 1954 and 1976 at Biharugra, Fehér-tó (Szeged), Hortobágy, Kardoskút and Orosháza. In the studied period in Hungary, geese from the north preferred to feed mostly at arable fields, because of

the decline of the steppe habitats followed the landscape scale changes. The decline of these natural habitats had the biggest impact on the LWfG, because this species is mostly connected to the natural vegetation of the alkaline steppe habitats. In the stomach content of 40 LWfG examined between 1954 and 1969 Sterbetz found no traces of maize, while the stomach content of 60 LWfG examined between 1970 and 1976 contained maize only in a low frequency (8 individuals, 13.3%) and a very low amount.

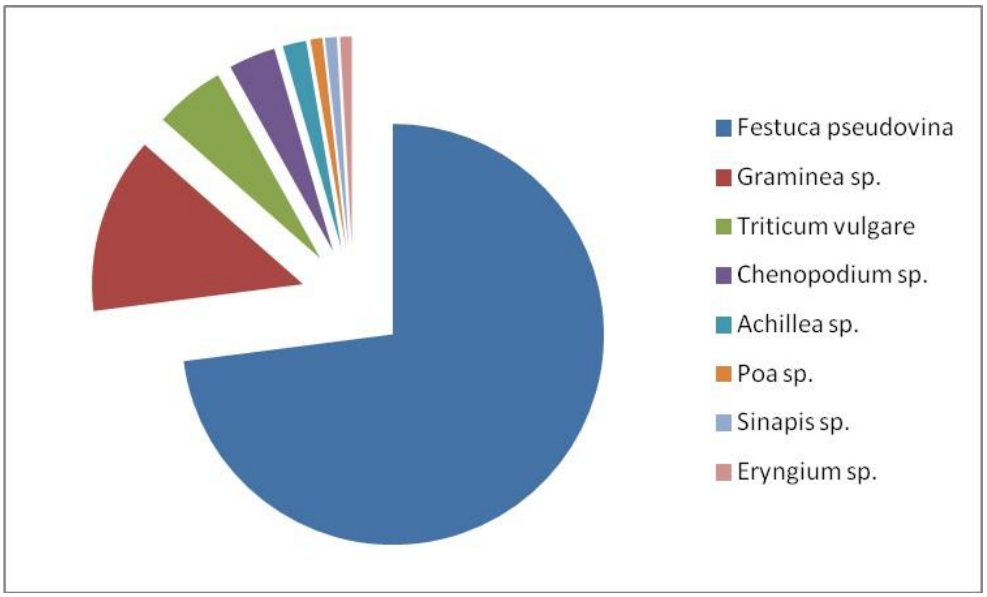

Figure 9. The stomach content of Lesser White-fronted Geese: remains of herbs/number of incidences (after Sterbetz 1978).

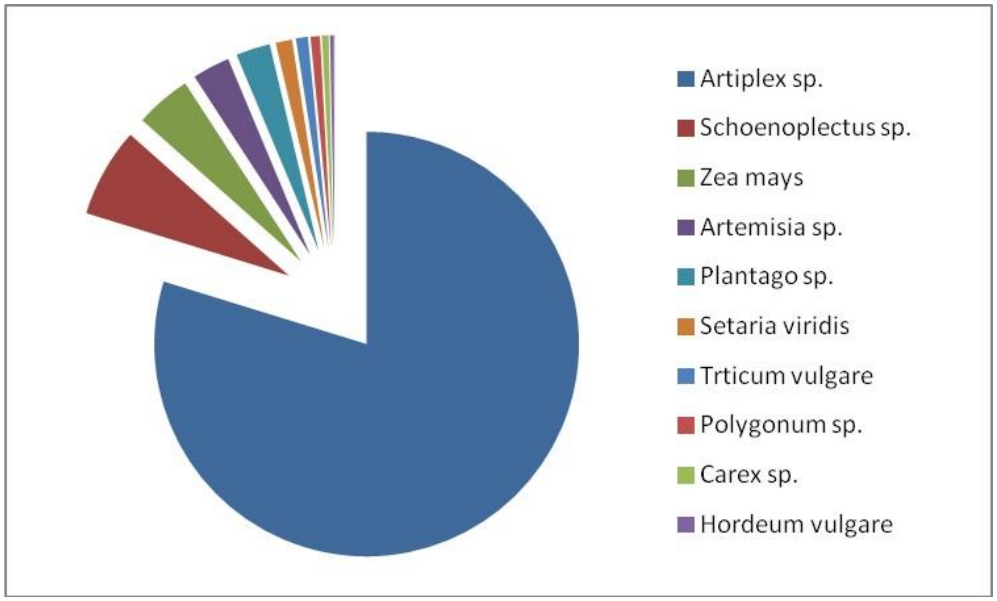

Figure 10. The stomach content of Lesser White-fronted Geese: number of seeds (after Sterbetz 1978).

For comparison, it is interesting to take a look on the GWfG stomach contents in the same publication. Maize was found in the stomach content of 18 from 132 individuals (13%) examined between 1947 and 1969, while between 1970 and 1976 this percentage increased to 68% (88 from 128 individuals) (Sterbetz 1978).

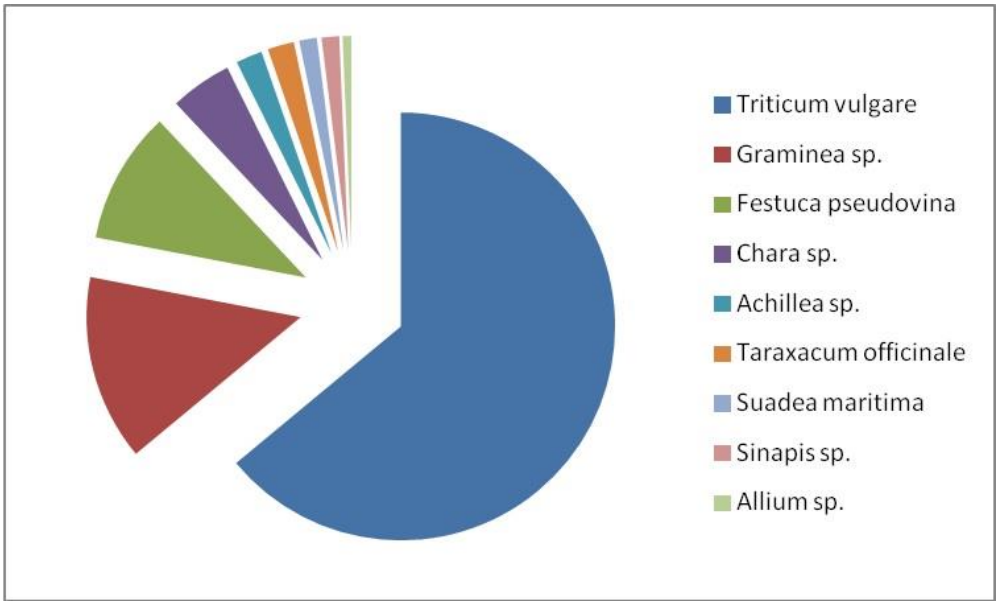

Figure 11. The stomach content of Greater White-fronted Geese: remains of herbs/number of incidences (after Sterbetz 1978).

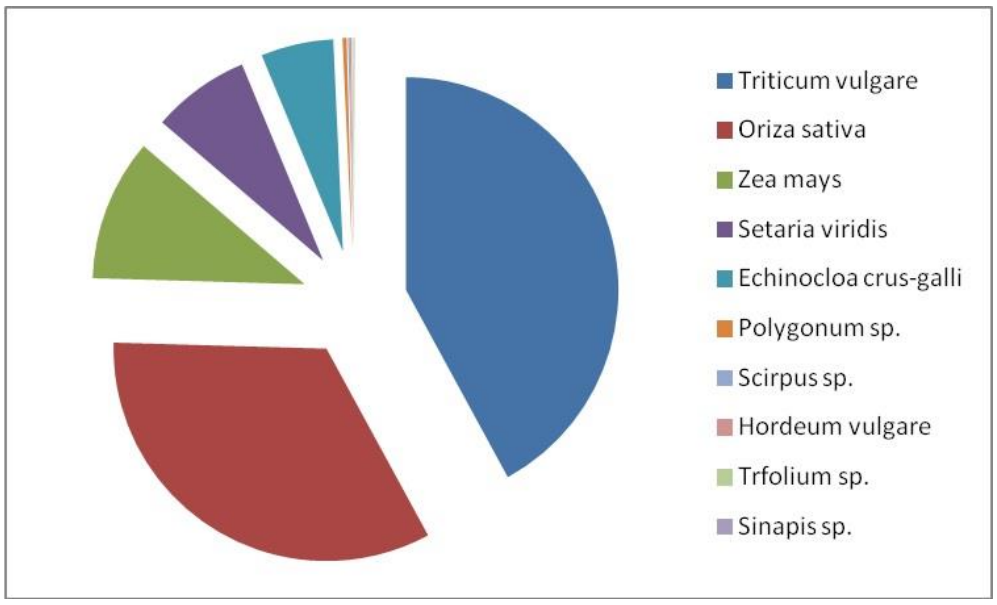

Figure 12. The stomach content of Greater White-fronted Geese: number of seeds (after Sterbetz 1978).

Later Sterbetz (1990) analysed the stomach content of another 103 LWfG. 65% of these individuals were feeding at alkaline steppe habitats, while 27% was feeding on freshly grown cereals, and 8% was feeding at fishponds. The stomach content of the individuals feeding at

alkaline steppe habitats (67 individuals) consisted mainly of alkaline grasses (75.4%). The stomach content of the individuals feeding on freshly grown cereals (28 individuals) and at fishponds (8 individuals) also consisted mainly of alkaline grasses (60.6% and 55.0%). The dominant species was the *Festuca pseudovina* in all of the examined stomach contents (by habitat: 60,6% alkaline steppe, 34,6% freshly grown cereals, 33% fishponds). The results show, that the primary food source of the LWfG are the freshly grown grasses of heavily grazed alkaline grasslands.

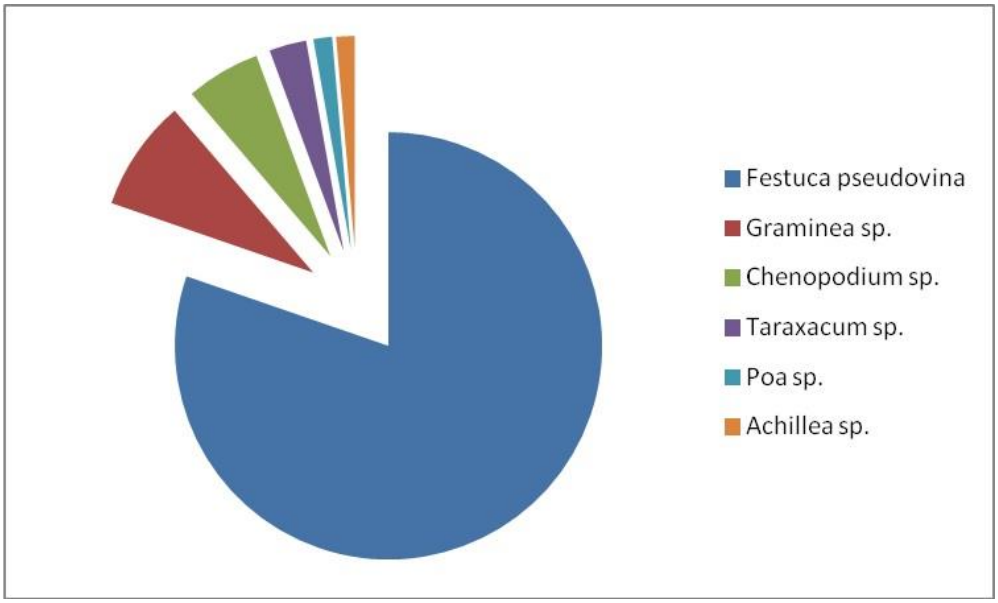

Figure 13. The stomach content of Lesser White-fronted Geese feeding on *Festucion pseudovinae* grasslands: remains of herbs/number of incidences (after Sterbetz 1990).

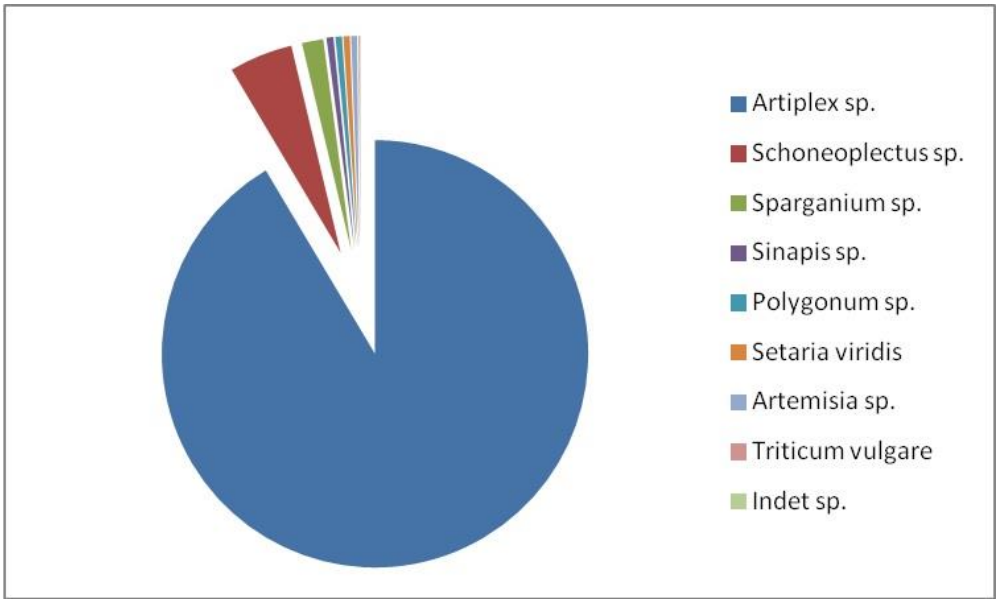

Figure 14. The stomach content of Lesser White-fronted Geese feeding on *Festucion pseudovinae* grasslands: number of seeds (after Sterbetz 1990).

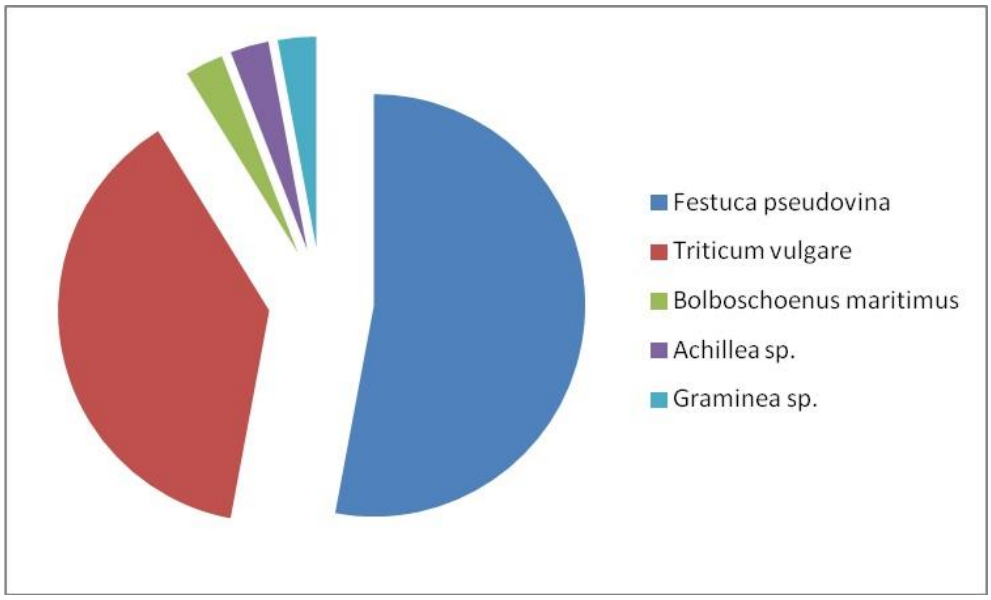

Figure 15. The stomach content of Lesser White-fronted Geese feeding on croplands: remains of herbs/number of incidences (after Sterbetz 1990).

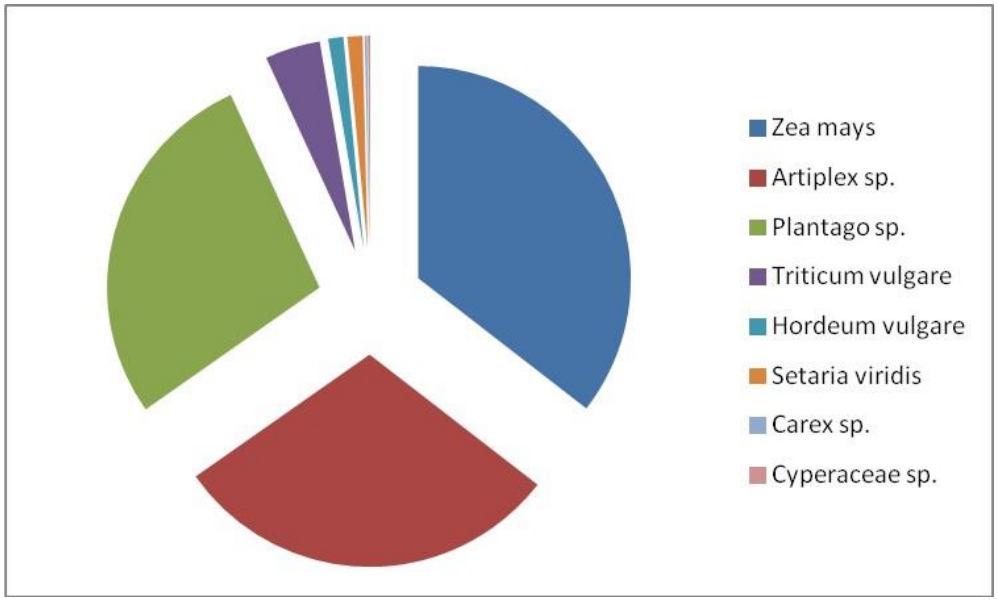

Figure 16. The stomach content of Lesser White-fronted Geese feeding on croplands: number of seeds (after Sterbetz 1990).

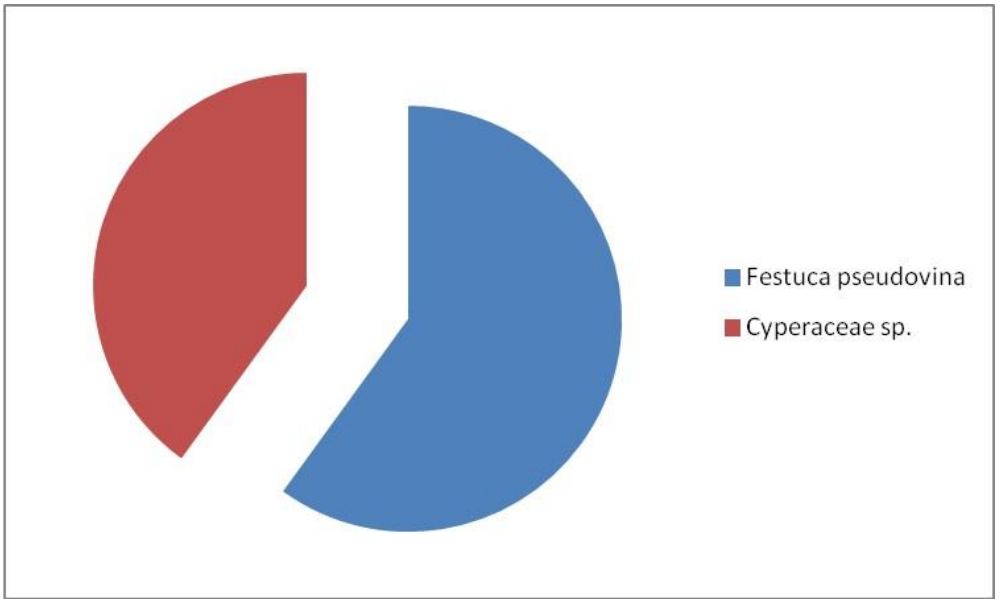

Figure 17. The stomach content of Lesser White-fronted Geese feeding on fishponds: remains of herbs/number of incidences (after Sterbetz 1990).

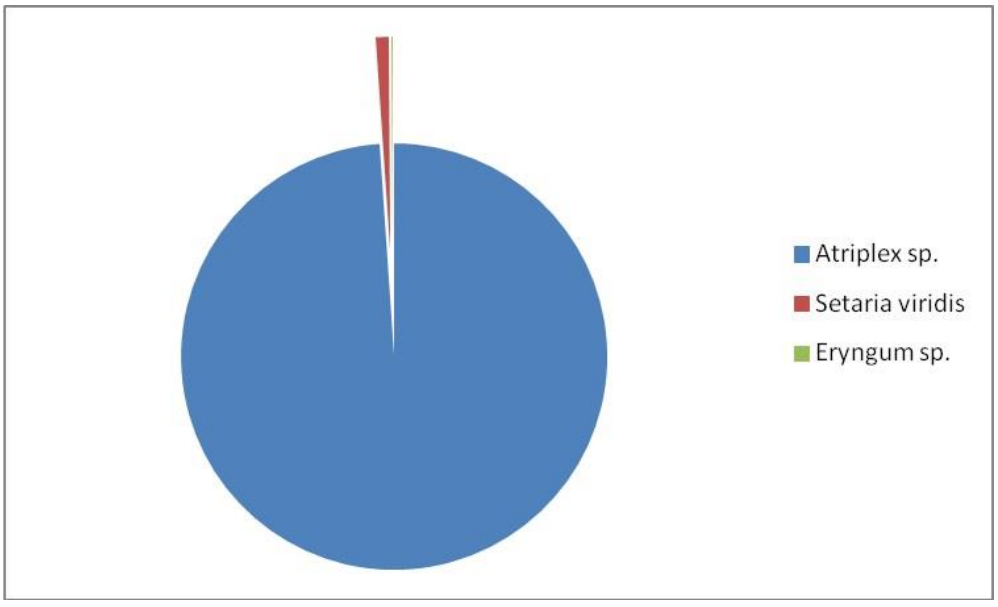

Figure 18. The stomach content of Lesser White-fronted Geese feeding on fishponds: number of seeds (after Sterbetz 1990).

b) Dropping analyses of the LWfG

Between 2012 and 2013 a research was carried out in the framework of the LWfG LIFE+ project (LIFE10NAT/GR/000638) in order to provide botanical information on the diet and dropping content of the LWfG at the Hortobágy (Valkó *et al.* 2013).

Researchers studied the droppings of the LWfG and other foraging goose species (GWfG, Greylag Geese). In order to analyse the diet of the LWfG samples were collected in April and October 2012 at the Hortobágy. As control samples, droppings of other goose species were collected.

The mass and size of the LWfG droppings differs significantly from the other migratory goose species. The LWfG droppings are smaller in mass and size compared to other goose species from the same sites.

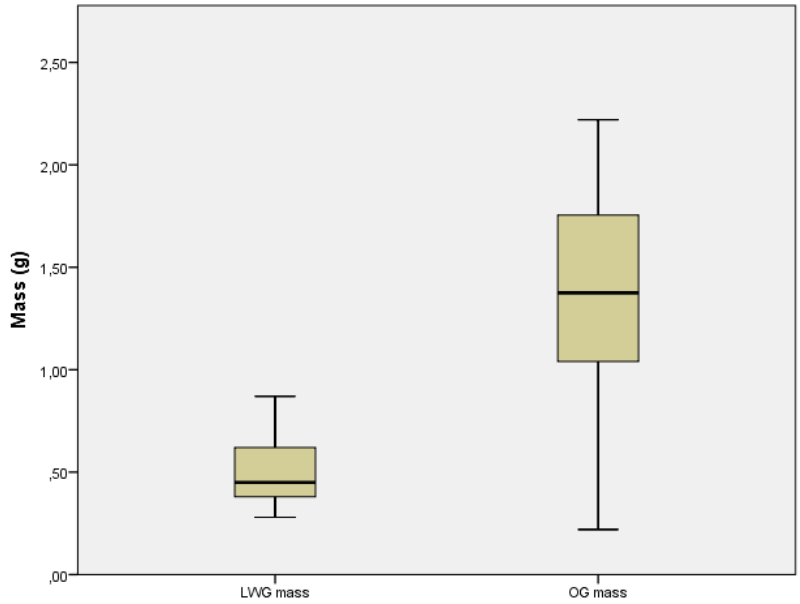

Figure 19. Mass of Lesser White-fronted Goose droppings and the droppings of other wild geese (GWfG and Greylag Goose) (Valkó et al. 2013)

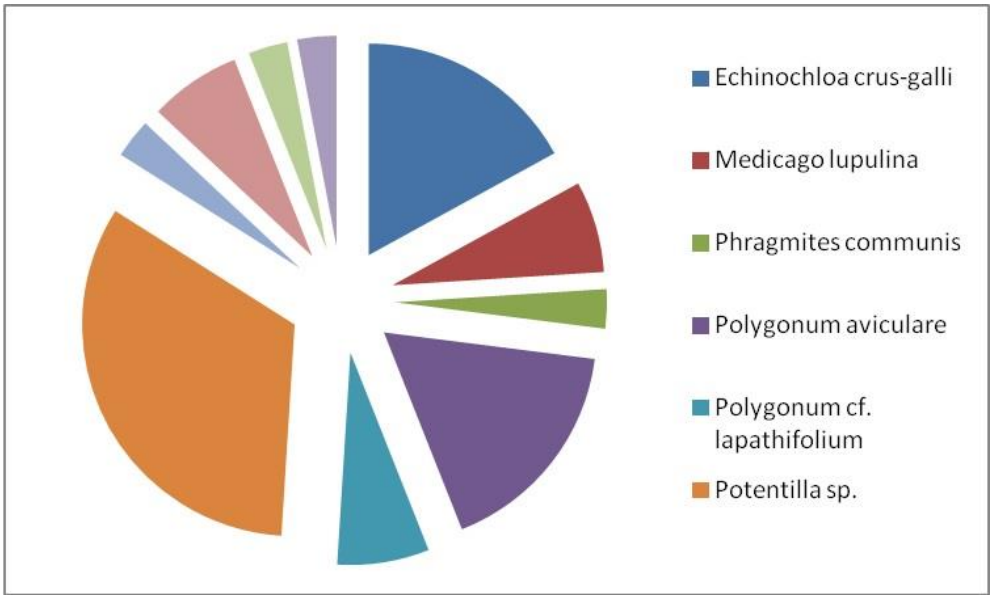

Figure 20. Seeds observed after sieving in Lesser White-fronted Goose droppings (Valkó et al. 2013).

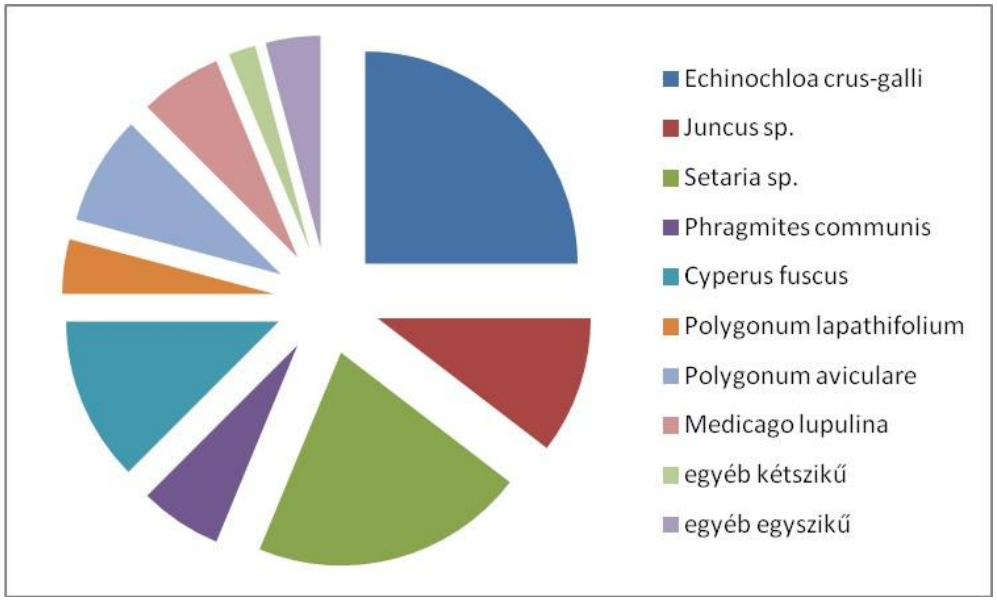

Figure 21. Seeds observed after sieving in Greater White-fronted and Greylag Goose droppings (Valkó et al. 2013).

After sieving the droppings, the collected seeds were germinated. We found that 94% of germinated seedlings from LWfG droppings belonged to 4 species: *Cyperus fuscus* (*Cyperaceae*), *Echinochloa crus-gallii* (*Poaceae*), *Myosurus minimus* (R*anunculaceae*), *Poa angustifolia* (*Poaceae*). The most abundant species in LWfG droppings was *Echinochloa crus-gallii*, possessing more than 59% of total seedling number.

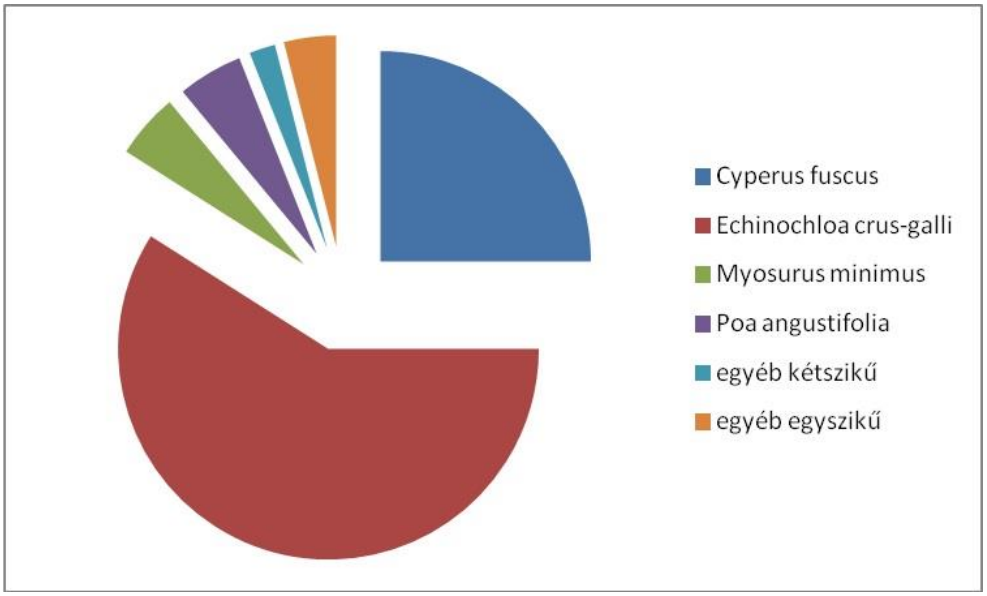

Figure 22. Plant species germinated from Lesser White-fronted Goose droppings (Valkó et al. 2013)

We found that 96% of the germinated seedlings from droppings of other goose species belonged to 5 plant species: *Amaranthus retroflexus* (*Amaranthaceae*), *Echinochloa crus-gallii*

(*Poaceae*), *Polygonum aviculare* (*Polygonaceae*), *Potentilla supina* (*Rosaceae*) and *Setaria viridis* (*Poaceae*). The most abundant species in LWfG droppings was *Echinochloa crus-gallii*, possessing more than 86% of total seedling number.

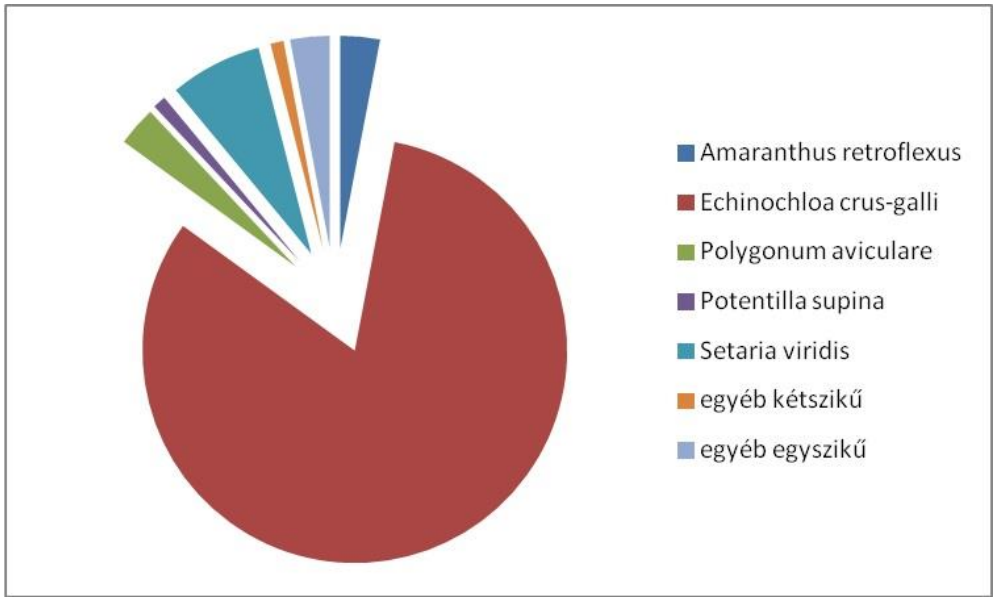

Figure 23. Plant species germinated from Greater White-fronted and Greylag Goose droppings (Valkó et al. 2013)

We found that from the species pool of the feeding habitats, mostly *Poaceae* (*Echinochloa crus-gallii, Poa angustifolia* and *Setaria viridis*) species and several *Polygonaceae, Ranunculaceae* and *Cyperaceae* seeds were found in the droppings of the LWfG and other goose species. The LWfG consumes less *Echinochloa crus-gallii* than other goose species, while consumes other dominant species in different proportion and species composition than other goose species.
The germination experiment will be continued with more detailed species level analyses during 2013 with a sampling period in October. The results of this research will be incorporated into the next versions of the Hungarian National Action Plan (hereafter NAP). The disadvantage of these methods (dropping analyses and germination) is, that some weeds might be overrepresented. Most of the grasses leave their seeds by autumn, or domestic animals can graze them and this way they are not represented in the LWfG diet. More likely the weed seeds have a better survival rate when running through the alimentary canal and have a better chance to germinate.

Discussion

In the Carpathian Basin LWfG prefer natural grasslands close to the wetlands of the alkaline steppe habitats (soda pans, steppe lakes, floodplains, fishponds, etc.). Shortly grazed freshly grown *Festucion pseudovinae* grasslands showed the highest importance. In the dry or drying wetland beds *Echinochloa crus-gallii* has the highest importance amongst pioneer species, however LWfG consumes the species in smaller proportion compared to other goose species. The individuals of the Fennoscandian LWfG feed only occasionally at arable fields with high

coverage of *Echinochloa crus-gallii*. This is more typical by the individuals of the Western Main population, moving together with GWfG flocks. According to these information the most important species conservation action is to provide, maintain and preserve a mosaic structure of shortgrass steppes, meadows and partially open water surfaces. Traditional, but disturbed staging sites should be restored, too.

Habitat use

The individuals of the Fennoscandian population are using Northern Hortobágy, especially the Hortobágy-fishponds and the surrounding areas during their spring and autumn migration. Here they prefer the well managed, slightly overgrazed alkaline grasslands with *szikfok* (*Puccinella limosa* dominant sward salt habitat on natron rich soil) and *szikpadka* habitats (Tucker & Evans 1997).

Photo 1. The most preferred feeding and roosting sites of the Fennoscandian Lesser White-fronted Goose population at Hortobágy: Kondás-fishpond and the Rókás area (Photo: J. Tar)

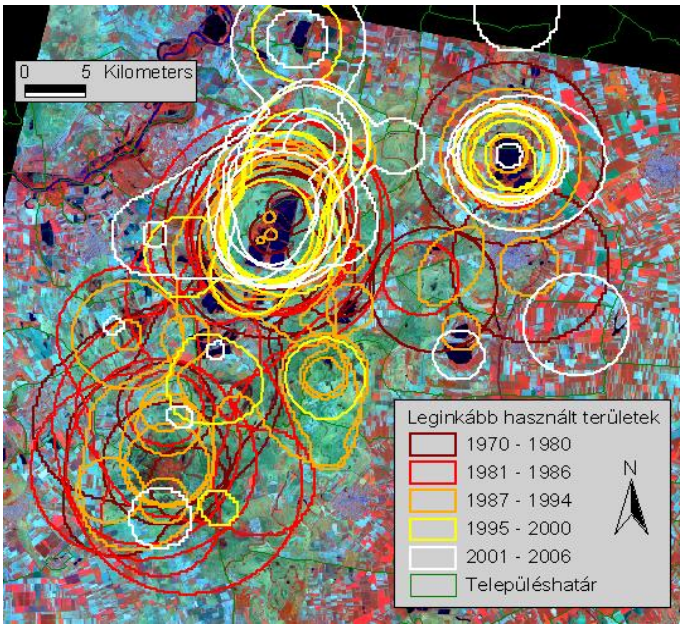

Figure 24. Space use of the Lesser White-fronted Geese at the Hortobágy area in the years 1970-2006 (see Lengyel et al. 2009)

The habitat use of the species changed remarkably in the last 40 years. During the first half of this period, the habitat use of the species concentrated to the alkaline grasslands and wetlands of the Southwestern Hortobágy, to the surroundings of Nagyiván and to the central fishponds of the Hortobágy. From the middle of the 1990's, the observations concentrated to the Hortobágy-fishponds and surrounding alkaline grasslands and wetlands. This trend was more clear in the autumn, than in the spring period.

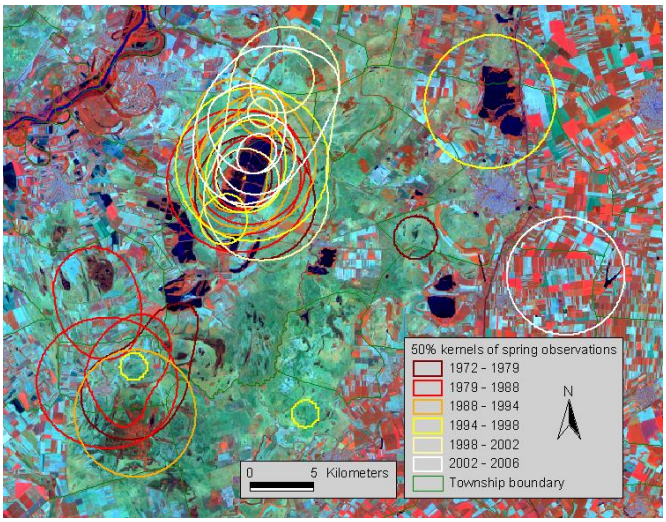

Figure 25. Space use of the Lesser White-fronted Geese in spring at the Hortobágy area in the years 1970-2006 (see Lengyel et al. 2009)

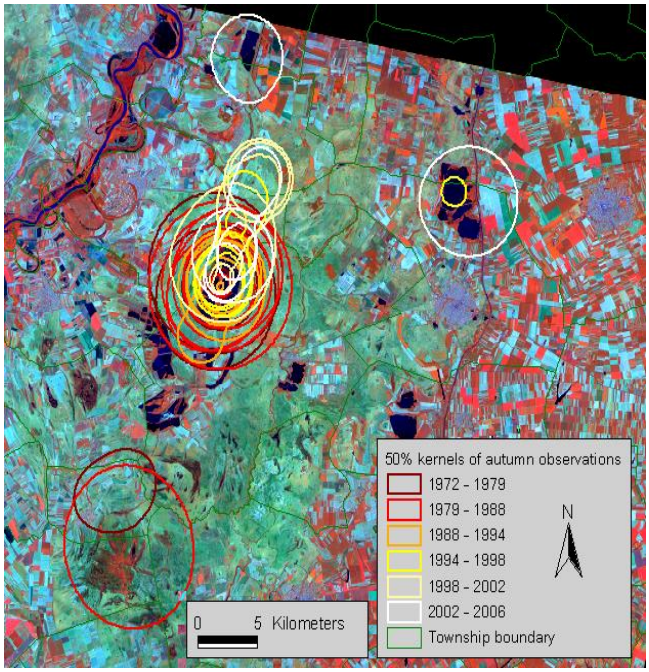

Figure 26. Space use of the Lesser White-fronted Geese in autumn at the Hortobágy area in the years 1970-2006 (see Lengyel et al. 2009)

By this time, the Fennoscandian birds left the South Hortobágy as staging sites. This shift has more probable explanations:

1. The hunting ban established at the Hortobágy-fishponds and adjoining areas.
2. Increasing hunting pressure at the South Hortobágy.
3. The positive changes in the habitat conditions at the northern grasslands and wetlands, while the negative changes in the habitat conditions at the southern sites.
4. Changes in the level of the monitoring activity at the different sites.

There are both direct and indirect evidences for all the hypothesis mentioned above.

At the Hortobágy-fishponds and the adjoining areas hunting was banned since the 1990's, hunting could be observed only at the non-protected areas. Hunting is also not allowed at the southern part of the Hortobágy National Park, however at the surrounding non-protected areas in Jász-Nagykun-Szolnok County, hunting pressure has been increasing. Thanks to the nature conservation measures, at the grasslands north from the Hortobágy-fishonds, grazing level became higher, which helped to turn grasslands into a good natural condition. Because of the elimination of the former drainage channels at these areas, carried out by the HNPD, the water regimes of this areas also turned into a better condition.

The HNPD became a trustee of the Hortobágy-fishponds and as a nature conservation manager they can reach that at least for the autumn period, optimal roosting sites are available to the LWfG. At the southern alkaline grasslands and marshes due to the regular artificial flooding and declining number of grazing animals, the extent of the optimal resting and feeding habitats for the LWfG decreased.

Since the 1990's a new group of experts raised at the Hortobágy, who are concentrating their monitoring efforts to the central areas.

Since the middle of the 1990's, the fennoscandian LWfG individuals use almost exclusively the central fishponds and surrounding areas for resting and feeding. If they find optimal conditions around these fishponds, they do not leave the National Park area (Lengyel *et al.* 2009).

Recently, the most important sites for the Fennoscandian population are the followings: Hortobágy-fishponds (Kondás-fishpond, Fishpond no. V and VI), Rókas, Kecskés-puszta, Boca-lapos (Tiszacsege), Dinnyés-lapos (Újszentmargita), and occasionally the Bivalyhalmi-fishpond (Folyás).

Photo 2. Lesser White-fronted Geese feeding at the Rókás area (Photo: J. Tar)

The LWfG is far more connected to the natural habitats, than any other goose species. As feeding sites, they prefer heavily grazed, short alkaline grasslands with pioneer vegetation, but also prefer the similar pioneer vegetation of the lakebed of the drained fishponds. As roosting sites (during day and night) they use different fishponds of the Hortobágy-fishpond system with shallow water level, while in lower percentage they also use natural wetlands. Very rarely, when natural habitats are in unfavourable conditions, the Fennoscandian population also visits agricultural fields to feed (Kovács & Tar 2004).

The single individuals or smaller flocks of the Western Main population LWfG usually occur together with bigger GWfG flocks and follow them to their feeding sites. Because of this opportunistic behaviour, the Western Main population individuals in Hungary could be mostly observed feeding at agricultural fields and in a lower percentage feeding at natural habitats (MME NB 2008c).

Legal status, international categories and conventions

The LWfG is protected or strictly protected at national level in almost all the countries within its distribution area (exceptions: Macedonia and China).

Status in Hungary

The LWfG is strictly protected in Hungary with a nature conservation value of 1 000 000 HUF (Ministry of Rural Development 2012a). Beside the nesting bird species in Hungary, LWfG is one of the three migratory species at this level of protection. The practical protection of the species could be provided due to the legal regulation of wild goose hunting. The Agency of Agriculture and Rural Development maintains the Agri-Envrionmental Support (AIS) within the European Agricultural Fund for Rural Development (EAFRD). One of the AIS' schemes is the "Plant production on plough lands with wild goose and crane protection prescriptions" (MVH 2013), which is available for registered agricultural private persons and for agricultural organizations. This scheme should be popularized, and it is required to have the possibility to designate regions/areas, based on nature conservation point of view, for the participants. Recently, there is not any spatial restriction during the utilization of the different schemes. The more detailed elaboration and clarification of the scheme could give the opportunity to decrease or even terminate the agricultural damage caused by wild geese.

International conservation categories

Red List of International Union for Conservation of Nature (IUCN): vulnerable (BirdLife International 2012).

Species of European Conservation Concern Category (SPEC): SPEC 1 (Tucker *et al.* 1994).

International status

In order to ensure and increase the protection level of the species, numerous international conventions have provisions. However, these conventions have been only partly ratified or even not ratified at all in numerous countries.

Bern Convention on the Conservation of European Wildlife and Natural Habitats: Appendix II. (EEC 1982a).

Bonn Convention on the Conservation of Migratory Species of Wild Animals: Appendix I. and II. (EEC 1982b).

Hungary also joined The Convention on Wetlands of International Importance (Republic of Hungary 1993). Lot of roosting and feeding sites of LWfG are in the list of wetlands of international importance (Nimfea Nature Conservation Association 2004; Ramsar 2006, Ministry of Rural Developement 2011).

Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA): Appendix I. (AEWA 2013).

Numerous roosting and feeding sites of LWfG are in the register of Important Bird and Biodiversity Areas (IBA) (Heath & Evans 2000; Nagy 1998).

Status in the European Union

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds: Appendix I. (02.04.79) (EC 2009). In Hungary numerous Special Protection Areas (SPAs) have been designated in order to protect the LWfG. It is also recommended in the case of the following SPAs to include LWfG as a species, the protection of which the sites is designated for: Felső-Kiskunsági szikes puszták és turjánvidék (HUKN10001), Hódmezővásárhely környéki és Csanádi-háti puszták (HUKM10004), Borsodi-sík (HUBN10002). It can be justified with the regular presence of the species recently.

3. Threats and general measure suggestions

We evaluated the different threats affecting the LWfG visiting Hungary. We assessed all the recent threats as 100%: if a threat's occurrence is about 1-4% than its importance is considered low; if a threat's occurrence is about 5-15% than its importance is considered medium; if a threat's occurrence is about 16-29% than its importance is considered high; if a threat's occurrence is at least 30% than its importance is considered critical.

In order to have very efficient protection of LWfG in Hungary, we have to eliminate as soon as possible all the threats with high and critical importance at sites where the species occur. It is worth only after this step to deal with, and spend money and energy on the elimination of threats with medium and low importance.

Former threats for the Lesser White-fronted Goose

a) Hunting

The drastic population decline of the LWfG in the Carpathian Basin was mainly due to the excessive hunting, which reached its peak in the 1920's and 1930's. We found historical data published mainly from the Hortobágy region to justify this. Mentioning only some data from those, it is clear how remarkable was the effect of hunting on the migrating population of LWfG. Hundreds of LWfG individuals were hunted only at Hortobágy, particularly during autumn (Kovács & Tar 2004). For example, on the 8th October 1918 12 individuals were shot at North-Hortobágy (Szomjas 1919), between 1920 and 1925 62 individuals were shot (Szomjas 1926). Between the 29th October and the 15th November 1934 739 wild geese were shot from which 90 individuals were LWfG (Graefl 1934). These data derived from publishing hunters who were also birdwatchers. The hunting bags of hunters from abroad and non-birdwatcher Hungarian hunters were unknown, but presumably were similarly high. Similar excessive hunting practices were likely in other regions of the Great Hungarian Plain (Kiskunság, South-Great Hungarian Plain, Délvidék (currently part of Serbia), etc.)

b) Habitat transformation

The extensive transformation of the hydro-geographical conditions of the Carpathian Basin began with the flood- and river-control during the 19th Century. It continued later in the 20th century with the large-scale drainage of inland water-bodies at lowlands, which particularly affected the shallow lakes and wetland habitats.

Today we can say, that the greater part of wetland habitats at lowlands (such as former soda pans, marshlands and astatic stagnant water-bodies, shallow wetlands) has been destroyed. Due to geographical conditions, the middle part of Danube–Tisza Interfluve with almost 10 000 km^2 was the richest part of the Carpathian Basin regarding astatic soda pans. We know from landscape scale surveys on transformation of soda pans that from the middle of 19th Century (approx. 18 000 ha) until the middle of 20th Century (approx. 7 000 ha) the extent of the soda pans decreased by approx. 60%. This period includes the first phase of flood-control and drainage of inland water-bodies at lowlands.

The second considerable phase of drainage of inland water-bodies at lowlands was after the World War II, in the middle of the 20th Century. More detailed hydro-geographical data are available about this phase. Because of the cumulative effect of the changing water management, the increasing intensive exploitation of groundwater, land use and the extreme climatic conditions (e.g. droughts), by the end of the 20th Century the extent of the natural soda pans decreased by 86%, from approx. 18 000 ha (which can be considered as an initial state regarding the survey) to approx. 2 500 ha in the Danube–Tisza Interfluve (Boros *et al.* in press).

This trend of decrease was quite the same regarding other astatic water-bodies (like steppe-lakes, marshlands with partly open water surfaces, alkaline shallow wetlands, etc.) of the Great Hungarian Plain.

Based on historical and recent data it is clearly demonstrated that LWfG are connected to astatic stagnant water-bodies and to the neighbouring alkaline grassland habitats with short-grass, especially to associations of *vakszik* (annual salt vegetation on natron rich (soda) soil with barren surface) and *szikfok* (Sterbetz 1978, Sterbetz 1990). The above-mentioned transformation of the water regime affected these habitat types first and foremost (Kovács & Tar 2004).

Some stopover sites of the LWfG disappeared, or just lost their importance, due to turning the astatic, temporary status into permanent, stable water coverage, mostly by making fishponds, water-reservoirs, sport fishing lakes, recreational lakes, etc.

c) Transformation of the habitat management

These kinds of astatic wetland habitats and the connected dry alkaline grassland habitats were general all over the Great Hungarian Plain, and both types were grazed intensively until the World War I. Afterwards, the intensity of grazing decreased continuously until the beginning of the 1990's, when it started to increase slowly thanks to the financial support from the European Union. The decrease of the grazing intensity together with the transformation of the

water regime caused the slow alteration of the associations: the dry habitats began to turn into steppe habitats (desodification), while the wetland habitats began to turn into marshlands. Regarding the LWfG it meant that the open water surfaces of the remnant wetland habitats decreased, the height of the vegetation of dry grassland habitats, which are important because of feeding, increased and the extent of *szikfok* associations decreased.

Recent threats for the Lesser White-fronted Goose

a) Transformation of the roosting and feeding sites (30%)

The "Habitat transformation" detailed above still has effect on the habitats preferred by LWfG, the previously excavated channels still drain the water from the area, causing the desodification of the alkaline habitats. Moreover, the channel-dredgings, supported by European Union funds, are continuous even now, and slowly these works follow the sinking ground-water.

The drying up effect of the water regime transformation is combined with the cumulative water shortage caused by global climate change and with the extreme precipitation. The climate change forecasts regarding the Carpathian Basin emphasize the increase of extreme weather-events' frequency. In different degrees, the alkaline lowland region of the Carpathian Basin is basically arid and susceptible to be drought, therefore the region is considered as a very sensitive region for drought. Namely, climatic water-shortage appears, because the difference between the potential evaporation and precipitation (water balance), is negative (Boros *et al.* in press). The conservation of important habitats for LWfG could be ensured by keeping and enforcing the recent operative administrative conservation measures. Beside the climate change, it is important to emphasize, that we have to consider also in Hungary the appearance of those threats that have significant negative influence, although have unknown impact (e.g. aerial cables, air transportation) on the short-distance migration.

b) Inadequate management of roosting and feeding sites (20%)

The primary management measure regarding the most and the most important habitats of LWfG was the protection. Only some of the sites were grazed and generally with low intensity. In accordance with this, the vegetation-free littoral zone of the wetland habitats disappeared and the coverage of marshland vegetation increased. The average height of the vegetation at the neighbouring pastures become higher and the extent of the *szikfok* associations decreased. The same changes were resulted by keeping the water level of some wetland habitats permanently high and paralelly the regular and multiple flooding of those. The optimal nature conservation measure at protected areas and Natura 2000 sites which are important for the LWfG could be ensured by managing these sites considering all the needs (primarily increasing the grazing intensity, regular floodings in the right time with the right extent) of the species.

c) Postponement of reconstructing the former roosting and feeding sites (15%)

Mainly because of the lack of financial resources, the reconstruction of transformed roosting and feeding sites has been postponed or slowed down at most of the sites, especially at a landscape-scale. After opening new European Union financial resources (e.g. (EEOP, EEEOP,

LIFE, LIFE+, etc.), more and more possibility has been arisen for reconstruct those wetland habitats preferred by LWfG. There are some good examples at Hortobágy and at Kiskunság. The reconstruction of former important habitats of LWfG, which are in an undesirable status of nature conservation, needs to be extended to a national level.

d) Agricultural disturbance (12%)

Based on field experiences, it seems that LWfG are very shy and could start up with fright easier and earlier than other goose species. The individuals that flown up with fright could move outside the protected areas, where their presence could be very risky because of hunting. Other consequences of movements forced by disturbances could be the shortened time for feeding and comfort behaviour (e.g. preening). All of this could cause worse physical condition and higher mortality during the later periods of migration (Ecsedi *et al.* 2008). The different reasons of forced movements of the birds are the followings, in the order of frequency: active agricultural works (soil-cultivation, harvest, etc.), direct deterrence by owners or land-users (with agricultural machinery, firearm, and carbide cannon), grazing, fish feeding and fish harvest, and disturbance connected to reed-management (mainly reed-transportation). The level of agricultural disturbance could be decreased significantly by sharing information and intense presence of rangers.

e) Hunting activity (8%)

The extent and the importance of hunting activity recently is much lower than it used to be. The most endangered individuals regarding hunting are those which migrate together with GWfG as vagrants, and originated from the Western Main population. The species is strictly protected in Hungary, and killing individuals is a crime. This status should be maintained in the future, however few individuals can fall a prey because of the difficult identification of the species or negligence. Therefore, before hunting informing the hunters and organizing trainings for helping the identification is the priority task. Recently, hunting more can be considered as a disturbance than actual shot-downs. Despite of this, these can happen, and for the vulnerable European nesting population the loss of every individual could be remarkable. That is why it is very important to keep all LWfG individual within the borders of protected areas with the help of different nature conservation measures. In Hungary, the threat of poaching is undetectable. In the case of agricultural damage caused by geese, all proceedings connected to hunting outside hunting season and hunting preventing agricultural damage should be investigated from a nature conservation point of view before giving permits. In the case of preventing agricultural damage caused by geese deterrence should be brought to the fore instead of shooting.

f) Disturbance of animal origin (5%)

Different potential predators can threaten the species from multiple point of view. In the case of regular disturbance, the physical condition of disturbed individuals worsen significantly, and these individuals could leave the safe protected areas. Besides, actual predation might occur occasionally in a low number. This threat is particularly important at Kondás-fishpond of Hortobágy-fishponds, where the disturbance is regular and continuous, and consequently the

resting birds at midday leave the pond instead of having rest. Creating feeding-spots for predators could help to avoid this kind of disturbance. Numerous well-designed and operative examples could be found at Hortobágy. In the case of foxes and stray-dogs, which are not protected, even the intensified trapping and hunting could be justifiable. Besides, the extent of roosting and feeding sites with barren and grazed littoral zone should be increased, which are in an optimal condition for the species. These habitats could provide shelter for the disturbed birds within the protected areas.

g) Uncontrolled visitors of roosting and feeding sites (4%)

Beside the agricultural disturbance, sometimes tourists and bird-watchers without permission, herb-collectors, mushroom-collectors, etc. disturb the flocks of LWfG by their occasional appearances. At protected areas the control by rangers is usually sufficient in order to avoid this type of disturbance. Considering the increasing attraction of organized and unorganized crane-watch trips during the autumn bird-migration period, the increasing number of tourists could cause increased disturbance for LWfG, which stay at the same sites where the cranes stay. At the most important sites intensified control by rangers should be implemented, which could be financed by different project funds.

h) Controlled visitors of roosting and feeding sites (3%)

In certain cases, scientific surveys, monitoring, the work of the rangers and professional ecotourism could be considered as a threat, but in a low extent. The effect of those is negligible, because the sites and the geese could be observed well and easily from watchtowers with telescopes, without disturbing the birds.

i) *Poisoning (2%)*

In the last century, because of the unprofessional use of disinfectants poisoning of geese occurred, although with decreasing numbers. This is going to be a threat in the future to LWfG, however in negligible extent. As a preventing measure, making the LWfG stay within protected areas could be applicable, which also includes the designation of geese feeding sites on protected croplands. Effective examples can be found in the Pusztaszer Landscape Protection Area and at the Hortobágy National Park.

j) *Genetic impoverishment (1%)*

At the western part of Hungary (Dunántúl) wild LWfG could meet geese with questionable genetics (hybrids made with GWfG). These individuals with different genetics could later mate, which worsen the genetic value of wild populations.

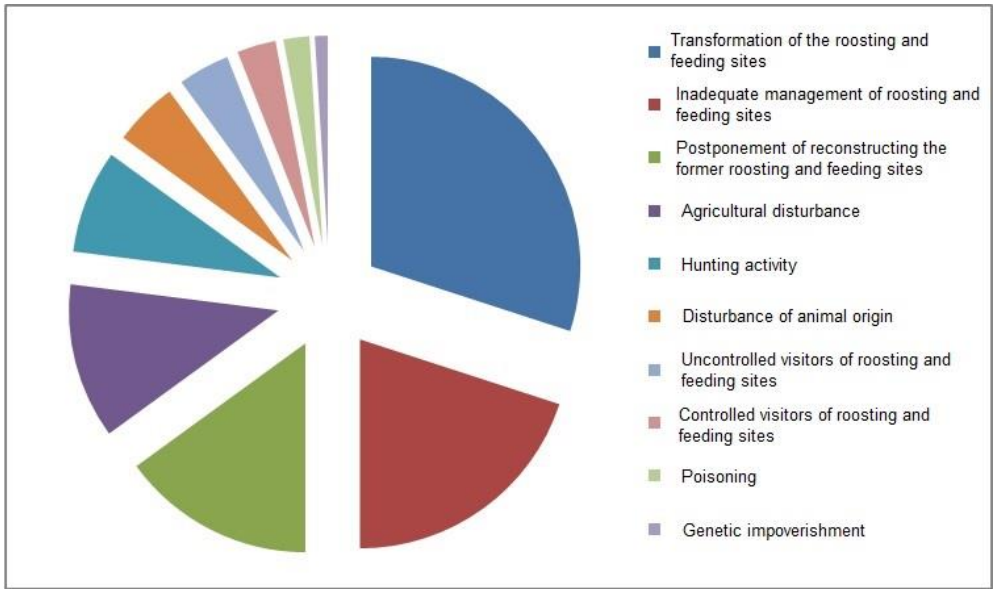

Figure 27. The importance of the recent threats for the Lesser White-fronted Goose in Hungary

4. Framework for Action

The goal of the Action Plan is the restoration of the Hungarian LWfG population to a favourable conservation status, namely to stop and reverse the current population decline. A priority has been assigned to each result of the plan, according to the following scale, which shows the importance of the result regarding reaching the favourable conservation status of the LWfG:

Essential: a result that is needed to prevent further large declines in the Fennoscandian population that could lead to the species' extinction.

High: a result that is needed to prevent further declines in the Hungarian wintering and migrating populations.

Medium: a result that is needed primarily not to conserve the Fennoscandian population but other populations.

Low: a result that has low importance in the conservation of the species, and has little effect on the conservation status of the species.

Timescales are attached to each result using the following criteria:

Immediate: to commence within the next year.
Short: to commence within the next 3 years.
Medium: to commence within the next 5 years.
Long: to commence within the next 10 years.
Continuous: a measure that is currently being implemented and should continue.

For the summary of the framework assessed in a table, please see Appendix 1. In this chapter only the legal status of the sites that are especially important regarding the migration of LWfG is detailed, except for the species conservation action framework regarding the conservation of Fennoscandian population, which is detailed also here.

Resources for the designations of the sites:
Nature conservation status in Hungary: Nature Conservation Information System public relations module (http://geo.kvvm.hu/tir/viewer.htm)
Important Bird and Biodiversity Areas (IBAs): Fontos madárélőhelyek Magyarországon (Nagy 1998)
Special Protected Areas (SPAs): Natura 2000 Viewer (http://natura2000.eea.europa.eu/#)
Man and Biosphere Reserve: Nature Conservation Information System public relations module (http://geo.kvvm.hu/tir/viewer.htm)
Wetlands of International Importance (Ramsar Sites): www.termeszetvedelem.hu (http://www.termeszetvedelem.hu/ramsar-sites)
Non-hunting Zones for Water Fowls: according to the 27/A § of 79/2004. (V. 4.) Decree of the Ministry Agricultural and Rural Development, the local hunting authority regulates the rules of hunting in the case of those nationally and internationally important wetland habitats that are relevant considering the breeding and the migration of water fowls (Ministry of Agriculture and Rural Development 2004). According to this Decree, recently 42 Non-hunting Zones for Water Fowls are designated (Faragó 2006b).

a) Hanság and surroundings

National level of conservation:	partly a national park, Fertő-Hanság National Park.
Important Bird Area:	partly, Hanság IBA (IBA code: HU02); goose species of designation: -.
Special Protected Area:	partly, Hanság SPA (HUFH30005); goose species of designation: *Anser fabalis, A. albifrons, A. erythropus, A. anser, Branta ruficollis.*
Others:	partly a Man and Biosphere Reserve.

b) Fertő and surroundings

National level of conservation:	partly a national park, Fertő-Hanság National Park.
Important Bird Area:	partly, Fertő-tó IBA (IBA code: HU03); goose species of designation: *Anser fabalis, A. albifrons, A. anser*.
Special Protected Area:	partly, Fertő-tó SPA (HUFH10001); goose species of designation: *Anser fabalis, A. albifrons, A. erythropus, A. anser, Branta ruficollis.*
Others:	partly a Man and Biosphere Reserve; partly a Non-hunting Zone

c) Kis-Balaton, Balaton and Nagy-berek

National level of conservation:	partly a national park (Balaton Uplands National Park – Kis-Balaton); partly a protected area (Nagybereki Fehérvíz Protected Area).
Important Bird Area:	partly, Kis-Balaton IBA (IBA code: HU04); goose species of designation: *Anser fabalis, A. albifrons, A. anser*; partly Balaton IBA (IBA code: HU05); goose species of designation: *Anser fabalis, A. albifrons*; Nagy-berek IBA (IBA code: HU06); goose species of designation: *Anser fabalis, A. albifrons*.
Special Protected Area:	partly, Kis-Balaton SPA (HUBF30003); goose species of designation: *Anser fabalis, A. albifrons, A. erythropus, A. anser, Branta ruficollis*. Balaton SPA (HUBF30002); goose species of designation: *Anser fabalis, A. albifrons, A. erythropus, A. anser, Branta ruficollis*. Balatoni berkek SPA (HUDD10012): goose species of designation: *Anser fabalis, A. albifrons, A. erythropus, A. anser*.
Others:	partly Ramsar Sites (Kis-Balaton, Balaton); partly Non-hunting Zones (Kis-Balaton, Balaton, Nagybereki Fehérvíz Protected Area).

d) Dinnyési-fertő

National level of conservation:	partly a protected area, Dinnyési-fertő Protected Area.
Important Bird Area:	partly, Velencei-tó and Dinnyési-fertő IBA (IBA code: HU12); goose species of designation: *Anser fabalis, A. albifrons, A. anser*.
Special Protected area:	partly, Velencei-tó and Dinnyési-fertő SPA (HUDI10007); goose species of designation: *Anser fabalis, A. albifrons, A. erythropus, A. anser, Branta ruficollis*.
Others:	partly a Ramsar Site; partly a Non-hunting Zone.

e) Tata and surroundings

National level of conservation:	partly a protected area of local importance, Tatai Öreg-tó Protected Area.
Important Bird Area:	partly, Tatai Öreg-tó IBA (IBA code: HU14); goose species of designation: *Anser fabalis, A. albifrons*.
Special Protected Area:	partly, Tatai Öreg-tó SPA (HUDI10006);

	goose species of designation: *Anser fabalis, A. albifrons, A. anser, Branta ruficollis*.
Others:	partly a Ramsar Site; partly a Non-hunting Zone

f) Felső-Kiskunság alkaline grasslands

National level of conservation:	partly a national park, Kiskunság National Park.
Important Bird Area:	partly, Duna-menti síkság IBA (IBA code: HU22); goose species of designation: *Anser albifrons, A. anser*.
Special Protected Area:	partly, Felső-Kiskunsági szikes puszták és turjánvidék SPA (HUKN10001); goose species of designation: *Anser fabalis, A. albifrons, A. anser, Branta ruficollis*.
Others:	partly a Ramsar Site; Man and Biosphere Reserve.

g) Kiskunság soda pans

National level of conservation:	partly a national park, Kiskunság National Park.
Important Bird Area:	partly, Duna-menti síkság IBA (IBA code: HU22); goose species of designation: *Anser albifrons, A. anser*.
Special Protected Area:	partly, Kiskunsági szikes tavak és őrjegi turjánvidék SPA (HUKN10002); goose species of designation: *Anser fabalis, A. albifrons, A. erythropus, A. anser, Branta ruficollis*.
Others:	partly a Ramsar Site; Man and Biosphere Reserve. partly a Non-hunting Zone.

h) Pusztaszer Landscape Protection Area

National level of conservation:	partly a landscape protection area, Pusztaszer Landscape Protection Area.
Important Bird Area:	partly, Pusztaszer Landscape Protection Area IBA (IBA code: HU26); goose species of designation: *Anser albifrons, A. anser*.
Special Protected Area:	partly, Alsó-Tisza-völgy SPA (HUKN10007); goose species of designation: *Anser albifrons, A. erythropus, A. anser, Branta ruficollis*.
Others:	partly a Ramsar Site; partly a Non-hunting Zone

i) Fehér-tó (Kardoskút)

National level of conservation:	partly a national park, Körös-Maros National Park.
Important Bird Area:	partly, Kardoskúti Fehér-tó IBA (IBA code: HU28); goose species of designation: *Anser albifrons, A. anser*.
Special Protected Area:	partly, Hódmezővásárhely környéki és Csanádi-háti puszták SPA (HUKM10004); goose species of designation: *Anser albifrons, A. anser,*

	Branta ruficollis.
Others:	partly a Ramsar Site; partly a Non-hunting Zone.

j) Kis-Sárrét

National level of conservation:	partly a national park, Körös-Maros National Park.
Important Bird Area:	partly, Biharugrai-halastavak IBA (IBA code: HU30); goose species of designation: *Anser albifrons, A. anser*.
Special Protected Area:	partly, Kis-Sárrét SPA (HUKM10002); goose species of designation: *Anser albifrons, A. erythropus, A. anser, Branta ruficollis*.
Others:	partly a Ramsar Site; partly a Non-hunting Zone.

k) Bihari-sík

National level of conservation:	partly a landscape protection area, Bihari-sík Landscape Protection Area.
Important Bird Area:	partly, Bihari-sík IBA (IBA code: HU31); goose species of designation: -.
Special Protected Area:	partly, Bihar SPA (HUHN10003); goose species of designation: *Anser albifrons, A. erythropus, A. anser, Branta ruficollis*.
Others:	-.

l) Tisza-tó and surroundings (Tisza-tó, Hevesi-sík, Borsodi-mezőség)

National level of conservation:	partly a national park, Hortobágy National Park – Tisza-tó; partly a landscape protection area, Hevesi Füves Puszták Landscpae Protection Area, Borsodi-mezőség Landscpae Protection Area.
Important Bird Area:	partly: Kiskörei-víztározó IBA (IBA code: HU33); goose species of designation: *Anser albifrons, A. anser*. Hevesi-sík IBA (IBA code: HU36); goose species of designation: -. Borsodi-mezőség IBA (IBA code: HU37); goose species of designation: -.
Special Protected Area:	partly: Hortobágy SPA (HUHN10002) (Tisza-tó); goose species of designation: *Anser albifrons, A. erythropus, A. anser, Branta ruficollis*. Hevesi-sík SPA (HUBN10004); goose species of designation: *Anser albifrons, A. erythropus, A. anser, Branta ruficollis*.

	Borsodi-sík SPA (HUBN10002): goose species of designation: *Anser fabalis, A. albifrons, A. anser, Branta ruficollis*.
Others:	partly a Ramsar Site (Tisza-tó); partly Non-hunting Zones (Tisza-tó, Hevesi-Füves Puszták Landscape Protection Area, Borsodi-Mezőség Landscape Protection Area).

m) Hortobágy: Kunkápolnás-marshland and surroundings

National level of conservation:	partly a national park, Hortobágy National Park.
Important Bird Area:	partly, Hortobágy IBA (IBA kód: HU32); goose species of designation: *Anser fabalis, A. albifrons, A. erythropus, A. anser*.
Special Protected Area:	partly, Hortobágy SPA (HUHN10002); goose species of designation: *Anser albifrons, A. erythropus, A. anser, Branta ruficollis*.
Others:	partly a Ramsar Site; partly Man and Biosphere Reserve; partly a Non-hunting Zone.

n) Hortobágy: Csécsi-fishponds and surroundings

National level of conservation:	partly a national park, Hortobágy National Park.
Important Bird Area:	partly, Hortobágy IBA (IBA kód: HU32); goose species of designation: *Anser fabalis, A. albifrons, A. erythropus, A. anser*.
Special Protected Area:	partly, Hortobágy SPA (HUHN10002); goose species of designation: *Anser albifrons, A. erythropus, A. anser, Branta ruficollis*.
Others:	partly a Ramsar Sites; partly Man and Biosphere Reserve; partly a Non-hunting Zone.

o) Hortobágy: Hortobágy-fishponds and surroundings

National level of conservation:	partly a national park, Hortobágy National Park.
Important Bird Area:	partly, Hortobágy IBA (IBA kód: HU32); goose species of designation: *Anser fabalis, A. albifrons, A. erythropus, A. anser*.
Special Protected Area:	partly, Hortobágy SPA (HUHN10002); goose species of designation: *Anser albifrons, A. erythropus, A. anser, Branta ruficollis*.
Others:	partly a Ramsar Sites; partly Man and Biosphere Reserve; partly a Non-hunting Zone.

p) Hortobágy: Elep-fishponds and surroundings

National level of conservation:	partly a national park, Hortobágy National Park.
Important Bird Area:	partly, Hortobágy IBA (IBA kód: HU32);

	goose species of designation: *Anser fabalis, A. albifrons, A. erythropus, A. anser*.
Special Protected Area:	partly, Hortobágy SPA (HUHN10002); goose species of designation:: *Anser albifrons, A. erythropus, A. anser, Branta ruficollis*.
Others:	partly a Ramsar Site; partly Man and Biosphere Reserve; partly a Non-hunting Zone.

q) Hortobágy: Virágoskút-fishponds and surroundigs

National level of conservation:	partly a national park, Hortobágy National Park.
Important Bird Area:	partly, Hortobágy IBA (IBA kód: HU32); goose species of designation: *Anser fabalis, A. albifrons, A. erythropus, A. anser*.
Special Protected Area:	partly, Hortobágy SPA (HUHN10002); goose species of designation: *Anser albifrons, A. erythropus, A. anser, Branta ruficollis*.
Others:	partly a Ramsar Site; partly Man and Biosphere Reserve; partly a Non-hunting Zone.

Conservation of the Fennoscandian population (Hortobágy-fishponds and surroundings)

In every spring and autumn a part or all individual of the remnant Fennoscandian population migrates through Hortobágy, accurately in the area of Hortobágy-fishponds, and spends there three or four months every year. Therefore, managing the Hortobágy-fishponds and the surroundings considering the needs of LWfG is very important in order to conserve the Fennoscandian population. The aim of the nature conservation measure is to provide favourable roosting and feeding sites in order to make the individuals of the Fennoscandian population stay at Hortobágy, within the protected areas as long as possible during their stay.

Priority areas: Hortobágy-fishponds, Rókás, Dinnyés-lapos, Kis-Kondás, Kungyörgy-puszta, Kecskés-puszta, Bivalyhalmi-fishponds.

All priority area needs to be maintained in an optimal condition for LWfG, or this favourable status is need to be achieved by the spring and autumn migratory season (Ecsedi *et al.* 2009, Nagy & Könczey 1995).

Hortobágy-fishponds:

The most important parts are the Kondás-fishpond, the Fishpond no. V and the Fishpond no. VI. However, if the neighbouring grasslands are in an optimal condition, any part of the fishpond-system could be a favourable roosting site for LWfG.

1. Water management
   Water management is a determinative factor from the LWfG protection point of view. The fish harvest at Kondás-fishpond, Fishpond no. V and the Fishpond no. VI should be scheduled considering that one of the ponds above should be in an optimal condition by

the arrival of LWfG (15th September). The essence of the habitat restoration is to maintain open water surfaces in the lakebed, and also to have available freshly grown pioneer vegetation in the surroundings (Nagy & Könczey 1995). In order to achieve this, the fish harvest in a certain pond should be around 20th August, if it is possible considering the experiences and best-practices of the Directorate and the fishery-managers. Mostly, this time of the year is too warm to have the fish harvest.

Priority: essential
Timescale: immediate/continuous
Responsible: HNPD Department of Nature Conservation and Department of Rangers

2. Increase the open water surface in Fishpond no. V
The extent of the bulrush has significantly increased during the recent years in the lakebed of Fishpond no. V. In order to increase the open water surface in the fishpond the bulrush should be controlled and eliminated by stem-crushing the bulrush when the lakebed is dry.
Priority: essential
Timescale: immediate/continuous
Responsible: HNPD

3. Restore the natural water regime in the Kondás-fishpond, providing shallow littoral zone
In order to have shallow littoral zone which is favourable for LWfG, the dam at the north side of Kondás-fishpond should be demolished and the reeds at the north should be grazed by large ruminants.
Priority: essential
Timescale: medium/continuous
Responsible: HNPD

4. Restore the natural water regime in the Fishpond no. V, providing shallow littoral zone
In order to have shallow littoral zone which is favourable for LWfG, the dam at the west side of Fishpond no. V should be demolished and the reeds should be grazed by large ruminants through the whole lakebed.
Priority: high
Timescale: long/continuous
Responsible: HNPD

5. Restrict the disturbance connected to fishing and reed-management
During the stay of LWfG all activity connected to fishing and reed-management should be avoided at ponds used by the flocks for resting.
Priority: essential
Timescale: immediate/continuous
Responsible: HNPD Department of Nature Conservation and Department of Rangers

6. Control of tourism
   During the stay of LWfG all activity connected to tourism should be moderated at ponds used by the flocks for resting.
   Priority: essential
   Timescale: immediate/continuous
   Responsible: HNPD Department of Rangers

Rókás:

1. Provide favourable grazing intensity for LWfG
   At the south part of Rókás and surroundings should be grazed at least by 1 animal unit (AU). The aim is to graze the *szikfok* habitats, and to provide favourable shallow, open water surface habitats by grazing the littoral zone intensively.
   Priority: essential
   Timescale: immediate/continuous
   Responsible: HNPD Department of Rangers and Department of Trustee

2. Restrict disturbance
   Disturbances connected to grazing and reed-management might occur occasionally at the site, the effect of which should be moderated by information sharing and intensified control on the field. The increasing uncontrolled tourism activity during the crane migration period also should be moderated by intensified control on the field.
   Priority: essential
   Timescale: immediate/continuous
   Responsible: HNPD Department of Rangers

Dinnyés-lapos:

1. Provide favourable grazing intensity for LWfG
   The habitats mixed with *szikfok* and surroundings should be grazed at least by 1 animal unit (AU). The aim is to graze the *szikfok* habitats, and to provide favourable shallow, open water surface habitats by grazing the littoral zone intensively.
   Priority: essential
   Timescale: immediate/continuous
   Responsible: HNPD Department of Rangers and Department of Trustee

2. Provide suitable flooding/water supply conditions and provide appropriate floods if needed
   The water management works for providing water supply for Dinnyés-lapos should be constructed. In drought years, when conditions are not optimal at Rókás, the area should be flooded considering nature conservation interest.
   Importance: essential
   Timescale: short/continuous
   Responsible: HNPD Department of Operation and Technical Facilities, Department of Rangers

3. Restrict the disturbance

   Disturbances connected to grazing might occur at the site from time to time, the effect of which should be moderated by information sharing and intensified control on the field. The increasing uncontrolled tourism activity during the crane migration period also should be moderated by intensified control on the field.

   Priority: essential
   Timescale: immediate/continuous
   Responsible: HNPD Department of Rangers

Kis-Kondás:

1. Restore the natural water regime

   In order to restore the natural water regime of Kis-Kondás, all artificial dam should be demolished.

   Priority: essential
   Timescale: medium
   Responsible: HNPD

2. Provide favourable grazing intensity for LWfG

   The habitats mixed with *szikfok* and surroundings should be grazed at least by 1 animal unit (AU). The aim is to graze the *szikfok* habitats, and to provide favourable shallow, open water surface habitats by grazing the littoral zone intensively.

   Priority: essential
   Timescale: medium/continuous
   Responsible: HNPD Department of Rangers and Department of Trustee

3. Restrict the disturbance

   Disturbances connected to grazing and reed-management might occur occasionally at the site, the effect of which should be moderated by information sharing and intensified control on the field.

   Priority: high
   Timescale: immediate/continuous
   Responsible: HNPD Department of Rangers

Kungyörgy-puszta:

1. Restore the natural water regime

   In order to restore the natural water regime of Kungyörgy-puszta, the channel-system should be demolished.

   Priority: essential
   Timescale: medium
   Responsible: HNPD

2. Provide favourable grazing intensity for LWfG
   The habitats mixed with *szikfok* at Ludas-rét and surroundings, the plain areas of Matyó-fenék, Vince-fenék, Kút-fenék and their surroundings should be grazed at least by 1 animal unit (AU). The aim is to graze the *szikfok* habitats, and to provide favourable shallow, open water surface habitats by grazing the littoral zone intensively.
   Priority: essential
   Timescale: medium/continuous
   Responsible: HNPD Department of Rangers and Department of Trustee

3. Restrict the disturbance
   Disturbances connected to grazing and reed-management might occur occasionally at the site, the effect of which should be moderated by information sharing and intensified control on the field.
   Priority: high
   Timescale: immediate/continuous
   Responsible: HNPD Department of Rangers

Kecskés-puszta:

1. Provide favourable grazing intensity for LWfG
   The habitats mixed with *szikfok* at Kecskés-puszta, the plain areas around Boca-lapos should be grazed at least by 1 animal unit (AU). The aim is to graze the *szikfok* habitats, and to provide favourable shallow, open water surface habitats by grazing the littoral zone intensively.
   Priority: essential
   Timescale: medium/continuous
   Responsible: HNPD Department of Rangers and Department of Trustee

2. Provide suitable flooding/water supply conditions and provide appropriate floodings if needed
   In drought years, when conditions are not optimal at the site, the area should be flooded considering nature conservation interest.
   Priority: essential
   Timescale: short/continuous
   Responsible: HNPD Department of Rangers

3. Restrict the disturbance
   Disturbances connected to grazing might occur occasionally at the site, the effect of which should be moderated by information sharing and intensified control on the field.
   Priority: high
   Timescale: immediate/continuous
   Responsible: HNPD Department of Rangers

Bivalyhalmi-fishpond:

The primary aim is to make the flock of LWfG stay around Hortobágy-fishponds when they are here in Hungary. If that does not succeed in a particular year because of some reasons, the birds usually use the Bivalyhalmi-fishpond. In these particular cases the surroundings of Bivalyhalmi-fishpond should be in an optimal conditions considering the conservation aims of the species.

1. Water management

   The appropriate water management of the fishponds is essential considering the conservation aims of the species. The fish harvest of at least one pond should be scheduled considering the arrival of LWfG (15th September), so the habitat should be in a favourable condition to the species. The essence of the habitat restoration is to maintain open water surfaces in the lakebed, and also to have available freshly grown pioneer vegetation in the surroundings (Nagy & Könczey 1995). In order to achieve this, the fish harvest in a certain pond should be around 20th August, if it is possible considering the experiences and best-practices of the Directorate and the fishery-managers. Mostly, this time of the year is too warm to have the fish harvest.

   Priority: high
   Timescale: immediate
   Responsible: HNPD Department of Rangers and Department of Nature Conservation

2. Restrict the disturbance connected to fishing and reed-management

   During the stay of LWfG all activity connected to fishing and reed-management should be avoided at ponds used by the flocks for roosting.

   Priority: high
   Timescale: immediate/continuous
   Responsible: HNPD Department of Rangers and Department of Nature Conservation

3. Restrict the disturbance connected to Great Cormorant alerting and hunting

   During the stay of LWfG all activity connected to Great Cormorant alerting and hunting should be restricted at ponds used for roosting.

   Priority: high
   Timescale: immediate/continuous
   Responsible: HNPD Department of Rangers and Department of Nature Conservation

4. Restrict hunting

   500 m buffer zone should be designated around the lakes, where out of the season wild goose hunting should be prohibited.

   Priority: high
   Timescale: immediate
   Responsible: HNPD Department of Rangers and Department of Nature Conservation

Monitoring and research

For the successful conservation of a species the scientific research and monitoring of the fundamental information, the population trends, the habitat alterations, and threats are essential (Tar *et al.* 2009). Basically, all recorded data should be assessed into the National Database. The Hortobágy Environmental Association assessed the national database during the previous LIFE project (LIFE05 NAT/FIN/000105) connected to the conservation of LWfG. The database was updated during the LIFE10 NAT/GR/000638 project. This update included the collection of previously omitted historical data, the procession of data of National Biodiversity Monitoring Programme reports by Hungarian Ornithological and Nature Conservation Society, data from birding.hu website, and processing the database of HNPD and Hortobágy Environmental Association. The database also contains data indicated in red that are considered as unaccepted.

Regarding the LWfG the following basic monitoring and scientific research activities are required.

1. General data collection
   During the general data collection all Hungarian occurrence data should be recorded, and should be assessed in the national (HNPD) and international (BirdLife Norway & BirdLife Finland 2013) databases. Also, advertise the data collection on popular bird-webpages like birding.hu, and homepages of Hungarian Ornithological and Nature Conservation Society (hereafter MME) and Hortobágy Environmental Association (birding.hu 2013; MME 2013; Hortobágy Environmental Association 2013). Update yearly and store the national database at the server of the HNPD.
   Priority: high
   Timescale: long/continuous
   Responsible: HNPD species conservation coordinator

2. Monitoring the migrating and overwintering birds in Hungary
   The monitoring method is the same Migratory Waterbird Monitoring that is applied by the Hungarian Ornithological and Nature Conservation Society (MME Monitoring Centre 2013).
   General description of the method:
   The aim is to survey the populations of migrating waterbirds between July and April. The survey and the data recording are performed once monthly in the middle of the month, or twice in the most important months (September, November, January, March). The surveyors perform the bird-counts with the help of large magnification telescopes. This method meets the requirements of the National Biodiversity Monitoring System (Báldi *et al.* 1997).
   Based on this method, 15 wetland habitats have been designated within the Hortobágy National Park in order to perform the integrated bird monitoring. The survey is made by the professional staff of the HNPD and other collaborators.

The recorded data are collected by the MME. The MME passes the data to the HNPD, based on a contract signed in 2012, in order to assessed all Hungarian LWfG data into the national database.

The water fowl monitoring is unified since 1984, which includes 24 different areas of Hungary and coordinated by the Hungarian Waterfowl Monitoring Group managed by the Institute of Wildlife Management and Vertebrate Zoology of the University of West-Hungary (Faragó 1996a). In 2012 a contract was signed by the University of West-Hungary and HNPD in order to share information and data, and to assess these data also into the national database.

Priority: medium
Timescale: long/continuous
Responsible: HNPD bird monitoring coordinator

3. Monitoring the migrating Fennoscandian population

   The monitoring of Fennoscandian population migrating through the key feeding, resting and roosting sites at the Hortobágy area. At least one survey per week from the arrival of the birds till the departure. If the conditions of the observations make it possible sex, age and family-data are recorded. Assess the data into the national database.

   Priority: essential
   Timescale: long/continuous
   Responsible: HNPD species conservation coordinator

4. Update of the National LWfG Database annually

   This activity includes the annual update of the national database, the general data collection, the monitoring of migrating and overwintering populations and the monitoring of the Fennoscandian population. Assess and record all data on the HNPD's server.

   Priority: high
   Timescale: long/continuous
   Responsible: HNPD species conservation coordinator/external assistance

5. Scientific researches needed for the conservation of the species

   For the well-founded nature conservation management of the Fennoscandian population continue the ongoing research activity, which contains primarily the survey of the site and habitat use of the migrating population, the botanical survey of these areas, further diet analyses and the monitoring of the nature conservation measures' effects. Publish the results.

   Priority: high
   Timescale: long/continuous
   Responsible: HNPD species conservation coordinator

Cooperation with hunting organizations

During the autumn stay of the LWfG in Hungary, there is a hunting season for wild geese (Ministry of Rural Development 2012b). By the arrival and during the stay of the Fennoscandian population there is no wild goose hunting season at the Hortobágy region (in the case of Bean Goose and GWfG officially between 1st December and 31st January, in the case of Greylag Goose between 1st December and 31st December), however, practically, the hunting authority permits wild goose hunting out of the season in order to avoid agricultural wild goose damage even before the arrival of the birds, most of the times automatically from 1st November. In the case of Bean goose and Greater White-fronted Goose the restrictions at Hajdú-Bihar, Békés, Csongrád and the Transtisza region of Jász-Nagykun-Szolnok Counties is the same as at the Hortobágy. In the case of Greylag Goose the restrictions at Hajdú-Bihar and the Transtisza region of Jász-Nagykun-Szolnok Counties are the same as at Hortobágy. However, the practical hunting begins generally from 1st November as an out of the season hunting to avoid agricultural wild goose damage. At the other part of Hungary the hunting season for Bean Goose and GWfG is between 1st October and 31st January, for Greylag Goose is between 1st October and 31st December. During the spring season only hunting in order to avoid agricultural wild goose damage is possible in Hungary. During these occasions sometimes accidental shoot-downs could happen. The aim is to minimize these accident by the cooperation.

1. Cooperation with the hunting authorities
   Consider all case from a nature conservation point of view during the authorizations of hunting out of the season and to avoid agricultural wild goose damage. In the case of hunting to avoid agricultural wild goose damage prefer alerting instead of shooting. Involve the local nature conservation manager during the authorizations of hunting out of the season and to avoid wild goose damage. Maintain non-hunting zones/sites and designate new ones. Completely ban the wild goose hunting at the Hortobágy SPA, which is very important considering the migration of the LWfG.
   Priority: high
   Timescale: immediate/continuous
   Responsible: hunting authorities, national park directorates

2. General information sharing at the Hortobágy region
   Continuously share information about the wild geese movements with the local game managers and hunting associations. Include all information about the not protected areas which are used by the LWfG. In case of fair game wild goose damage prefer deterrence instead of shooting.
   Priority: high
   Timescale: immediate/continuous
   Responsible: HNPD species conservation coordinator

3. General information sharing outside the Hortobágy region
   Continuously share information about the wild geese movements with the local game managers and hunting associations. Include all information about the not protected areas which are used by the LWfG. In case of fair game wild goose damage prefer deterrence instead of shooting.
   Priority: medium
   Timescale: medium/continuous
   Responsible: national park directorates

4. Education of hunter-candidates nationally and regionally
   Emphasize the identification and the distinction of vulnerable species during the theoretical education of hunter-candidates. It is extraordinarily important to broaden the knowledge about easily mixed up species, and make this acquired both in theory and in practice.
   Priority: essential
   Timescale: long/continuous
   Responsible: education centres for hunters, national park directorates

5. Introduction of the LWfG, demonstration for hunters
   Introduce the LWfG for the hunter community locally and nationally. Educational lectures at regional levels (county hunters-chambers, hunter associations, etc.) about the species. Publish articles in nationally distributed hunter magazines, especially before the beginning of the hunting-season. Beside the introduction of the LWFG's status, expound identification and recognition. Special television channels about hunting are also available in Hungary, educational short-film about the conservation of the LWfG should be made or should make the channel itself to shoot.
   Priority: essential
   Timescale: immediate/continuous
   Responsible: national park directorates

6. Scientific surveys on measuring and determining agricultural wild goose damage
   The extent of the agricultural wild goose damage is determinative during the authorization of the out of the season wild goose hunting. However, particular surveys and researches about this were seldom performed.
   Priority: high
   Timescale: immediate/continuous
   Responsible: national park directorates

International cooperation

It is very important to emphasize, that the Hungarian measures alone could not stop the decreasing trend of the species, but international collaboration is needed. The success in reproductivity could only bring result together with decreasing mortality on the migratory flyways.

The basis of the international cooperation is the fact, that the species is in the Appendix I and II of Convention on the Conservation of Migratory Species of Wild Animals (Bonn convention) (EEC 1982b), and also in the Supplement II of the African-Eurasian Waterbird Agreement (AEWA 2013), which is under the auspices of the Bonn Convention. The implementation of the AEWA agreement is performed by the AEWA Secretariat which is independent from the Secretariat of the Bonn Convention. The preparation of the first (preliminary) LWfG species conservation plan (Madsen 1996) could be considered as a remarkable international collaboration. Sándor Faragó took part in this work from Hungary. Later, the AEWA Secretariat coordinated the assessment of the current and valid species conservation plan (Jones *et al.* 2008), in which Szabolcs Lengyel took part from Hungary. Since 2010 the AEWA Secretariat operates the international "Lesser White-fronted Goose International Working Group". The working group had two meetings, Hungary was represented by János Tar as an expert:

- 1st Meeting of the AEWA Lesser White-fronted Goose International Working Group (30th November – 1st December 2010, Helsinki, Finland);
- 2nd Meeting of the AEWA Lesser White-fronted Goose International Working Group (09–11 November 2012, Lake Kerkini, Greece).

In Hungary two remarkable international projects were performed so far. The goal of these was the conservation of the Fennoscandian population which has extremely low number of individuals:

- 2005-2009: „Conservation of Lesser White-fronted Goose on the European migration route" (LIFE05 NAT/FIN/000105) (Tolvanen *et al.* 2009);
- 2011-2016: „Safeguarding the Lesser White-fronted Goose Fennoscandian population in key wintering and staging sites within the European flyway" (LIFE10 NAT/GR/000638).

Beside the Hungarian tasks and activities, during both projects meetings and field visits were held together with international participants at the stopover and wintering sites of the Fennoscandian population (Helsinki, Kerkini, and Hortobágy). Furthermore, the HNPD took part in the educational programme for the (future) experts from countries (e.g. Azerbaijan, Serbia, Romania, etc.) outside the project during the Action A.1 of the recent LIFE+ project.

1. International cooperation
   Continue the recent, previously mentioned international cooperation, have connections with beneficiaries of the LIFE+ project and with the AEWA Secretariat.
   Priority: high
   Timescale: long/continuous
   Responsible: HNPD species conservation manager, Ministry of Agriculture Department of Nature conservation

2. Cooperation in the Carpathian Basin
   A collaboration in the Carpathian Basin should be established. In order to protect the Fennoscandian population, the cooperation with Serbia is essential, where detection and

monitoring of the possible migratory sites (Slano Kopovo, Lake Ruszanda) are necessary. In order to have precise data collection regarding the Western Main population, strong connection should be developed with neighbouring countries (Austria, Slovakia, Croatia, and Romania). In order to protect the species a conservation project in the Carpathian Basin should be launched in the future.

Priority: essential
Timescale: medium/continuous
Responsible: HNPD Department of Nature Conservation

Information sharing/education

Information sharing

On the basis of the best practice "getting acquainted – become fond of – protect" principle the education is the most efficient nature conservation investment (Oláh 2004). According to this, it is very important to give information to the different levels of society about the LWfG itself, its population trend, status, migration, nature conservation measures and threats of the species, and the nature conservation efforts to eliminate those.

1. Laymen
   Generally, people at the LWfG's habitats do not know the species at all. Making people acquainted with the species is also important because the population trend of the LWfG well demonstrates the importance of the protection regarding the conservation of a species. It also raise awareness on the destroying human activity on the environmental. The recent conservation status of the LWfG should be presented in a layman-style in local daily newspapers, sensational media, online media, and national daily newspapers. Any kind of sensational event should be presented immediately. The best way is to have the articles written by professional journalists on the basis of experts' suggestions. Beside the printed media, similar campaign should be done in the television and the radio. Regular broadcast in some more important national/local radio and television channel.
   Priority: high
   Timescale: long/continuous
   Responsible: national park directorates, NGO's

2. Experts
   It turned out in numerous cases that in some substantial questions even the experts are not well-informed regarding the actual status of the certain nature conservation issue. Therefore it is also important to publish professional and scientific articles about the latest status and results. It is suggested to publish a scientific information sharing article in every, or every second year (Madártávlat, TermészetBÚVÁR, etc.). The latest scientific results should be published in the national scientific literature in every three or four years (Aquila, Ornis Hungarica, etc.).

Priority: high
Timescale: long/continuous
Responsible: national park directorates, HNPD species conservation manager

Demonstration and education

The best-practice "getting acquainted – become fond of – protect" principle (Oláh 2004) is also important in this case, because the awareness or the will of the current decision-makers would be significant regarding the conservation of a species.

1. Students
   During the advertised and the spontaneous guided tours for students the demonstration of the habitats and the avifauna should be particularly concentrated on the LWfG (e.g. Hortobágy-fishponds, Fertő, Pusztaszer Landscape Protection Area, Fehér-tó (Kardoskút), Kis-Sárrét, etc.). The conservation history and the threats that led to the drastic decline of the population should be described on field. The guided tours should be led by educated experts.
   Priority: high
   Timescale: long/continuous
   Responsible: national park directorates, NGO's

2. Laymen and general tourism
   For laymen and visitors within the frame of general tourism also guided tours should be organized similarly (same sites, same practice) as described for students. In addition, similarly to the so called "crane-days" it is worth to organize "wild goose-days" at Hortobágy, at Kardoskút and at the Fehér-tó (Szeged). The LWfG should be the focal topic and the main attraction of these events. The so called "Vadlúdsokadalom" (Wild goose gathering) at the Öreg-tó of Tata is a good example and a good model to be followed, which should be continued.
   Priority: high
   Timescale: long/continuous
   Responsible: national park directorates, NGO's

3. Experts
   The LWfG and its locations should be introduced for the eco-tourists (partly experts and partly laymen) visiting Hungary. This contributes a lot to the international protection and conservation of the species. The site-visits and the observations should not disturb the LWfG or any other protected species. There are two ways to implement this. In the first case educated local guides help to arrange the observations, in the second case all the facilities for observations (e.g. roofed watch-tower, hides and ambushes, covered roads, etc.) are available. Ideally the two solutions are combined.
   Priority: high
   Timescale: long/continuous
   Responsible: national park directorates, NGO's

4. Hunters

When LWfG arrive, at least one guided tour should be organized for the local hunting associations at the most important locations of the species, even before the start of the hunting season. Beside talking about the nature conservation issues connected to the species, the identification of the LWfG should be emphasized in any kind of circumstances during hunting (e.g. backlight, flying flock, individuals in the flock of other goose species).

Priority: essential
Timescale: long/continuous
Responsible: national park directorates, NGO's

Awareness-raising materials

Almost every species conservation programme includes making of different awareness-raising materials, souvenirs connected to the species to sell. These could be: plush animal figure, T-shirt, mug, fridge magnet, mousepad, bracelet, painting, pencil, and practical cloth embroidered with the head of the LWfG, jewel, mobile case, pillow, calendar, notebook, wood sculpture, etc.). In order to have more efficient information sharing and awareness-raising, communication plans should be design involving experts.

Priority: high
Timescale: long/continuous
Responsible: national park directorates, NGO's

5. Cooperating organizations and people

The conservation of the LWfG is coordinated by the HNPD.

In order to join all forces connected to the conservation of the LWfG, the HNPD launched a LWfG working group in May 2012. The communication platform of the working group is the LWfG mailing list (kislilik@lists.hnp.hu), which is operated and maintained by the HNPD. The working group is actively takes part in designing the species protection plan.

The HNPD coordinates the LWfG conservation programme closely together with nature conservation authorities, university research centres, NGO's and the Ministry of Agriculture. In the case of protected areas and Natura 2000 sites the conservation goals, and the planned measures should be designed together with the nature conservation manager.

At other, not protected areas cooperation should be developed with the farmers, professional and sport hunters.

In some cases, contacting local governments and schools could significantly help the conservation.

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Appendix I. Elements of the NAP by areas

The goal of the NAP is the restoration of the Hungarian LWfG population to a favourable conservation status, namely to stop the current population decline. A priority has been assigned to each result of the plan, according to the importance of the result regarding reaching the favourable conservation status of the LWfG:

Essential: a result that is needed to prevent further large declines in the Fennoscandian population that could lead to extinction.

High: a result that is needed to prevent further declines in the Hungarian wintering and migrating populations.

Medium: a result that is needed primarily not to conserve the Fennoscandian population but other populations.

Low: a result that has low importance in the conservation of the species, and has little effect on the conservation status of the species.

Timescales are attached to each measure using the following criteria:

Immediate: to commence within the next year.

Short: to commence within the next 3 years.

Medium: to commence within the next 5 years.

Long: to commence within the next 10 years.

Continuous: a action that is currently being implemented and should continue.

If the threat has only small effect or even is not relevant, most of the time measures have not been designed, because such measures could be negligible regarding the conservation of the LWfG population.

a) Hanság and surroundings

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the water catchment's extent. Decrease of the shallow, open water surfaces' extent. Ploughing the grasslands.	high	Increase the restoration of wetland habitats. Restore the grasslands neighbouring the roosting sites.	low	long
Inadequate management of roosting and feeding sites	Irrelevant.	-	-	-	-
Postponement of reconstruction of the former roosting and feeding sites	Partly implemented (416 ha).	high	Double the extent of wetland habitats.	low	low
Agricultural disturbance	Disturbing the feeding flocks of GWfG.	low	-	-	-
Hunting activity	Wild goose hunting at the feeding sites.	medium	Restrict all kind of hunting activity around the roosting site, designate non-hunting zones. Share information with hunters.	low	medium/ continuous
Disturbance of animal origin	The site is seldom visited by White-tailed Eagles.	low	-	-	-
Uncontrolled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Controlled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Poisoning	Absent.	irrelevant	-	-	-
Genetic impoverishment	Possibility to meet genetically questionable individuals that are reintroduced.	low	-	-	-

b) Fertő and surroundings

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the water catchment's extent. Decrease of the shallow, open water surfaces' extent. Ploughing the grasslands.	medium	Slightly increase the restoration of wetland habitats, conserve the recent habitats. Restore the grasslands neighbouring the roosting sites.	medium	long/continuous
Inadequate management of roosting and feeding sites	Inadequate grazing intensity. Inadequate management of the littoral zones.	medium	Increase the intensity of grazing particularly at the littoral zones. Graze partially the littoral zone of Fertő.	medium	medium/ continuous
Postponement of reconstruction of the former roosting and feeding sites	Implemented substantially (250 ha).	medium	Slightly increase the extent of wetland habitats.	low	long
Agricultural disturbance	Disturbing the feeding flocks of GWfG.	low	-	-	-
Hunting activity	Wild goose hunting at the feeding sites.	medium	Restrict all kind of hunting activity around the roosting site, designate non-hunting zones. Share information with hunters. Designate and maintain wild goose feeding sites.	medium	medium/ continuous
Disturbance of animal origin	The site is seldom visited by White-tailed Eagles	low	-	-	-
Uncontrolled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Controlled visitors of roosting and feeding sites	Mass tourism.	low	-	-	-
Poisoning	Absent.	irrelevant	-	-	-
Genetic impoverishment	Possibility to meet genetically questionable individuals that are reintroduced.	low	-	-	-

c) Kis-Balaton, Balaton and Nagy-berek

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the shallow, open water surfaces' extent. Stabilization of high water level at wetland habitats.	high	Restore partially the wetland habitats with shallow, open water surface.	low	long
Inadequate management of roosting and feeding sites	Inappropriate management of the littoral zone.	low	-	-	-
Postponement of reconstruction of the former roosting and feeding sites	Implemented reconstructions without considering nature conservation point of view.	medium	Implement the nature conservation point of view at new sites of reconstruction.	low	medium
Agricultural disturbance	Disturbing the feeding flocks of GWfG.	low	-	-	-
Hunting activity	Wild goose hunting at the feeding sites.	medium	Restrict all kind of hunting activity around the roosting site, designate non-hunting zones. Share information with hunters	medium	medium/ continuous
Disturbance of animal origin	The site is seldom visited by White-tailed Eagles	low	-	-	-
Uncontrolled visitors of roosting and feeding sites	Mass tourism.	low	-	-	-
Controlled visitors of roosting and feeding sites	Mass tourism.	low	-	-	-
Poisoning	Absent.	irrelevant	-	-	-
Genetic impoverishment	Possibility to meet genetically questionable individuals that are reintroduced.	low	-	-	-

d) Dinnyési-fertő

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the water catchment's extent. Decrease of the shallow, open water surfaces' extent. Ploughing the grasslands.	medium	Restore the catchment areas. Restore the grasslands neighbouring the roosting sites.	medium	long
Inadequate management of roosting and feeding sites	Inadequate grazing intensity. The littoral zone is grazed only partially.	medium	Further increase the grazing intensity. Graze the littoral zone.	medium	medium/ continuous
Postponement of reconstruction of the former roosting and feeding sites	Ploughing the grasslands connected to wetland habitats. Decrease of the open water surfaces.	medium	Restore the grasslands and graze intensively. Graze the littoral zone actively.	medium	long/continuous
Agricultural disturbance	Disturbing the feeding flocks of GWfG.	low	-	-	-
Hunting activity	Wild goose hunting at the feeding sites.	medium	Restrict all kind of hunting activity around the roosting site, designate non-hunting zones. Share information with hunters	medium	medium/ continuous
Disturbance of animal origin	The site is seldom visited by White-tailed Eagles	low		-	-
Uncontrolled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Controlled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Poisoning	Absent,	irrelevant	-	-	-
Genetic impoverishment	Possibility to meet genetically questionable individuals that are reintroduced.	low	-	-	-

e) Tata and surroundings

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Irrelevant.	-	-	-	-
Inadequate management of roosting and feeding sites	Irrelevant.	-	-	-	-
Postponement of reconstruction of the former roosting and feeding sites	Irrelevant.	-	-	-	-
Agricultural disturbance	Disturbing the feeding flocks of GWfG.	low	-	-	-
Hunting activity	Wild goose hunting at the feeding sites.	medium	Restrict all kind of hunting activity around the roosting site, designate non-hunting zones. Share information with hunters	medium	medium/ continuous
Disturbance of animal origin	The site is seldom visited by White-tailed Eagles	low		-	-
Uncontrolled visitors of roosting and feeding sites	General and recreational tourism.	medium	Increase the activity of rangers. Share information.	medium	immediate/ continuous
Controlled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Poisoning	Absent.	low	-	-	-
Genetic impoverishment	Possibility to meet genetically questionable individuals that are reintroduced.	low	-	-	-

f) Alkaline grasslands at Felső-Kiskunság

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the water catchment' extent, damage of aquitard layers. Decrease of open water surface, shallow wetland habitats' extent. Ploughing of the grasslands Decrease of the astatic wetland habitats' extent.	high	Restore the water catchment areas. Restore the grasslands neighbouring the roosting sites.	medium	medium
Inadequate management of roosting and feeding sites	Inadequate grazing intensity. The littoral zone is grazed only partially.	medium	Increase the grazing intensity. Graze the littoral zone.	medium	medium/ continuous
Postponement of reconstruction of the former roosting and feeding sites	Postponement of the complex reconstruction of the water catchment. Absence of the littoral zone management. Decrease of the open water surfaces.	medium	Restore the grasslands and graze intensively. Graze the littoral zone actively. Implement an artificial flooding system considering nature conservation goals.	medium	long
Agricultural disturbance	Disturbing the feeding flocks of GWfG. Disturbance connected to grazing.	medium	Share information.	medium	immediate/ continuous
Hunting activity	Wild goose hunting at feeding sites.	medium	Register LWfG as a species of designation of the SPA. Restrict all kind of hunting activity around the roosting site, designate non-hunting zones. Share information with hunters	medium	medium/ continuous
Disturbance of animal origin	The site is seldom visited by White-tailed Eagles	low		-	-
Uncontrolled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Controlled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Poisoning	Absent.	-	-	-	-
Genetic impoverishment	Uninterpretable.	-	-	-	-

g) Soda pans at Kiskunság

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the water catchment' extent, damage of aquitard layers. Decrease of the open water surface, shallow wetland habitats' extent. Ploughing of the grasslands	critical	Restore the water catchment areas. Restore the grasslands neighbouring the roosting sites.	high	medium
Inadequate management of roosting and feeding sites	Inadequate grazing intensity. The littoral zone is grazed only partially.	high	Increase the grazing intensity. Graze the littoral zone.	high	short/ continuous
Postponement of reconstruction of the former roosting and feeding sites	Postponement of the complex reconstruction of the water catchment. Ploughing of the grasslands around wetlands. Absence of the littoral zone management. Decrease of the open water surfaces.	critical	Restore the grasslands and graze intensively. Graze actively the littoral zone. Partial restoration of the water catchment is in progress (Kelemen-szék, Böddi-szék). Restore the grasslands at the coast of the soda pansat least in a 100 m lane.	high	medium/ continuous
Agricultural disturbance	Disturbing the feeding flocks of GWfG. Disturbance connected to grazing.	medium	Share information.	medium	immediate/ continuous
Hunting activity	Wild goose hunting at the feeding sites.	critical	Restrict all kind of hunting activity around the roosting site, designate non-hunting zones. Share information with hunters	high	short
Disturbance of animal origin	The site is seldom visited by White-tailed Eagles	low	-	-	-
Uncontrolled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Controlled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Poisoning	Absent.	-	-	-	-
Genetic impoverishment	Uninterpretable.	-	-	-	-

h) Pusztaszer Landscape Protection Area

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the water catchment' extent. Decrease of open water surface, shallow wetland habitats' extent. Ploughing of the grasslands	medium	Restore the water catchment areas (demolish the channels). Restore the Csaj-lake as a soda pan. Restore the grasslands neighbouring the roosting sites.	medium	medium
Inadequate management of roosting and feeding sites	Decrease of the open water surface's extent. Inappropriate management of the littoral zone	medium	Increase the grazing intensity, particularly in the littoral zones and at the degraded soda pans.	medium	short/ continuous
Postponement of reconstruction of the former roosting and feeding sites	Postponement of the complex reconstruction of water catchment. Ploughing of the grasslands around wetlands. Absence of the littoral zone management. Decrease of the open water surfaces	critical	Restore the grasslands and graze intensively. Graze actively the littoral zone. Partial restoration of the water catchment has been implemented (Vesszős-szék). Restore the grasslands at the coast of the soda pans at least in a 100 m lane.	medium	medium/ continuous
Agricultural disturbance	Disturbing the feeding flocks of GWfG. Disturbance connected to grazing.	medium	Share information.	medium	immediate/ continuous
Hunting activity	Wild goose hunting at the feeding sites.	critical	Restrict all kind of hunting activity around the roosting site, designate non-hunting zones. Share information with hunters Maintain wild goose feeding sites.	high	short/ continuous
Disturbance of animal origin	The site is seldom visited by White-tailed Eagles	low	-	-	-
Uncontrolled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Controlled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Poisoning	Absent.	-	-	-	-
Genetic impoverishment	Uninterpretable.	-	-	-	-

i) Fehér-tó (Kardoskút)

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the water catchment' extent. Ploughing of the grasslands	medium	Restore the water catchment areas (demolish the channels). Restore the grasslands neighbouring the roosting sites.	medium	medium
Inadequate management of roosting and feeding sites	Absent		Maintain the appropriate grazing intensity.	medium	immediate/ continuous
Postponement of reconstruction of the former roosting and feeding sites	Ploughing the grasslands connected to the wetland habitats. Elimination of the dams at Fehér-tó which disconnects the bays.	medium	Restore the grasslands and graze intesively. Restore the grasslands at the coast of the soda pans at least in a 100 m lane. Demolish the dams.	medium	medium
Agricultural disturbance	Disturbing the feeding flocks of GWfG. Disturbance connected to grazing.	medium	Share information	medium	immediate/ continuous
Hunting activity	Wild goose hunting at the feeding sites.	critical	Register LWfG as a species of designation of the SPA. Restrict all kind of hunting activity around the roosting site, designate non-hunting zones. Share information with hunters	high	short/ continuous
Disturbance of animal origin	Absent.	-	-	-	-
Uncontrolled visitors of roosting and feeding sites	Absent.	-	-	-	-
Controlled visitors of roosting and feeding sites	Negligible.	-	-	-	-
Poisoning	Absent.	-	-	-	-
Genetic impoverishment	Uninterpretable.	low	-	-	-

j) Kis-Sárrét

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of open water surface, shallow wetland habitats' extent. Ploughing of the grasslands	medium	Restore of the water catchment areas (demolish the channels). Restore the grasslands neighbouring the roosting sites.	medium	medium
Inadequate management of roosting and feeding sites	Decrease of open water surface, shallow wetland habitats' extent. Inappropriate management of the littoral zone.	medium	Provide appropriate shallow wetland habitats by draining the fishponds during the migratory period. Increase the grazing intensity, particularly at the littoral zones	medium	short/ continuous
Postponement of reconstruction of the former roosting and feeding sites	Ploughing the grasslands connected to the wetland habitats.	low	Restore the grasslands and graze intensively. Graze actively the littoral zone.	medium	medium
Agricultural disturbance	Disturbing the feeding flocks of GWfG. Disturbance connected to grazing. Disturbance connected to fishing. Disturbance connected to cormorant deterrence and hunting.	medium	Share information. Restrict the cormorant deterrence and hunting at lakes relevant to wild goose migration.	medium	medium/ continuous
Hunting activity	Wild goose hunting at the feeding sites.	critical	Restrict all kind of hunting activity around the roosting site, designate non-hunting zones. Share information with hunters	high	short/ continuous
Disturbance of animal origin	The site is regularly visited by White-tailed Eagles	low	-	-	-
Uncontrolled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Controlled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Poisoning	Absent.	-	-	-	-
Genetic impoverishment	Uninterpretable.	-	-	-	-

k) Bihari-sík

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the water catchment' extent. Decrease of open water surface, shallow wetland habitats' extent. Ploughing of the grasslands	medium	The partial restoration of water catchment area has been done (Andaháza, Peres, K-IX. tározó). Restore the water catchment. Restore the grasslands neighbouring the roosting sites.	medium	medium
Inadequate management of roosting and feeding sites	Decrease of open water surface's extent. Inappropriate management of the littoral zone.	medium	Maintain the grazing intensity, increase if it is possible, particularly at the littoral zones.	medium	short/ continuous
Postponement of reconstruction of the former roosting and feeding sites	Postponement of the complex reconstruction of water catchment. Ploughing of the grasslands around wetlands.	critical	Restore the grasslands and graze intesively. The partial restoration of water catchment is in progress (pl. Nagy-nyomás), or has been done (pl. Tetétlen).	medium	medium
Agricultural disturbance	Disturbing the feeding flocks of GWfG.	medium	Share information	medium	medium/ continuous
Hunting activity	Wild goose hunting at the feeding sites.	critical	Register LWfG as a species of designation of the SPA. Restrict all kind of hunting activity around the roosting site, designate non-hunting zones. Share information with hunters	medium	short/ continuous
Disturbance of animal origin	The site is regularly visited by White-tailed Eagles	low		-	-
Uncontrolled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Controlled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Poisoning	Absent.	-	-	-	-
Genetic impoverishment	Uninterpretable.	-	-	-	-

l) Tisza-tó and surroundings (Tisza-tó, Hevesi-sík, Borsodi-mezőség)

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Irrelevant.	-	-	-	-
Inadequate management of roosting and feeding sites	Irrelevant.	-	-	-	-
Postponement of reconstruction of the former roosting and feeding sites	Implemented reconstructions without considering nature conservation point of view.	critical	Few reconstructions have nature conservation benefits, maintain these benefits.	medium	immediate/ continuous
Agricultural disturbance	Disturbing the feeding flocks of GWfG.	medium	Information sharing	medium	medium/ continuous
Hunting activity	Wild goose hunting at the feeding sites.	critical	Remarkable effect on ploughlands, while lower importance on roosting sites. Register LWfG as a species of designation of the SPA (Borsodi-sík). Restrict all kind of hunting activity around the roosting site, designate non-hunting zones. Share information with hunters	medium	medium/ continuous
Disturbance of animal origin	The site is regularly visited by White-tailed Eagles	low	-	-	-
Uncontrolled visitors of roosting and feeding sites	Fishing.	low	-	-	-
Controlled visitors of roosting and feeding sites	Fishing.	low	-	-	-
Poisoning	Absent.	-	-	-	-
Genetic impoverishment	Uninterpretable.	-	-	-	-

m) Hortobágy: Kunkápolnás-marshland and surroundings

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the water catchment' extent. Decrease of open water surface, shallow wetland habitats' extent.	low	-	-	-
Inadequate management of roosting and feeding sites	Decrease of open water surface's extent. Inadequate management of the littoral zone. Artificial stabilization of the water level.	medium	Increase the grazing intensity, particularly at the littoral zones. Maintain the wetland habitats astatic naturally.	medium	medium/ continuous
Postponement of reconstruction of the former roosting and feeding sites	Irrelevant.	-	-	-	-
Agricultural disturbance	Disturbance connected to grazing.	low	-	-	-
Hunting activity	Wild goose hunting at the feeding sites.	medium	Restrict all kind of hunting activity around the roosting site, designate non-hunting zones. Restrict out of the season hunting activity. Share information with hunters	medium	medium/ continuous
Disturbance of animal origin	The site is regularly visited by White-tailed Eagles	low	-	-	-
Uncontrolled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Controlled visitors of roosting and feeding sites	Connected to nature conservation management.	low			
Poisoning	Absent.	-	-	-	-
Genetic impoverishment	Uninterpretable.	-	-	-	-

n) Hortobágy: Csécsi-fishpond and surroundings

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the water catchment's extent. Decrease of open water surface, shallow wetland habitats' extent. Ploughing of the grasslands	medium	Transform some of the ponds to astatic wetlands (e.g. Kungyörgyi-tó). Demolish the channel system that drain the static wetland habitats (Fekete-rét, Zám at Hortobágy). Restore the grasslands (ploughlands at Parajos, Szásztelek).	medium	medium
Inadequate management of roosting and feeding sites	Decrease of open water surface's extent. Inadequate management of the littoral zone. Artificial stabilization of the water level.	medium	Increase the grazing intensity, particularly at the littoral zones and the wild goose feeding sites (e.g. Fekete-rét, Zám). Maintain the wetland habitats astatic naturally.	medium	medium
Postponement of reconstruction of the former roosting and feeding sites	Demolition of the channel system.	medium	Partly implemented (e.g. Parajos, Fekete-rét at Hortobágy).	medium	medium
Agricultural disturbance	Disturbing the feeding flocks of GWfG. Disturbance connected to grazing. Disturbance connected to fishing. Disturbance connected to cormorant deterrence and hunting.	medium	Information sharing. Restrictions in cormorant deterrence and hunting at lakes relevant to wild goose migration.	medium	medium/ continuous
Hunting activity	Wild goose hunting at the feeding sites.	medium	Restrict out of the season hunting activity. Ban out of the season hunting activity at SPA. Share information with hunters	medium	short/ continuous
Disturbance of animal origin	The site is regularly visited by White-tailed Eagles	low	-	-	-
Uncontrolled visitors of roosting and feeding sites	Negligible.	low	-	-	-
Controlled visitors of roosting and feeding sites	Connected to nature conservation management.	low			
Poisoning	Absent	-	-	-	-
Genetic impoverishment	Uninterpretable.	-	-	-	-

o) Hortobágy: Hortobágyi-fishponds and surroundings

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the water catchment' extent. Decrease of open water surface, shallow wetland habitats' extent.	critical	Demolish the channel system that drain the astatic wetland habitats (Kungyörgy-puszta). Demolish the dam at the north side of Kondás-fishpond. Demolish the dams at Kis-Kondás pond.	essential	medium
Inadequate management of roosting and feeding sites	Decrease of open water surface's extent. Inadequate management of the littoral zone.	critical	Increase the grazing intensity, particularly at the littoral zones. Adequate water management of Hortobágy-fishponds. In drought years, water supply of Dinnyés-lapos and Boca-lapos considering nature conservation point of vie.	essential	medium
Postponement of reconstruction of the former roosting and feeding sites	Demolition of the channel system.	medium	Partly implemented (e.g.. Rókás, Kecskés-puszta).	essential	medium
Agricultural disturbance	Disturbance connected to grazing. Disturbance connected to fishing. Disturbance connected to weed management.	medium	Share information	high	medium
Hunting activity	Irrelevant	-	-	-	-
Disturbance of animal origin	The site is regularly visited by White-tailed Eagles	medium	Designate and maintain artificial feeding sites.	high	immediate/ continuous
Uncontrolled visitors of roosting and feeding sites	Tourism.	medium	Increase the activity of rangers. Share information.		
Controlled visitors of roosting and feeding sites	Connected to nature conservation management.	low			
Poisoning	Absent	-	-	-	-
Genetic impoverishment	Uninterpretable.	-	-	-	-

p) Hortobágy: Elep-fishponds and surroundings

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the water catchment' extent. Decrease of open water surface, shallow wetland habitats' extent. Ploughing of the grasslands	medium	Demolish the channel system that drain the astatic wetland habitats (e.g. Nagy-rét). Restore the grasslands (e.g. Álom-zug).	medium	medium
Inadequate management of roosting and feeding sites	Decrease of open water surface's extent. Inappropriate management of the littoral zone.	medium	Increase the grazing intensity, particularly at the littoral zones.	medium	medium/ continuous
Postponement of reconstruction of the former roosting and feeding sites	Demolition of the channel system.	medium	Implemented partly (e.g. Álom-zug)	medium	medium
Agricultural disturbance	Disturbing the feeding flocks of GWfG. Disturbance connected to grazing. Disturbance connected to fishing. Disturbance connected to cormorant deterrence and hunting.	medium	Share information. Restrict cormorant deterrence and hunting at ponds relevant to wild goose migration.	medium	medium/ continuous
Hunting activity	Wild goose hunting at the feeding sites.	medium	Restrict out of the season hunting activity. Ban out of the season hunting activity at SPA. Share information with hunters	medium	short/continuous
Disturbance of animal origin	The site is regularly visited by White-tailed Eagles	medium	Designate and maintain artificial feeding sites.	medium	immediate/ continuous
Uncontrolled visitors of roosting and feeding sites	Tourism.	low	-	-	-
Controlled visitors of roosting and feeding sites	Connected to nature conservation management.	low			
Poisoning	Absent	-	-	-	-
Genetic impoverishment	Uninterpretable.	-	-	-	-

q) Virágoskút-fishponds and surroundings

Threat	Particular threatening factor	Importance	Measures	Priority	Timescale
Transformation of the roosting and feeding sites	Decrease of the water catchment' extent. Decrease of open water surface, shallow wetland habitats' extent.	low	-	-	-
Inadequate management of roosting and feeding sites	Decrease of open water surface's extent.	medium	Apply appropriate water management at I- and II-pond.	medium	immediate/ continuous
Postponement of reconstruction of the former roosting and feeding sites	Irrelevant.		-	-	-
Agricultural disturbance	Disturbing the feeding flocks of GWfG. Disturbance connected to fishing. Disturbance connected to cormorant deterrence and hunting.	medium	Share information. Restrict cormorant deterrence and hunting at ponds relevant to wild goose migration.	medium	medium/ continuous
Hunting activity	Wild goose hunting at the feeding sites.	medium	Restrict out of the season hunting activity. Ban out of the season hunting activity at SPA. Share information with hunters	medium	short/ continuous
Disturbance of animal origin	The site is regularly visited by White-tailed Eagles	medium	Designate and maintain artificial feeding sites.	medium	immediate/ continuous
Uncontrolled visitors of roosting and feeding sites	Tourism.	low	-	-	-
Controlled visitors of roosting and feeding sites	Connected to nature conservation management.	low			
Poisoning	Absent	-	-	-	-
Genetic impoverishment	Uninterpretable.	-	-	-	-