

Amulsar Bird Survey Report Autumn 2013



TREWEEK
ENVIRONMENTAL CONSULTANTS

Chancery Cottage, Kentisbeare, Cullompton, Devon, EX15 2DS, UK. Tel. +44 (0)1884 266694. www.treweek.co.uk.

CONTENTS

1	Background.....	8
2	Material and methods	8
2.1	Migration counts	8
2.2	Ground use	9
2.3	Specific visits	13
3	Results	13
3.1	Migration counts	20
3.2	Ground use	22
3.2.1	Use of area by migrant birds.....	22
3.2.2	Use of area by local birds	28
4	Red Data Species	30
4.1	Egyptian Vulture.....	30
4.2	Saker Falcon	33
4.3	Black Vulture	33
4.4	Pallid Harrier.....	34
4.5	Red-footed Falcon.....	34
4.6	Black-winged Pratincole.....	34
4.7	Eurasian Curlew	35
4.8	European Roller	35
4.9	Greater Spotted Eagle	35
4.10	Eastern Imperial Eagle	35
4.11	Great Cormorant.....	35
4.12	White Pelican	36
4.13	Black Stork	36
4.14	Ruddy Shelduck	36
4.15	Lammergeier	36
4.16	Short-toed Eagle.....	36
4.17	Montagu's Harrier	37
4.18	Northern Goshawk	37

4.19	Levant Sparrowhawk.....	37
4.20	Lesser Spotted Eagle	38
4.21	Steppe Eagle	38
4.22	Golden Eagle	38
4.23	Booted Eagle	39
4.24	Osprey	39
4.25	Lesser Kestrel.....	39
4.26	Peregrine Falcon.....	42
4.27	Corncrake	42
4.28	Demoiselle Crane	42
4.29	Collared Pratincole.....	42
4.30	Armenian Gull.....	43
4.31	Eurasian Eagle Owl.....	43
4.32	Citrine Wagtail	43
4.33	Eastern Rock Nuthatch.....	43
4.34	Woodchat Shrike	43
5	Interpretation of implications under IFC Performance Standard 6	44
6	Recommendations	45
7	References	48
8	Annexes	49

GLOSSARY OF ACRONYMS

the Project	Amulsar Mine Project
Geoteam	Geoteam CJSC
ASPB	Armenian Society for the Protection of Birds
ARD	Acid Rock Drainage
BAP	Biodiversity Action Plan
BBOP	Business and Biodiversity Offset Programme
BOMP	Biodiversity Offset Management Plan
BMP	Biodiversity Management Plan
CE	Critically Endangered
E	Endangered
EBRD	European Bank for Reconstruction and Development
ESIA	Environmental and Social Impact Assessment
ESMS	Environmental and Social Management System
fBMP	framework Biodiversity Management Plan
HLF	Heap Leach Facility
HLP	Heap Leach pad
IBA	Important Bird Area
ICMM	International Council for Mining and Minerals
IPIECA	International Petroleum Industry Environmental Conservation Association
IUCN	International Union for the Conservation of Nature
IFC	International Finance Corporation
KBA	Key Biodiversity Area
KBC	Key Biodiversity Component

Lydian	Lydian International Ltd
NGO	Non Government Organisation
NPI	Net Positive Impact
NNL	No Net Loss
PA	Protected Area
PAA	Project Affected Area
RA	Republic of Armenia
RA NAS	Republic of Armenia, National Academy of Science
SAP	Species Action Plan
SEP	Stakeholder Engagement Plan
TEC	Treweek Environmental Consultants
VU	Vulnerable
WAI	Wardell Armstrong International
WDF	Waste-rock Dump Facility
WWF	World Wildlife Fund for Nature

SUMMARY

The Amulsar gold project (the 'Project') involves development of a gold deposit via open pit mining and heap leach processing techniques. The Project is owned by Lydian International (Lydian) and operated by a subsidiary company, Geoteam CJSC (Geoteam) in Armenia. The Environmental and Social Impact Assessment (ESIA) produced in 2013 included information from a survey of migratory raptors and other bird species carried out in Spring 2013 as well as information on breeding bird populations in the area potentially affected by the Project.

The need for a further survey of migratory birds was identified for Autumn 2013 to ensure that both seasons were covered in terms of quantifying numbers of birds and the level of use of Amulsar by species of global and national conservation concern could be clarified. This report presents the results of the Autumn Survey.

CONTENTS

1	Background	8
2	Material and methods	8
2.1	Migration counts	8
2.2	Ground use.....	9
2.3	Specific visits.....	13
3	Results	13
3.1	Migration counts	20
3.2	Ground use.....	22
3.2.1	Use of area by migrant birds	22
3.2.2	Use of area by local birds	28
4	Red Data Species.....	30
4.1	Egyptian Vulture.....	30
4.2	Saker Falcon	33
4.3	Black Vulture.....	33
4.4	Pallid Harrier	34
4.5	Red-footed Falcon	34
4.6	Black-winged Pratincole.....	34
4.7	Eurasian Curlew	35
4.8	European Roller	35
4.9	Greater Spotted Eagle	35
4.10	Eastern Imperial Eagle	35
4.11	Great Cormorant	35
4.12	White Pelican	36
4.13	Black Stork.....	36
4.14	Ruddy Shelduck	36
4.15	Lammergeier	36
4.16	Short-toed Eagle.....	36
4.17	Montagu's Harrier.....	37

4.18	Northern Goshawk	37
4.19	Levant Sparrowhawk	37
4.20	Lesser Spotted Eagle	38
4.21	Steppe Eagle.....	38
4.22	Golden Eagle.....	38
4.23	Booted Eagle	39
4.24	Osprey	39
4.25	Lesser Kestrel.....	39
4.26	Peregrine Falcon	42
4.27	Corncrake	42
4.28	Demoiselle Crane	42
4.29	Collared Pratincole.....	42
4.30	Armenian Gull	43
4.31	Eurasian Eagle Owl.....	43
4.32	Citrine Wagtail.....	43
4.33	Eastern Rock Nuthatch	43
4.34	Woodchat Shrike.....	43
5	Interpretation of implications under IFC Performance Standard 6	44
6	Recommendations	45
7	References	48
8	Annexes	49

1 Background

Treweek Environmental Consultants commissioned an international team of experts On behalf of Lydian International Ltd. to carry out ornithological surveys on and in the vicinity of Mount Amulsar in Armenia in autumn 2013. The autumn surveys were to complete the spring 2013 results, verifying ways in which the autumn migration differed from the spring migration and establishing whether this had any further implications for management of biodiversity-related risks and opportunities associated with proposed development of Lydian International's Amulsar Gold Mine. Special attention was given to the species listed in the Red Data Book of Armenia (Aghasyan & Kalashyan 2010).

To reduce errors associated with different surveyors, the survey team included some of the same people as in spring 2013: Mike Duckham (UK), Nicolas Vandestrade and Peter Adriaens (Belgium), Marta Peris Cabré (Spain), and Mårten Wikstrom (Sweden). The team cooperated closely with members of the Armenian Society for the Protection of Birds, namely Mamikon Ghasabian, Luba Balyan and Tsovinar Hovhannisyan, who each joined the surveys for an extended amount of time. This report was drafted by Peter Adriaens (Belgium) and reviewed by Jo Treweek.

2 Material and methods

Data on birds in the area were gathered through daily migration counts, recording of ground use, and a few targeted visits to specific locations. The survey area was roughly the same as in spring, consisting of the Saravan and Gorayk License Areas as well as the Saravan License Extension Area, and the immediate surroundings of these areas (figure 2).

2.1 Migration counts

Migrating birds, especially raptors, were counted almost daily from two main watch points, called A and B (see figure 1). To make sure that our data would be fully comparable with spring results, the same watch points were used but with some minor but necessary changes. We were now looking north instead of south, as birds migrating in autumn head southwards. On watch point B this was not a problem, as the view was good in all directions. Watch point A from spring, however, was located on a rather long, uneven hill top; if we wanted to have a good view of the whole area north of it, we lost sight of the valley to the south – an important valley as that is where the rock waste dump of the mining activities is allocated. Therefore, we moved the watch point a bit further down into the Vorotan valley, from where we had a good view in all directions, including the waste dump valley immediately to our west (see figure 2, area A4). On each watch point, counts were made by a team of 2 – 4 people between 09:00 and 18:00 (weather permitting) over the period 22 August to 14 October 2013. Double counting was not really an issue as both watch points were well separated by Amulsar mountain in between, essentially blocking the view from one watch point to the other. Still, occasional consulting by phone between the two watch point teams further prevented double counts.

Two more, temporary watch points were used in autumn: B-bis and C (figure 1). When the snow came, on October 7th, the main watch points (A and B) became difficult to access as the tracks

leading to them were wet and slippery. Point B-bis, located in the western edge of the survey area, provided an alternative for watch point B and was used on 7-8, 11 and 13-14 October. Watch point C was only used on 10-11 October, rather as a side activity when we were actually making a specific visit to the valley north of Jermuk. It was rather far outside of the survey area, but because it was located to the north of it, it is reasonable to assume that at least some of the migrating raptors seen will have passed over the survey area on their way south.

2.2 Ground use

Migrating birds were not just counted. It was also noted whether they were merely flying through or also making use of the area in any way, e.g. for hunting, roosting, or in search of food or suitable habitat. Behaviour was the determinant factor used for deciding whether a migrant bird was using the area. For instance, lingering above a certain area, stooping down, perching and hovering were all considered indications of ground use. Flight altitude was also taken into account (flying very low above the ground can often be a first indication of ground use) but was not used as a sole criterion, unlike in spring. Flight altitude may vary not only according to species but also due to weather conditions (see e.g. Kahlert et al 2012). In addition, it is very difficult to estimate flight altitude in the field, so deciding whether a bird is flying above or below a certain limit is dubious at best. Birds were recorded as using each area that they passed through such that a single individual bird could be recorded in multiple areas while passing through the vicinity of the mountain.

Local birds were usually recorded as using the area. ‘Local’ can be defined as either having bred in or near the area in spring, or being resident. The latter includes birds that remain in Armenia throughout the year and that therefore do not migrate. Sometimes, however, such birds can undertake local dispersive movements, and in such cases (i.e. when they showed migratory behaviour) they were written down as migrants.

For each watch point (except C), the land in view was divided into “visual areas” based on landscape features such as ridge tops, rivers, roads, or man-made structures (figure 2). We did not use the exact same divisions as in spring because we were now looking north instead of south, meaning that the land in view was now different. Also, we had moved watch point A slightly, so we had to redefine the “visual areas” anyway. One drawback of watch point A was its location in the very north of the license area. Our main focus in autumn was on the north (where migration was coming from), which meant that some of the ground use recorded (in areas A1, A2 and A3) was outside of the license area. Moving the watch point much further south in the Vorotan valley was not an option though, as then we would have lost sight of the waste dump valley (A4) entirely, and our view to the west and northwest would have been seriously hampered by Amulsar Mountain. Much of the ground use recorded was close to the watch point though, and therefore close to the license area so still relevant.

Ground use was not recorded at watch point C as this was too far outside of the survey area.

Data recorded from these “visual areas” were analysed as “bird-days” (or “ground-days”), that is the total number of birds using a given area over a number of days, e.g. two birds using one area on one day equals two “bird-days”, while one bird recorded from the same area on two different days also equals two “bird-days”. This is necessary since one bird could be recorded from more than one area

in a single day. The term “bird-day” should not be taken to imply any measure of time spent in a given area – a bird taking less than a minute perching in an area produces a record of one “bird-day” the same as does a single bird spending several hours circling over it.

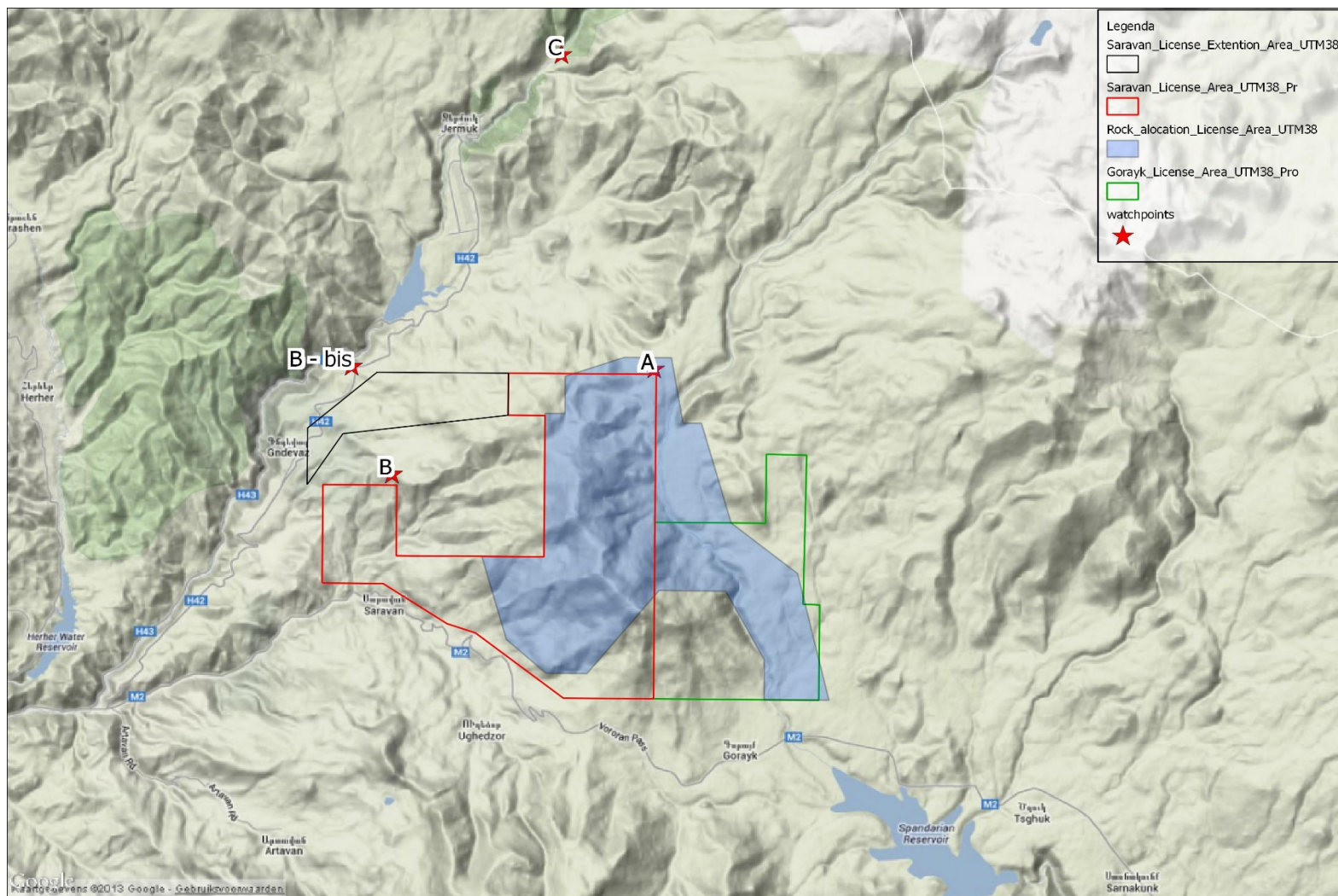


Figure 1. Location of watch points in autumn 2013

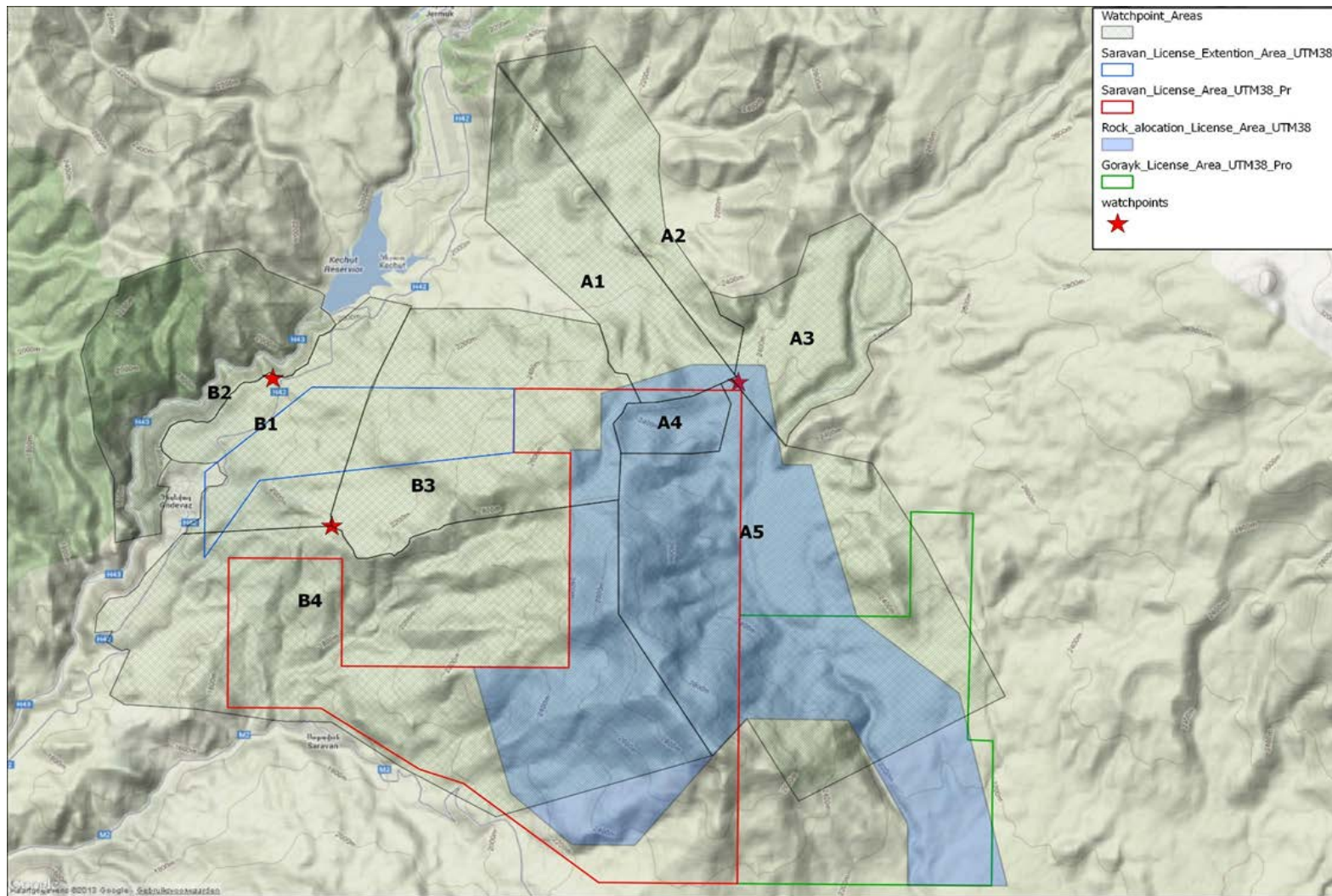


Figure 2 Recording areas for ground use in autumn 2013

2.3 Specific visits

On a few days, some team members made visits to certain parts of the survey area. This was done on 29-30 September and 5-6 October to determine the number of Lesser Kestrels (a Red Data species in Armenia) that were staying in the area but were not visible or identifiable from the watch points, and on 28 August and 5 September to record all birds using the ground between watch point B and the village of Gndevaz (i.e. the so-called Site 28). The latter was important to estimate the potential impact of a Heap Leach facility in this part of the survey area. On 10 and 11 October, visits were made to the valley just north of Jermuk. Distant views from watch point A had indicated that a lot of raptors were using this area, so we wanted to get some idea of the numbers involved.

3 Results

A total of 139 bird species were recorded within the survey boundary (i.e. the license area and the “visual areas” around the watch points, as shown in figure 2) in autumn 2013 (as opposed to 146 in spring¹). These are listed in Table 1 below, with the global and national threatened status of each provided. Of these 139 species, 36 are listed in the Armenian Red Data Book and 10 are globally threatened. Table 2 gives an overview of the species that were seen only in autumn and those that were recorded uniquely in spring.

Table 1 List of bird species recorded in the survey area in autumn 2013, with their global and national rarity status. IUCN = International Union for Conservation of Nature; ARDB = Armenian Red Data Book; LC = least concern; VU = vulnerable; EN = endangered; NT = near-threatened; DD = data deficient.

Scientific name	Common name	IUCN	ARDB
Phalacrocorax carbo	Great Cormorant	LC	VU
Pelecanus onocrotalus	Great White Pelican	LC	VU
Ardea cinerea	Grey Heron	LC	
Ardea purpurea	Purple Heron	LC	
Ciconia nigra	Black Stork	LC	VU
Ciconia ciconia	White Stork	LC	
Tadorna ferruginea	Ruddy Shelduck	LC	VU
Anas platyrhynchos	Mallard	LC	
Pernis apivorus	European Honey-buzzard	LC	
Milvus migrans	Black Kite	LC	
Gypaetus barbatus	Lammergeier	LC	VU

¹ The spring report mentioned only 137 species, but this number excluded 9 species which had been seen within the survey boundary at the time, namely Ruff, Armenian Gull, Calandra Lark, Bimaculated Lark, Oriental Skylark (*Alauda gulgula*), Isabelline Wheatear, Eastern Black-eared Wheatear, Blue Rock Thrush and Eastern Rock Nuthatch.

Scientific name	Common name	IUCN	ARDB
<i>Neophron percnopterus</i>	Egyptian Vulture	EN	EN
<i>Gyps fulvus</i>	Eurasian Griffon	LC	
<i>Aegypius monachus</i>	Black Vulture	NT	EN
<i>Circaetus gallicus</i>	Short-toed eagle	LC	VU
<i>Circus aeruginosus</i>	Marsh harrier	LC	
<i>Circus macrourus</i>	Pallid Harrier	NT	EN
<i>Circus pygargus</i>	Montagu's Harrier	LC	VU
<i>Accipiter gentilis</i>	Northern Goshawk	LC	VU
<i>Accipiter nisus</i>	Eurasian Sparrowhawk	LC	
<i>Accipiter brevipes</i>	Levant Sparrowhawk	LC	VU
<i>Buteo buteo vulpinus/menetriesi</i> ²	Steppe Buzzard	LC	
<i>Buteo rufinus</i>	Long-legged Buzzard	LC	
<i>Aquila pomarina</i>	Lesser Spotted Eagle	LC	VU
<i>Aquila clanga</i>	Greater Spotted Eagle	VU	VU
<i>Aquila nipalensis</i>	Steppe Eagle	LC	VU
<i>Aquila heliaca</i>	Imperial Eagle	VU	VU
<i>Aquila chrysaetos</i>	Golden Eagle	LC	VU
<i>Hieraetus pennatus</i>	Booted Eagle	LC	VU
<i>Pandion haliaetus</i>	Osprey	LC	VU
<i>Falco naumanni</i>	Lesser Kestrel	LC	VU
<i>Falco tinnunculus</i>	Common Kestrel	LC	
<i>Falco vespertinus</i>	Red-footed Falcon	NT	VU
<i>Falco columbarius</i>	Merlin	LC	DD
<i>Falco subbuteo</i>	Eurasian Hobby	LC	
<i>Falco biarmicus</i>	Lanner Falcon	LC	DD
<i>Falco cherrug</i>	Saker Falcon	EN	EN

² Migrating Steppe Buzzards all showed characters of the race *vulpinus*, while local breeding birds in Armenia are usually considered to belong to the race *menetriesi* – though there is still some confusion over this subspecies.

Scientific name	Common name	IUCN	ARDB
Falco peregrinus	Peregrine Falcon	LC	VU
Coturnix coturnix	Common Quail	LC	
Crex crex	Corncrake	LC	VU
Anthropoides virgo	Demoiselle Crane	LC	VU
Glareola pratincola	Collared Pratincole	LC	VU
Glareola nordmanni	Black-winged Pratincole	NT	VU
Calidris alpina	Dunlin	LC	
Philomachus pugnax	Ruff	LC	
Gallinago gallinago	Common Snipe	LC	
Numenius arquata	Eurasian Curlew	NT	VU
Tringa totanus	Common Redshank	LC	
Tringa ochropus	Green Sandpiper	LC	
Tringa glareola	Wood Sandpiper	LC	
Larus armenicus	Armenian Gull	LC	VU
Columba livia	Rock Pigeon	LC	
Columba oenas	Stock Pigeon	LC	
Columba palumbus	Woodpigeon	LC	
Streptopelia decaocto	Eurasian Collared-dove	LC	
Cuculus canorus	Common Cuckoo	LC	
Otus scops	Common Scops-owl	LC	
Bubo bubo	Eurasian Eagle-owl	LC	VU
Asio flammeus	Short-eared Owl	LC	
Caprimulgus europaeus	Eurasian Nightjar	LC	
Tachymarptis melba	Alpine Swift	LC	
Apus apus	Common Swift	LC	
Merops apiaster	European Bee-eater	LC	
Coracias garrulus	European Roller	NT	VU
Upupa epops	Eurasian Hoopoe	LC	

Scientific name	Common name	IUCN	ARDB
<i>Jynx torquilla</i>	Eurasian Wryneck	LC	
<i>Melanocorypha calandra</i>	Calandra Lark	LC	
<i>Melanocorypha bimaculata</i>	Bimaculated Lark	LC	
<i>Calandrella brachydactyla</i>	Greater Short-toed Lark	LC	
<i>Calandrella rufescens</i>	Lesser Short-toed Lark	LC	
<i>Lullula arborea</i>	Wood Lark	LC	
<i>Alauda arvensis</i>	Eurasian Skylark	LC	
<i>Eremophila alpestris</i>	Shorelark	LC	
<i>Riparia riparia</i>	Sand Martin	LC	
<i>Hirundo rupestris</i>	Eurasian Crag-martin	LC	
<i>Hirundo rustica</i>	Barn Swallow	LC	
<i>Delichon urbicum</i>	House Martin	LC	
<i>Anthus campestris</i>	Tawny Pipit	LC	
<i>Anthus trivialis</i>	Tree Pipit	LC	
<i>Anthus cervinus</i>	Red-throated Pipit	LC	
<i>Anthus spinoletta</i>	Water Pipit	LC	
<i>Anthus richardi</i>	Richard's Pipit	LC	
<i>Motacilla flava</i>	Yellow Wagtail	LC	
<i>Motacilla citreola</i>	Citrine Wagtail	LC	VU
<i>Motacilla cinerea</i>	Grey Wagtail	LC	
<i>Motacilla alba</i>	White Wagtail	LC	
<i>Prunella ocularis</i>	Radde's Accentor	LC	
<i>Prunella collaris</i>	Alpine Accentor	LC	
<i>Luscinia luscinia</i>	Thrush Nightingale	LC	
<i>Luscinia megarhynchos</i>	Common Nightingale	LC	
<i>Phoenicurus ochruros</i>	Black Redstart	LC	
<i>Phoenicurus phoenicurus</i>	Common Redstart	LC	
<i>Saxicola rubetra</i>	Whinchat	LC	

Scientific name	Common name	IUCN	ARDB
<i>Saxicola torquata</i>	Common Stonechat	LC	
<i>Oenanthe isabellina</i>	Isabelline Wheatear	LC	
<i>Oenanthe oenanthe</i>	Northern Wheatear	LC	
<i>Oenanthe hispanica</i>	Black-eared Wheatear	LC	
<i>Monticola saxatilis</i>	Rufous-tailed Rock-thrush	LC	
<i>Monticola solitarius</i>	Blue Rock-thrush	LC	
<i>Turdus torquatus</i>	Ring Ouzel	LC	
<i>Turdus merula</i>	Eurasian Blackbird	LC	
<i>Turdus viscivorus</i>	Mistle Thrush	LC	
<i>Acrocephalus palustris</i>	Marsh Warbler	LC	
<i>Sylvia nisoria</i>	Barred Warbler	LC	
<i>Sylvia curruca</i>	Lesser Whitethroat	LC	
<i>Sylvia communis</i>	Common Whitethroat	LC	
<i>Sylvia atricapilla</i>	Blackcap	LC	
<i>Phylloscopus sindianus</i>	Mountain Chiffchaff	LC	
<i>Phylloscopus trochilus</i>	Willow Warbler	LC	
<i>Muscicapa striata</i>	Spotted Flycatcher	LC	
<i>Parus caeruleus</i>	Blue Tit	LC	
<i>Parus major</i>	Great Tit	LC	
<i>Sitta tephronota</i>	Eastern Rock-nuthatch	LC	VU
<i>Sitta neumayer</i>	Western Rock-nuthatch	LC	
<i>Lanius collurio</i>	Red-backed Shrike	LC	
<i>Lanius minor</i>	Lesser Grey Shrike	LC	
<i>Lanius senator</i>	Woodchat Shrike	LC	VU
<i>Garrulus glandarius</i>	Eurasian Jay	LC	
<i>Pica pica</i>	Black-billed Magpie	LC	
<i>Pyrrhocorax pyrrhocorax</i>	Red-billed Chough	LC	
<i>Corvus corone</i>	Hooded Crow	LC	

Scientific name	Common name	IUCN	ARDB
Corvus corax	Common Raven	LC	
Sturnus vulgaris	Common Starling	LC	
Passer domesticus	House Sparrow	LC	
Petronia petronia	Rock Sparrow	LC	
Fringilla coelebs	Chaffinch	LC	
Fringilla montifringilla	Brambling	LC	
Serinus pusillus	Red-fronted Serin	LC	
Carduelis carduelis	European Goldfinch	LC	
Carduelis cannabina	Eurasian Linnet	LC	
Carduelis flavirostris	Twite	LC	
Rhodopechys sanguineus	Crimson-winged Finch	LC	
Carpodacus erythrinus	Common Rosefinch	LC	
Coccothraustes coccothraustes	Hawfinch	LC	
Emberiza citrinella	Yellowhammer	LC	
Emberiza cia	Rock Bunting	LC	
Emberiza hortulana	Ortolan Bunting	LC	
Emberiza melanocephala	Black-headed Bunting	LC	
Miliaria calandra	Corn Bunting	LC	

Table 2 List of bird species seen within the survey boundary in autumn 2013 (left) or spring 2013 (right) exclusively

Autumn only	Spring only
Great Cormorant	Common Teal
Grey Heron	Oriental Honey Buzzard
Great White Pelican	Red Kite
Greater Spotted Eagle	Chukar
Osprey	Grey Partridge
Lanner Falcon	Caspian Snowcock
Demoiselle Crane	Black-winged Stilt

Autumn only	Spring only
Collared Pratincole	Great Snipe
Dunlin	Common Sandpiper
Common Snipe	White-winged Tern
Eurasian Curlew	Blue-cheeked Bee-eater
Stock Pigeon	White-throated Dipper
Eurasian Collared Dove	Great Spotted Woodpecker
Common Scops-owl	European Turtle Dove
Eurasian Eagle-owl	Oriental Skylark
Short-eared Owl	Winter Wren
Eurasian Nightjar	Bluethroat
Lesser Short-toed Lark	White-throated Robin
Richard's Pipit	Cetti's Warbler
Citrine Wagtail	Sedge Warbler
Common Nightingale	Eurasian Reed Warbler
Blackcap	Orphean Warbler
House Sparrow	Menetries Warbler
Brambling	Garden Warbler
Hawfinch	Eastern Olivaceous Warbler
Yellowhammer	Common Chiffchaff
	Eastern Bonelli's Warbler
	Green Warbler
	Golden Oriole
	Rose-coloured Starling
	Eurasian Jackdaw
	Eurasian Siskin
	White-winged Snowfinch

3.1 Migration counts

A total of 15,110 migrating birds were counted from the watch points between 22 August and 14 October 2013. This included 8,508 migrating raptors of 27 different species. Compared to spring, the number of migrating raptor species was slightly lower (28 were recorded in spring), but the amount of birds was almost doubled (8,508 against 4,536). An overview of the numbers involved for each species is presented in table 3. Due to distance, bad light or other adverse conditions not all birds could be identified to species so identification of these was made to genus (*Aquila sp.*) or to species pair (Long-legged/Steppe Buzzard, Montagu's/Pallid Harrier or Common/Lesser Kestrel). Field identification of eagles, buzzards, harriers and kestrels is often difficult and tricky, so it would be bad science to try and put a name to each and every bird in all circumstances. We have taken utmost care to avoid identification mistakes and have tried to document difficult birds with photographs as often as possible. A good example of this are the kestrels. Identification of females and juveniles of this species pair comes down to the wing formula (something that should be verified on photographs), the colour of the claws (usually impossible to see in a flying bird) and a few subtle, variable plumage details. Extra care was required as one species (Lesser Kestrel) is red listed in Armenia while the other is not. To make matters worse, at least one bird was photographed that appears to be a hybrid between the two species. Hence, twice as many migrating kestrels were left unidentified compared to those named down to species level.

The bulk of all the migrants recorded consisted of Steppe Buzzards and Demoiselle Cranes. These two species alone comprised 63% of all migrating birds, while the percentage of Steppe Buzzards in itself amounted to 68% of all migrating raptors. The large number of Demoiselle Cranes is surprising, as this species was not recorded in spring. The species is an early migrant though, so perhaps all birds had already gone through before the spring survey started. Also of note were the 1,905 Pratincoles recorded, about twenty times as many as in spring. Most of these were Black-winged Pratincoles, but at least one big flock of 814 birds contained an unknown proportion of Collared Pratincoles too. A total of 255 White Pelicans was a high count for Armenia, and a Richard's Pipit was a new species for the country. Compared to the spring results, the number of European Honey Buzzards was surprisingly low (112 against 1,340). It looks like the vast majority of this species pass west of Armenia in autumn: Batumi in Georgia recorded 450,000 birds from 17 August to 16 October 2013. Other notable differences from the spring counts are found in the number of Pallid Harriers (ten times as many in autumn) and Lesser Kestrels (five times as many in autumn), both red listed in Armenia.

The list of migrant species recorded in the survey area in autumn 2013 contains 8 species considered to be globally threatened according to IUCN criteria, namely Egyptian Vulture (1), Black Vulture (1), Pallid Harrier (192), Greater Spotted Eagle (6), Eastern Imperial Eagle (13), Red-footed Falcon (11), Black-winged Pratincole (1,177), and Eurasian Curlew (1). Saker Falcon was also recorded but was written down as a local bird because it was seen perched and hung around in the survey area for two consecutive days.

Altogether, the total number of migrating birds and the numbers of individual globally-threatened species migrating past Mt. Amulsar in autumn did not meet the minimum requirements to identify the area as Critical Habitat as defined by the International Finance Corporation's Performance Standard and Birdlife International (see the spring report).

As was the case in spring, most migrating raptors preferred to pass west of Mt Amulsar rather than east; more than three times as many were counted from watch point B compared to A. Only three

species were more numerous in the eastern part of the survey area, namely Eurasian Sparrowhawk, Northern Goshawk and Pallid Harrier. Table 4 presents a breakdown of the numbers per watch point for each raptor species and further discussion is in section 3.2 on ground use. Unlike in spring, climate or weather conditions did not seem to offer sufficient explanation for the discrepancy between both sides of the mountain. The weather was relatively stable throughout the autumn, and sunny conditions prevailed both in the Vorotan valley and west of Mt Amulsar. The wind was often slightly stronger in the Vorotan valley, but the difference was not such that it prevented raptors from passing through. Perhaps the barren landscape on the eastern slopes of Amulsar, entirely devoid of taller vegetation such as bushes or trees, deters many raptors even on migration, as they cannot find proper shelter in case they would have to land (e.g. for roosting)? Perhaps migrating raptors are more attracted to the sheltered, warmer gorge that runs south from Jermuk, or to valleys further west?

Looking at the migration day by day, three peaks in numbers can more or less be defined, one of Demoiselle Cranes around the 10th of September, one of Steppe Buzzards and pratincoles on the 19th, and one of Steppe Buzzards on the 25th (Figure 3). Migration was very slow for the first two weeks at the start of the autumn survey. Only single figures of raptors were trickling through, though a flock of 55 White Pelicans provided some excitement on the 29th of August. The first day with substantial migration was the 7th of September, when 7 cranes and a flock of 200 White Pelicans were observed. From late September on, migration was generally slow again; the modest rises on 9-10 October consisted mainly of migrating flocks of Calandra Larks. No big numbers of eagles were counted (contra to, e.g., Georgia and Israel), but the diversity of *aquila* species was quite good in October. The lack of migrants at the start of the autumn survey provided us with a lot of opportunity to study the local raptors and to get a good insight into their numbers and use of the area.

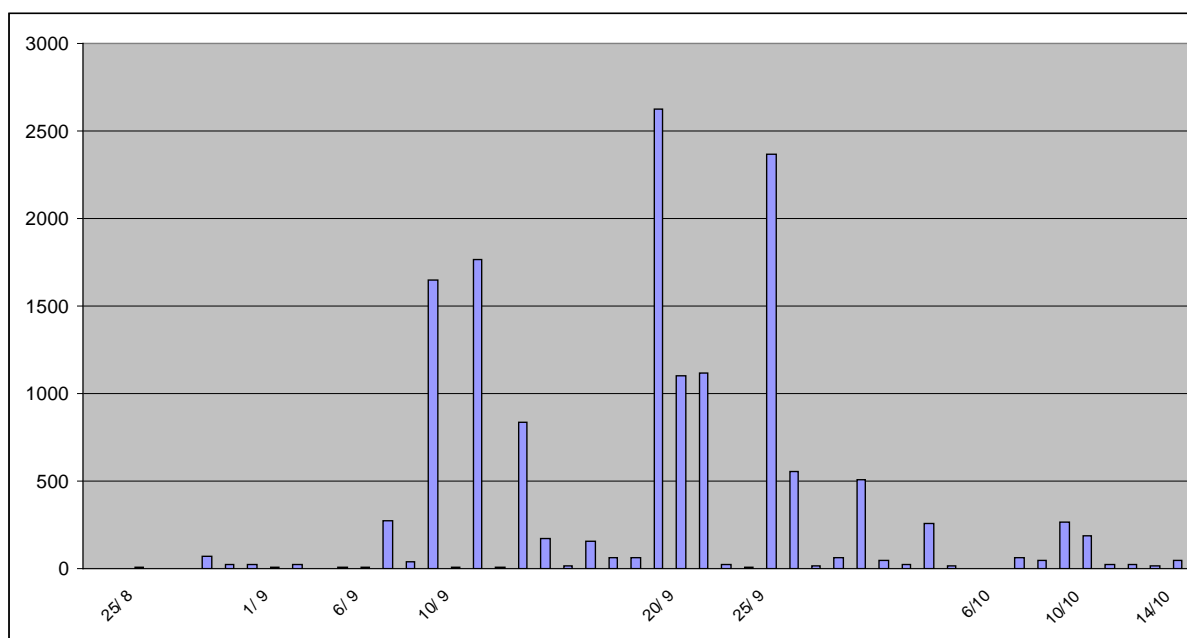


Figure 3. Number of birds migrating through the survey area by date in autumn 2013

The diurnal pattern of migration showed a bit of fluctuation in the morning, followed by a distinct peak around 13:00 and especially 14:00 (Figure 4). The first rise around 9:00 was mainly a result of migration of Pratincoles, while the second rise around 11:00 not only included Pratincoles but also the first numbers of Steppe Buzzards that were building up. The peaks at 13:00 – 14:00 consisted mainly of Steppe Buzzards and Demoiselle Cranes, the latter clearly favouring mid-day migration just like raptors.

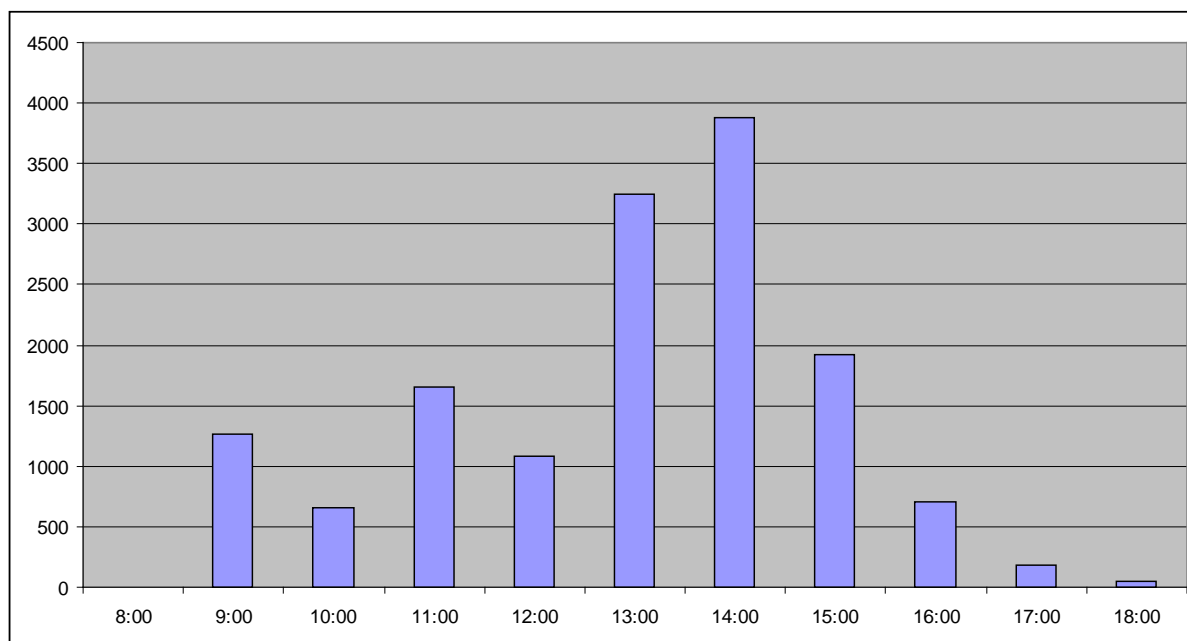


Figure 4. Number of birds migrating through the survey area by time of day in autumn 2013

In conclusion, though the number of migrating raptors was clearly higher than in spring, the totals were still modest, confirming that the area is not really a migration corridor. The total of 8,043 raptors migrating through the Amulsar area pales in comparison with Batumi, Georgia, where 1.2 million raptors were counted during autumn 2013. Still, the number of Pallid Harriers was comparatively high: 192 birds as opposed to 740 in Batumi, many of these using the area for feeding and roosting (see section 3.2). The number does not reach the 1% norm for Critical Habitat assessment of IUCN though. On the other hand, the numbers of migrating Demoiselle Cranes, Black-winged Pratincoles and Lesser Kestrels appear important, at least on the Armenian level. The former two species did not make use of the ground in the survey area, however.

3.2 Ground use

3.2.1 Use of area by migrant birds

Of the 15,110 migrating birds recorded in autumn 2013, a total of 476 were noted as using the survey area for feeding or resting – a proportion of 3%. This included 465 raptors, constituting 6% of all the migrating raptors counted. The most numerous species, such as Steppe Buzzard, Demoiselle

Crane and Black-winged Pratincole, hardly ever came down to inspect the survey area. However, as is evident from Table 3, ground use differed from species to species, and was quite regular in harriers and falcons. Important numbers of Pallid Harrier (35%) and Lesser Kestrel (82%) were found feeding or resting in the survey area. Pallid Harriers favoured the Vorotan Valley rather than the western slopes of Mt Amulsar; 48 were counted using the ground around watch point A, against 18 around B (Table 4). Pallid Harriers is a species of steppe areas, so the habitat was most suitable in the Vorotan valley. Lesser Kestrels on the other hand strongly preferred the western part of the survey area: only 14 were found around watch point A, while a minimum of 53 birds were feeding around B throughout the autumn. An additional 32 feeding Lesser Kestrels were counted from parts of the survey area that were not easily visible from the watch points during specific visits. The situation was very different from in spring, when the waste dump valley (area A4) and the southern part of the Vorotan valley near Spandarian reservoir were the most used. Food, in the form of millions of grasshoppers, was definitely abundant anywhere in the survey area, but the western part of the survey area proved to be the most attractive because it held many ideal vantage points in the form of tall electricity pylons. Also, many of the fields along the main road from Kechut to Gndevaz had been mown or ploughed, making it probably easier for the kestrels to spot their prey. A total of 99 birds in the area is quite significant, considering that the Armenian breeding population is estimated at only 20 – 35 breeding pairs (Iñigo & Barov 2010). The numbers involved and the prolonged use of the area indicate that the western part of the survey area is a favourite, regular hunting ground and that the species may be present in the autumns of most years.

Table 3. Total numbers per bird species migrating through the survey area in autumn 2013, with indication of ground use

Species	Migration	Ground use	Totals	ground use%
Great White Pelican	255		255	
Great Cormorant	16		16	
Grey Heron	3		3	
Purple Heron	1		1	
Black Stork	5		5	
White Stork	1		1	
Osprey	8		8	
European Honey Buzzard	108	4	112	4%
Black Kite	180	8	188	4%
Egyptian Vulture	1		1	
Griffon Vulture	4		4	
Black Vulture	1		1	
Short-toed Eagle	14		14	

Species	Migration	Ground use	Totals	ground use%
Marsh Harrier	251	33	284	12%
Pallid Harrier	124	68	192	35%
Montagu's Harrier	54	24	78	32%
Montagu's/Pallid Harrier	204	45	249	18%
Levant Sparrowhawk	81	3	84	4%
Eurasian Sparrowhawk	131	14	145	10%
Eurasian/Levant Sparrowhawk	36	1	37	3%
Northern Goshawk	3		3	
Steppe Buzzard	5440	48	5488	1%
Long-legged Buzzard	48	1	49	2%
Steppe/Long-legged Buzzard	7		7	
Lesser Spotted Eagle	128		128	
Greater Spotted Eagle	6		6	
Steppe Eagle	132	6	138	4%
Imperial Eagle	12	1	13	8%
<i>Aquila sp.</i>	48		48	
Golden Eagle	1		1	
Booted Eagle	40		40	
Lesser Kestrel	24	99	123	82%
Common Kestrel	69	26	95	27%
Common/Lesser Kestrel	365	62	427	15%
Red-footed Falcon	5	6	11	55%
Merlin	1	3	4	75%
Hobby	57	13	70	19%
Lanner Falcon	1		1	
Demoiselle Crane	4057		4057	
Crane sp	50		50	
Black-winged Pratincole	1177		1177	

Species	Migration	Ground use	Totals	ground use%
Pratincole sp	728		728	
Eurasian Curlew	1		1	
Ruff	363		363	
Stock Dove	1		1	
Common Cuckoo	1		1	
Short-eared Owl	1		1	
Calandra Lark	226	4	230	
Bimaculated Lark	65		65	
Lesser Short-toed Lark	60	3	63	
Richard's Pipit	1		1	
Yellowhammer	3		3	
Brambling	2		2	
Fire-fronted Serin	31		31	
Crimson-winged Finch	2	4	6	
TOTAL	14634	476	15110	3%

Table 4. Numbers of migrating raptors recorded from watch points A and B in autumn 2013

Species	watchpoint A				watchpoint B			total A+B	Ratio B/A
	passing	ground use	total A		passing	ground use	total B		
Black Kite	23	7	30		154	1	155	185	5,2
Booted Eagle	10	0	10		30		30	40	3,0
Steppe/Long-legged Buzzard	5	0	5		2		2	7	0,4
Black Vulture			0		1		1	1	
Common Kestrel	23	18	41		34	7	41	82	1,0
<i>Aquila sp.</i>	14	0	14		31		31	45	2,2
Egyptian Vulture			0		1		1	1	
Eurasian Sparrowhawk	65	9	74		53	4	57	131	0,8
European Honey Buzzard	27	0	27		79	4	83	110	3,1

Golden Eagle			0		1		1	1	
Greater Spotted Eagle			0		2		2	2	
Griffon Vulture			0		4		4	4	
Hobby	17	9	26		33	4	37	63	1,4
Imperial Eagle	2	0	2		4	1	5	7	2,5
Common/Lesser Kestrel	127	18	145		211	42	253	398	1,7
Lesser Kestrel	4	14	18		17	53	70	88	3,9
Lesser Spotted Eagle	44	0	44		77		77	121	1,8
Levant Sparrowhawk	26	1	27		55	2	57	84	2,1
Long-legged Buzzard	8	1	9		37		37	46	4,1
Marsh Harrier	67	22	89		163	8	171	260	1,9
Merlin	1	1	2			2	2	4	1,0
Montagu's/Pallid Harrier	73	31	104		126	15	141	245	1,4
Montagu's Harrier	27	13	40		27	8	35	75	0,9
Northern Goshawk	2	0	2		1		1	3	0,5
Osprey	2	0	2		6		6	8	3,0
Pallid Harrier	67	48	115		45	18	63	178	0,5
Red-footed Falcon			0		5	5	10	10	
Short-toed Eagle	3	0	3		11		11	14	3,7
Eurasian/Levant Sparrowhawk	20	0	20		15	1	16	36	0,8
Steppe Buzzard	906	23	929		4503	25	4528	5457	4,9
Steppe Eagle	30	1	31		71	4	75	106	2,4
Total	1593	216	1809		5799	204	6003	7812	3,3

The temporal use of the ground mirrors the peaks observed in the main passage, but did not necessarily involve the same species (Figure 5). The increases around the 10th of September were mainly caused by an increase in the number of harriers feeding in the survey area, while the main peaks on 20 and 25 September consisted of kestrels, harriers and Steppe Buzzards. From late September on, Lesser Kestrels (and distant, unidentified kestrels) accounted for most of the ground use.

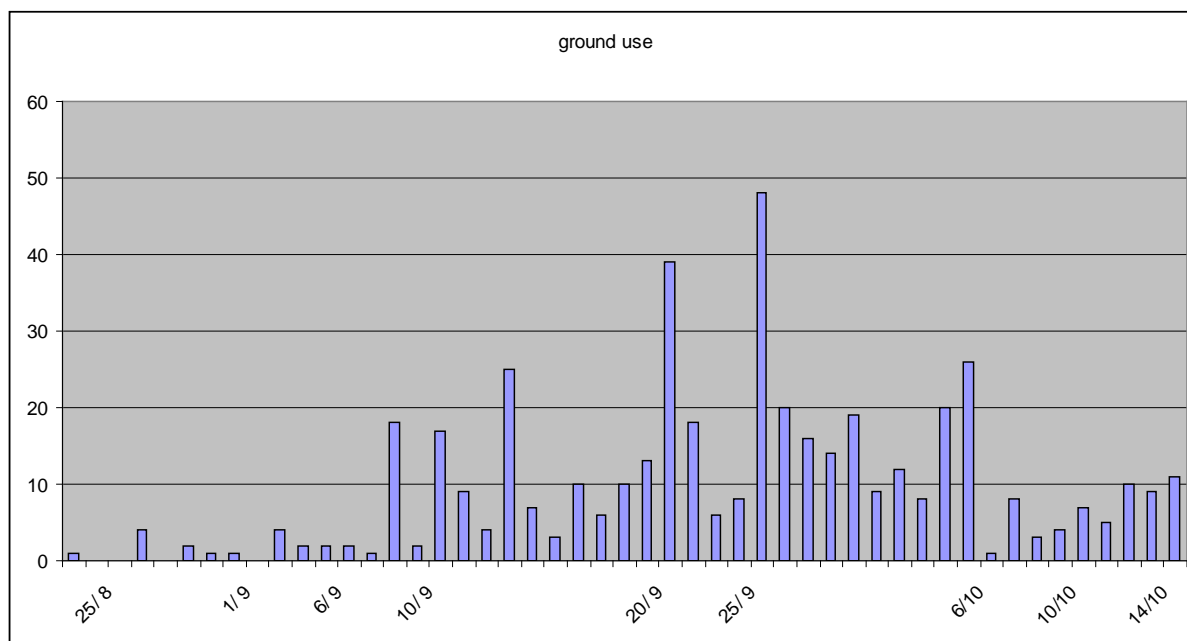


Figure 5. Numbers of migrating birds using the ground in the survey area by date in autumn 2013

As described in chapter 2 (Material and Methods), the same migrant bird could make use of more than one part of the survey area, and could do so during more than one day. For this reason, it makes sense to present not only minimum counts of birds, but to also express ground use in “bird days”. Table 5 gives an overview per species and per watch point section of the 662 “bird days” recorded (see also figures 9-18 in annex). As in spring, the area between Kechut reservoir and Mt Amulsar was a popular feeding ground for migrating raptors. The waste dump valley (area A4) attracted far less migrants, probably because it had become much drier than in spring and because it was heavily overgrazed. Most ground use by migrants was found in the north-eastern part of the Vorotan valley (area A3).

Three of the migrant species recorded feeding or resting in the survey area are considered globally threatened, namely Eastern Imperial Eagle, Pallid Harrier and Red-footed Falcon. Seven species are included in the Red Data Book of Armenia and have been printed in bold in table 5. All of these species will be discussed further in this report.

Table 5. Number of “bird-days” recorded per migrating species and per watch point section in autumn 2013

Species	A1	A2	A3	A4	A5	B1	B2	B3	B4	TOTAL
Black Kite	6	6	1				1		1	15
Common Kestrel	4	3	5	14	2	2		1		36
crimson-winged finch			4							4
Eurasian Sparrowhawk	4	1	4	2	2	2			1	20
European Honey Buzzard							1		2	4
Hobby	5		2	6	2			1	2	20
Imperial Eagle								1		1
Common/Lesser Kestrel	8	7	7	2	5	22	10	12	12	85
Lesser Kestrel	3		7	4	4	32		1	45	139
Levant Sparrowhawk	1								2	3
Long-legged Buzzard	1	1								2
Marsh Harrier	13	6	7	5	4	6		3	1	45
Merlin			1				1		1	3
Montagu's/Pallid Harrier	6	14	16	3	2	5		8	4	58
Montagu's Harrier	7	5	11	6	2	2		5	2	40
Pallid Harrier	19	13	26	11	14	10		1	10	112
Red-footed Falcon							2	2	3	7
sparrowhawk sp							1			1
Steppe Buzzard			21		6	17		6	6	56
Steppe Eagle	1		1	1	1	1		1	2	11
TOTAL	78	56	113	54	44	105	18	103	91	662

3.2.2 Use of area by local birds

As local birds were often present for many days throughout the autumn and were using large parts of the survey area, they accounted for a lot of “bird days” – 3,246 to be precise. Table 6 presents the totals per species and per watch point section. Only raptor species were used to calculate the number of local “bird days”. In total, 23 raptor species were involved; these were mainly birds that we knew to be resident or to have bred in or near the survey area, though a few migrants that hung

around for at least a full day, such as one Marsh Harrier and a few Lesser Kestrels, were also written down as 'local'.

The same watch point sections that were best for feeding or resting migrants were also the most attractive to local raptors. These were the eastern part of the upper Vorotan valley (area A3), and the area between Kechut reservoir and Mt Amulsar. The area northeast of Gndevaz was also heavily used. Unlike in spring, the waste dump valley (area A4) was less important, though it was now very occasionally used by a few globally threatened raptors, namely Black Vulture and Saker Falcon.

The list of local raptors that were using the survey area in autumn 2013 contains three species that are considered globally threatened, namely Black Vulture, Egyptian Vulture and Saker Falcon. 14 are included in the Red Data Book of Armenia; these have been printed in bold in table 6. All of these species will be discussed further in this report. See also figures 9-18 in annex.

Table 6. Number of "bird-days" recorded per local raptor species and per watch point section in autumn 2013. Red Data species have been printed in bold.

Species	A1	A2	A3	A4	A5	B1	B2	B3	B4	total
Black Kite	2	2	2		1		2	4		13
Booted Eagle	25	17	18	11	6	21	33	35	32	198
Steppe/Long-legged Buzzard		3	13	5		1	6	5	5	38
Black Vulture	14	11	19	1	4	13	30	14	4	110
Common Kestrel	55	36	63	49	36	42	8	43	32	364
Aquila sp.		3								3
Egyptian Vulture			2			12	3	6	4	27
Eurasian Sparrowhawk	13	11	21	7	1	17	3	19	9	101
European Honey Buzzard								1	4	5
Golden Eagle	11	12	25	4	5	15	28	28	27	155
Griffon Vulture	16	17	77	4	24	52	66	53	40	349
Hobby	2			1		1	1	2	2	9
Common/Lesser Kestrel	19	20	53	26	9	36	11	52	17	243
Lammergeier	12	14	30	11	9	12	26	30	22	166
Lesser Kestrel	4	1	1	2	2	1		3	4	18
Lesser Spotted Eagle	33	26	44	23	10	24	33	51	51	295
Levant Sparrowhawk		1	4	1		3	1	4	4	18
Long-legged Buzzard	61	62	103	56	51	64	20	95	56	568
Marsh Harrier		1						1		2

Species	A1	A2	A3	A4	A5	B1	B2	B3	B4	total	
Montagu's/Pallid Harrier			1	2			1			4	
Montagu's Harrier		5	1	2	2	2	1		2	15	
Northern Goshawk				3	1		2		1	2	9
Peregrine Falcon		3	3	4	3	1	5	1	2		22
Saker Falcon		1		1	1					1	4
Short-toed Eagle		5	7	5	1	3	31	13	46	27	138
Eurasian/Levant Sparrowhawk				4			1	1	1	2	9
Steppe Buzzard		38	36	54	34	25	59	5	55	51	357
Steppe Eagle		1	1	2	1	1					6
TOTAL		320	286	552	244	190	414	291	553	396	3246
		10%	9%	17%	8%	6%	13%	9%	17%	12%	

10% 9% 17% 8% 6% 13% 9% 17% 12%

4 Red Data Species

During the autumn of 2013, the survey area was used by a number of globally and/or nationally threatened bird species. The area could therefore be potentially important for the continued survival of these species, worldwide or in Armenia. Data about these species is presented below and can be used in the Critical Habitat Assessment. The species are discussed in order of rarity, the most threatened ones first.

4.1 Egyptian Vulture

Global status: endangered

Status in Armenia: endangered

[Figure 9 in annex]

In autumn 2013, this species was mainly observed in the western part of the survey area. No more than 4 local birds were seen, two adults and two juveniles. The two adults were most likely the same pair that was nesting in Arpa gorge south of Gndevaz in spring 2013, and one of the juveniles must have been their offspring. Birds were seen within the survey area on 15 days (out of a total of 54 survey days, though the species is migratory and was last recorded on 24 September, so more realistically 34 survey days), resulting in 27 "bird days". They seemed mainly interested in the area northeast of Gndevaz (section B1), but otherwise were using the whole part of the survey area west of the Amulsar massif. Two birds, an adult and a juvenile, were also seen exploring the upper Vorotan valley (area A3) on 29 August.

On several occasions, one or both adult birds were seen perched or circling very low above the ground (figure 6). This was the case on 24 August, when both adults were perched in B1 (one on a pylon, one nearby on the ground) and one was again perched further north close to the rubbish tip east of Kechut later that day, which is outside of the survey area. An adult was back on the same

pylon in B1 on 2nd of September; an adult seen circling very low above the ground close to Kechut reservoir that day may have been the same. On 28 August, during a specific visit to site 28, both adults were found circling very low above the ground in area B4. On 6-7 September, an adult was feeding on a dead fox just east of Gndevaz (area B1).

Juveniles were seen only occasionally: one in A3 on 29 August, one in B4 on 9 September, and one in B1 – B3 on 18 September. Juveniles wander around a lot more than adults as they are no longer attached to the nest site area once independent. Two birds were recorded on migration: one immature over watch point B on 13 September, and one adult over the park in Jermuk on 24 September.

In conclusion, Egyptian Vultures were more numerous than in spring, and were using the survey area more intensively too. They were not solely dependent on the survey area though, as sightings of perched birds to the north of this area seemed to indicate. The nest site in the Arpa gorge is very close to the part of the survey area where the Heap Leach facility may be allocated (site 28).

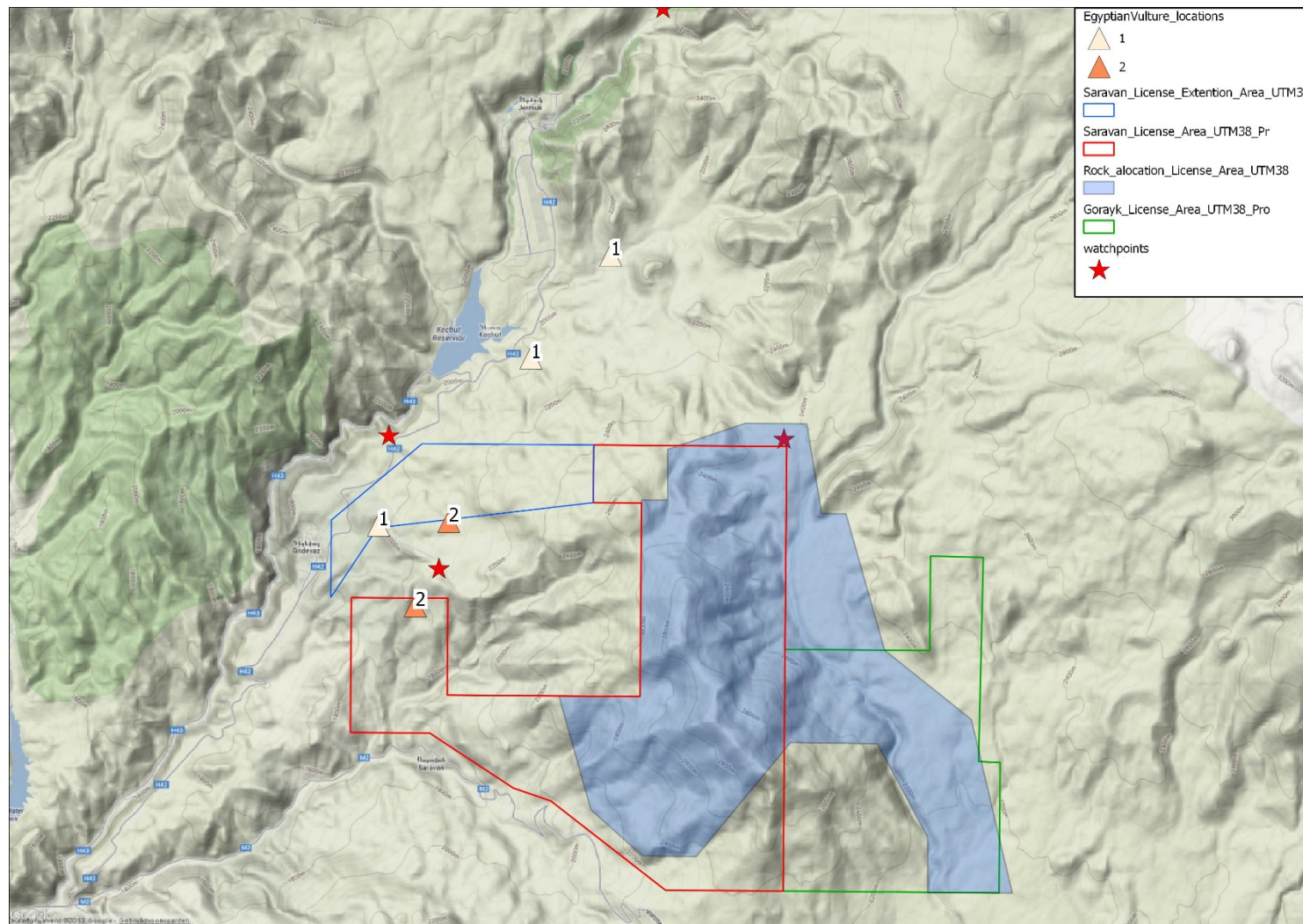


Figure 6. Point locations of the number of Egyptian Vultures seen on or just above the ground in autumn 2013

4.2 Saker Falcon

Global status: endangered

Status in Armenia: endangered

At least one bird of this species was recorded in the survey area, on 2-3 September 2013. On the first date, it was recorded from watch point A where it was first seen hunting in the waste dump valley (area A4) and further to the north (area A1). Later that day, it was seen perched in area A3, close to the watch point. The next day, in the morning, what was probably the same bird was seen from watch point B flying overhead from Gndevaz towards Mt Amulsar.

The paucity of records in autumn 2013 confirms that this species probably did not breed anywhere in or near the survey area. The occasional sightings in spring and autumn 2013 may refer to wandering or dispersing birds from other areas.

4.3 Black Vulture

Global status: near-threatened

Status in Armenia: endangered

[Figure 10 in annex]

With this species, the situation was clearly different in autumn 2013 compared to spring. While in spring it was recorded on only six days, we now had almost daily sightings from 7 September on. More precisely, Black Vultures were seen on 34 out of 54 survey days (i.e. 63% of the time). We estimated that at least 4 different birds were using the survey area, though no more than 3 were seen together at the same time. The birds accounted for a total of 110 “bird days”, and were exploring the whole survey area with a clear preference for the wooded slopes just east of the Arpa gorge (area B2). The many junipers on these slopes provide good habitat for this species. Area B2 is outside of the license area, however, and so were many other sightings, e.g. in A1, A2 and A3. At least 36 “bird days” were recorded within the license area though. Black Vultures were never seen perched or low above the ground in the license area. On 7 September, two adult birds were seen landing on the juniper slope behind the village of Gndevaz (area B2).

One adult bird had been fitted with white wing tags and must have originated from Georgia (where such tags are used). It was seen on 7 and 20 September.

The valley north of Jermuk (around watch point C) seemed to be best for this species. The habitat looked excellent and on both days that a specific visit to this area was made (10-11 October) two to three birds were almost constantly in sight. It is likely that this valley was the main stronghold in the region and that birds were exploring nearby areas from here, including the license area. A few pairs of Black Vulture bred in the Jermuk area up to 1986, which illustrates the potential of the region.

One migrating bird was recorded, flying southwest over watch point B on 8 September.

4.4 Pallid Harrier

Global status: near-threatened

Status in Armenia: endangered

[Figure 11 in annex]

Again, the situation with this species was now different than in spring. While only 11 birds were recorded in spring 2013, with just one using the ground, autumn 2013 produced 192 Pallid Harriers, of which 68 were feeding or resting in the survey area. A total of 112 “bird days” was recorded and the species used the whole survey area, with a preference for the Vorotan valley (especially area A3). The first birds were observed on 8 September and the species was then noted almost daily until the end of the survey. The peak day was the 25th of September, when 28 birds were counted.

Juveniles and females of this species are very similar to Montagu’s Harrier; plumage details need to be visible for reliable identification. For this reason, birds seen from a distance or in bad light were often impossible to name down to species level and were recorded as Montagu’s/Pallid Harrier. A total of 249 of these unidentified harriers were counted. Many of these are likely to have been Pallid Harriers. For instance, no definite Montagu’s Harriers were seen after 25th of September, yet 54 unidentified harriers were seen after that date. Montagu’s Harrier is an earlier migrant than Pallid Harrier, so it seems reasonable to assume that at least those 54 birds were probably the latter. It is entirely possible that more than 300 Pallid Harriers passed through the survey area in autumn 2013.

At least on a national level, the survey area, particularly the Vorotan valley, appears to be an important migration corridor for this species. On a global level, the number of birds using the ground did not meet the 1% norm used for Critical Habitat Assessment by the IUCN.

4.5 Red-footed Falcon

Global status: near-threatened

Status in Armenia: vulnerable

Both in spring and in autumn, this was a very scarce species in the survey area. A total of 11 birds were recorded in autumn 2013, with 5 to 6 birds seen feeding or resting in the area, all in the western part. Two juveniles were seen hunting above the wooded slopes along the Arpa gorge (area B2) on 18 September, an immature male was sitting on telephone wires in B1 on the 6th of October, at least one juvenile was hunting in B1 and B3 on 12-13 October, and two juveniles were seen in area B3 one day later.

4.6 Black-winged Pratincole

Global status: near-threatened

Status in Armenia: vulnerable

This species was a much more numerous migrant in autumn than in spring 2013. While in spring no more than about 100 birds were seen, in autumn the recorded total amounted to 1,177 migrating birds. The actual total may be somewhat less though, as photographs of the biggest flock (814 birds on 19th September) revealed quite a few Collared Pratincoles as well.

No pratincoles (of any species) were seen using the ground.

4.7 Eurasian Curlew

Global status: near-threatened

Status in Armenia: vulnerable

One flew over watch point A on 30th of September.

4.8 European Roller

Global status: near-threatened

Status in Armenia: vulnerable

This species was now rarer than in spring. Only one was seen; it was present in area B3 from 10 to 12 September.

4.9 Greater Spotted Eagle

Global status: vulnerable

Status in Armenia: vulnerable

A total of 6 migrating birds was seen: an adult over watch point B on 13 September, 2 birds over watch point B-bis on 8 October, one adult and one juvenile over watch point C north of Jermuk on 10 October, and an adult over watch point B on 12 October. No ground use was recorded. This species was not observed in spring 2013.

4.10 Eastern Imperial Eagle

Global status: vulnerable

Status in Armenia: vulnerable

This species was more numerous than in spring 2013. A total of 13 migrating birds was counted, one of which was using the ground. The latter was a juvenile exploring area B2 on 7th of October. Earlier on that day, it had been seen circling above the park in Jermuk (together with an immature bird of the same species).

4.11 Great Cormorant

Global status: least concern

Status in Armenia: vulnerable

A total of 16 migrating birds was seen, all flying past watch point B. One was observed on 23 September, 5 on 29 September, and a flock of 10 on 14 October. No ground use was recorded. In spring 2013, this species was only observed just outside of the survey area: one bird was present on Kechut reservoir for several consecutive days.

4.12 White Pelican

Global status: least concern

Status in Armenia: vulnerable

Two migrating flocks were observed from watch point B, one of 55 birds on 29 August and one of 200 on 7 September. The latter was probably the biggest flock ever recorded in Armenia. No birds were seen using the ground. This species was not recorded in spring 2013.

4.13 Black Stork

Global status: least concern

Status in Armenia: vulnerable

Five individually migrating birds were seen: one over watch point A on 13 September, one over watch point B on 19 September, one over B on 25 September, one over B on 2 October, and one over B-bis on 7 October. No ground use was recorded.

4.14 Ruddy Shelduck

Global status: least concern

Status in Armenia: vulnerable

This species was surprisingly rare in the survey area in autumn 2013, considering that in spring several pairs were breeding. A single flock of 6 birds was observed from watch point B in late August, flying north above the Arpa gorge.

4.15 Lammergeier

Global status: least concern

Status in Armenia: vulnerable

[figure 12 in annex]

A local, resident species. We counted at least 7 different birds in the survey area: four adults, one subadult and two juveniles. In spring, only one pair was found breeding in Arpa gorge, rearing one young. Another pair was present but did not successfully nest. The second juvenile in autumn must therefore have come from another area. Lammergeiers were seen almost daily (on 45 out of 54 survey days) and accounted for 166 “bird days”. They were using the entire survey area, including Mt Amulsar itself. They were most often recorded in the eastern part of the upper Vorotan valley (area A3) and between Kechut reservoir and the Amulsar massif (B3). At least 5 birds (2 adults, 2 juveniles and 1 subadult) were also found in the valley north of Jermuk (area C); it is not clear if these were the same birds that regularly visited the survey area.

4.16 Short-toed Eagle

Global status: least concern

Status in Armenia: vulnerable

[figure 13 in annex]

A locally breeding, migratory species. Birds were seen almost daily, but had left the area by 2 October. The species was seen on 35 out of 42 survey days (discounting those after 2 October). The number of “bird days” amounted to 138. Short-toed Eagles were using the whole survey area, but showed a clear preference for the western part of it, especially the area between Kechut reservoir, Gndevaz and Mt Amulsar, where they could often be found sitting on electricity pylons. It is difficult to estimate the exact number of birds that used the survey area throughout the autumn, but a maximum of 4 were seen together in area B3 on 18 September, and two birds were regularly seen together near watch point A, so it is reasonable to assume that at least 6 birds were involved. Birds could often be heard calling from watch point B and must therefore have been of a pair that had bred locally.

In addition to the local birds, 14 migrating Short-toed Eagles were also recorded, with a maximum of 4 on 25 September. These were not seen using the ground.

4.17 Montagu’s Harrier

Global status: least concern

Status in Armenia: vulnerable

[figure 14 in annex]

Of the 78 migrating Montagu’s Harriers that were recorded in autumn 2013, 24 were seen using the ground for feeding or resting. In addition, 5 birds in late August – early September were written down as local. A total of 55 “bird days” was counted, 40 for migrating birds and 15 for local ones. All birds using the ground showed a clear preference for the Vorotan valley. No birds were using the wooded slopes along the Arpa gorge (area B2), which is logical as the species prefers open, grassy areas. The species is quite an early migrant and was last seen on 25 September.

4.18 Northern Goshawk

Global status: least concern

Status in Armenia: vulnerable

A scarce species in the survey area. At least three local birds and three migrants were seen. Among the local birds were two adults and at least one juvenile. The adults were seen displaying northeast of Gndevaz (area B1) and one was perched on a pylon in area B4 on 21 September. The species probably did not breed within the survey boundary. One or two adult birds were also seen in the valley north of Jermuk (area C), where the habitat is very suitable, and these may offer an explanation for the records of local Goshawks in the Vorotan valley (such as one adult and one juvenile on 27 August, one bird on 29 August, and one juvenile on 25 September), an area devoid of trees and bushes and therefore not quite good habitat for the species.

The three migrating birds (two over watch point A, one over B) were not using the ground.

4.19 Levant Sparrowhawk

Global status: least concern

Status in Armenia: vulnerable

84 migrating Levant Sparrowhawks were counted in autumn 2013, of which only 3 were seen using the ground. These figures are very similar to those in spring (78 and 2, respectively). The species is a long-distance migrant that often flies through at high altitude, so not much ground use is to be expected. Birds were seen feeding in area B3 (two on 18 September) and in A1 (one on 25 September). Migrants were recorded from 25 August to 1 October.

In addition to migrating birds, 13 Levant Sparrowhawks in late August – early September were written down as local, resulting in 18 “bird days”. These birds were seen in most of the survey area, except for area A1 and A5.

4.20 Lesser Spotted Eagle

Global status: least concern

Status in Armenia: vulnerable

[figure 15 in annex]

Several pairs of this species bred in the survey area in spring 2013, and a lot of activity by these local birds was noted in autumn, resulting in 295 “bird days”. At least 10 different birds were involved, with a maximum of 5 seen together. Lesser Spotted Eagles were seen feeding or resting throughout the whole survey area, but seemed to have a slight preference for areas B3 and B4. Birds were often heard calling or seen displaying, so it was obvious that they were of locally breeding pairs.

In addition to the local birds, 128 migrants were recorded, with a maximum of 13 on the 25th of September. The migrating birds were not seen using the ground. The number of birds migrating over watch point B was almost twice as high as the number of birds going over A.

4.21 Steppe Eagle

Global status: least concern

Status in Armenia: vulnerable

A total of 138 migrating Steppe Eagles was recorded, which is only slightly more than in spring. Of these, 6 were using the ground. The maximum day count was 29, on the 10th of October. The main migration of this species started on 13 September.

In addition to migrants, three birds were written down as local in late August – early September, before the main migration had started. Local birds and migrants using the ground amounted to 17 “bird days” and were using all parts of the survey area. One bird was even perched on our seats when we arrived on watch point B one morning!

4.22 Golden Eagle

Global status: least concern

Status in Armenia: vulnerable

[figure 16 in annex]

This species is resident and the birds that bred near the survey area in spring 2013 were still using it quite intensively in autumn. At least 9 different birds were involved, resulting in 155 “bird days”. All parts of the survey area were used, with the waste dump valley (area A4) and area A5 being least preferred. Birds were rarely seen perched though; only one was seen landing on cliffs in the valley north of Jermuk on 11 October. This was well outside of the survey area. One bird was written down as migrating (or dispersing): a juvenile flying southwest over watch point B on 26 September.

4.23 Booted Eagle

Global status: least concern

Status in Armenia: vulnerable

[figure 17 in annex]

This migratory species bred locally in spring 2013 and the local birds were still seen almost daily in autumn, i.e. on 31 out of 42 survey days (none were seen after 2 October). At least 8 different birds were involved and were using the whole survey area, especially the western part, resulting in 198 “bird days”. Birds were seen displaying over the Arpa gorge (area B2) occasionally, but were rarely if ever seen perched, though one was seen stooping down to the ground to catch a Common Quail just east of Gndevaz on 5 September.

In addition to the local birds, 40 migrants were counted, all between 1 September and 2 October. The maximum count was 13, on the 25th of September. None of the migrating birds were using the ground.

4.24 Osprey

Global status: least concern

Status in Armenia: vulnerable

A rather rare species in Armenia. We counted 8 migrating birds in autumn 2013, between 19 September and 10 October. None were using the ground.

This species was not recorded in spring 2013.

4.25 Lesser Kestrel

Global status: least concern

Status in Armenia: vulnerable

[figure 18 in annex]

Though this species is not threatened worldwide, it is important on an Armenian level as the Gorayk region just south of the license area holds one of the only two known breeding sites in the country (the other being in Sisian). The Armenian breeding population is estimated at only 20 – 35 breeding pairs (Iñigo & Barov 2010). Moreover, the autumn survey indicated that the western part of the survey area is an important staging area for migrating Lesser Kestrels. Of the 123 migrants recorded, no less than 99 were found feeding or resting (i.e. 82%), mainly in areas B1, B3 and B4. A total of 139 “bird days” were recorded, with an additional 18 for birds that were written down as local. Though

the waste dump valley (area A4) was still used by the occasional feeding Lesser Kestrel, it was now much less popular than in spring, probably because it had become heavily overgrazed.

The high proportion of ground use should perhaps be put into perspective. Identification of Lesser Kestrel requires care, and on birds migrating at high altitude or seen from great distance not all the necessary details were visible to allow for positive identification. In theory, it is therefore possible that many of the 365 unidentified kestrels not using the ground were Lesser Kestrels and that the proportion of ground use is therefore biased. However, in those (common) cases where a migrating kestrel flew close enough to allow for positive identification, it usually turned out to be a Common Kestrel, which suggested that most of the unidentified birds must have been of this species too. For instance, when about 50 kestrels were counted flying at reasonably low altitude over the park in Jermuk in the late afternoon and evening of 24 September, these all turned out to be Common Kestrels. It seems therefore entirely possible that most migrating Lesser Kestrels came down in the survey area to feed.

Efforts were made to record all feeding and resting Lesser Kestrels, including those in parts of the survey area that were not easily visible from the watch points. For this reason, several specific visits were made to various parts of the area, such as the western and southern edges and the lower Vorotan valley close to Gorayk, on 29-30 September and 5-6 October. The results are shown in figure 7 below. Many birds were found feeding in flocks along the main road from Kechut to Gndevaz and further south, with e.g. a flock of 10 birds just south of Gndevaz, in the area where the Heap Leach facility may be allocated (site 28). The biggest flock, containing 21 birds, was found on a pylon just south of the hairpin bend in the main road going south from Gndevaz. It seemed that most Lesser Kestrels were found on or near pylons, which they used as vantage points; other good feeding areas (away from the main road) were located immediately around watch point B and northeast of the village of Saravan. One bird was found on pylons in the lower Vorotan valley close to Gorayk, and a few birds were using the area around watch point A. Though food in the form of millions of grasshoppers was just as available in the eastern as in the western part of the survey area, heavy overgrazing probably deterred many birds from using the former. Also, the biggest grasshoppers (up to 15 cm in length) were found only in the western part, and were the preferred food source.

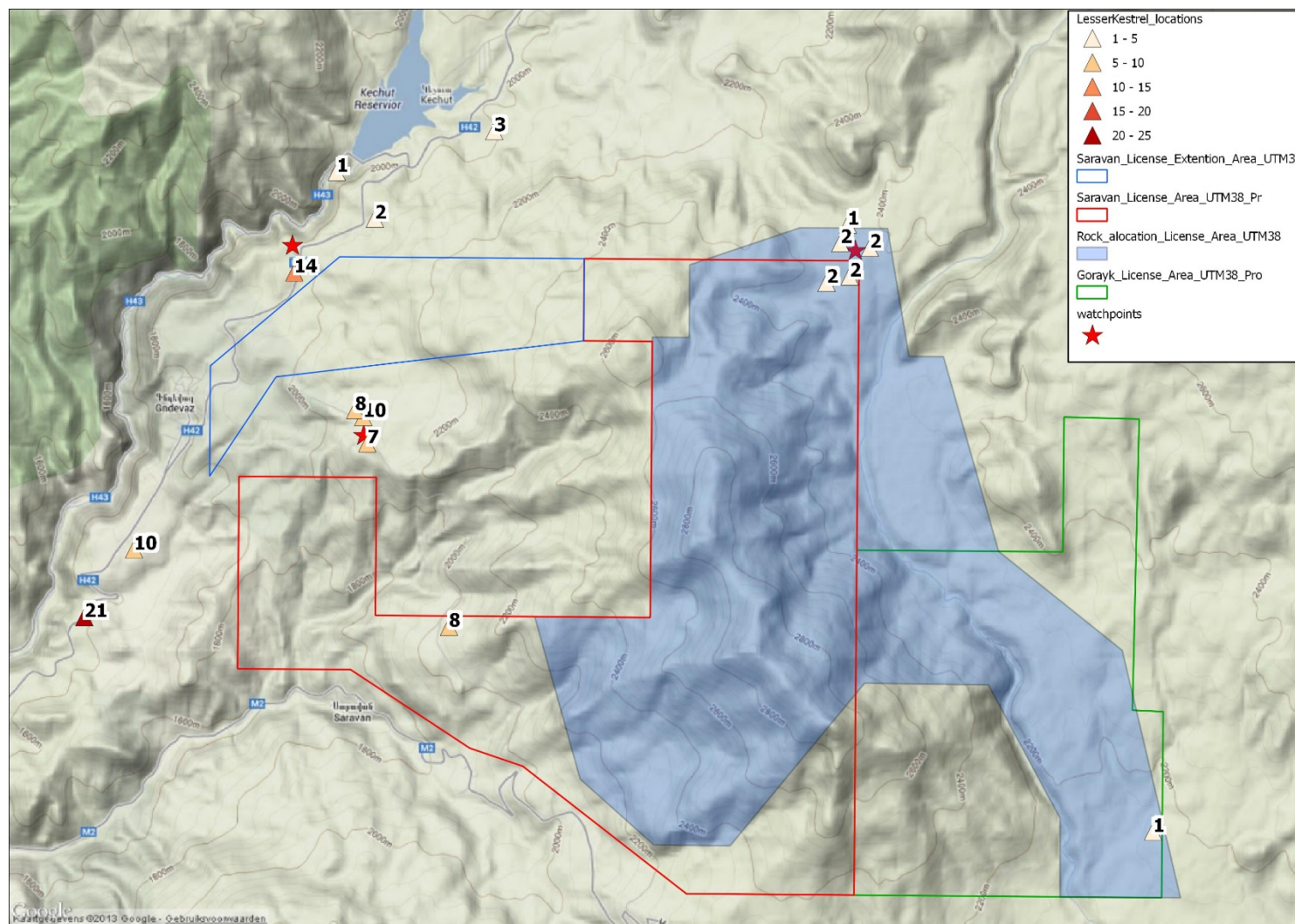


Figure 7. Point locations of the number of Lesser Kestrels seen on the ground in autumn 2013

4.26 Peregrine Falcon

Global status: least concern

Status in Armenia: vulnerable

All Peregrine Falcons seen during the autumn survey (at least 6 birds) were considered local; the species is a year-round resident in Armenia. Activity of these 6 birds resulted in a total of 22 “bird days”, with ground use recorded in all parts of the survey area except for section B4. Only one bird was seen perched, an adult sitting on a pylon north of watch point B on 3 October. Probably the same bird was seen circling over the park in Jermuk later that day.

4.27 Corncrake

Global status: least concern

Status in Armenia: vulnerable

As this species is mainly nocturnal and very skulking, it is often very difficult to get an idea of the numbers present in an area. In spring, males can be counted because they advertise their presence by repeated calling at night. Outside of the breeding season, however, contact with this species is a matter of pure luck. Yet, luck was with us as some team members saw a family party of 7 Corncrakes crossing the gravel road about 1 mile east of Kechut in the evening of 2 September. This observation confirmed the successful breeding close to the license area.

4.28 Demoiselle Crane

Global status: least concern

Status in Armenia: vulnerable

Big numbers of this species were seen on migration in autumn 2013: a total of 4,057 birds were counted. All passed between 9 and 20 September, though 7 distant, unidentified cranes on 7 September were very likely also this species. The biggest flock was recorded on 11 September and contained about 700 birds. The bulk of the migration happened on just two days: 9 September (1,599 birds) and 11 September (1,730). No ground use was recorded.

The big numbers were somewhat surprising, as no Demoiselle Cranes had been observed in spring.

4.29 Collared Pratincole

Global status: least concern

Status in Armenia: vulnerable

A flock of 814 pratincoles that was seen against the light flying past watch point B on 19 September apparently not only consisted of Black-winged Pratincoles, but also contained an unknown number of Collared Pratincoles as photographs later revealed. On 21 September, two big flocks of pratincoles (600 and 120 birds) could not be identified down to species level due to bad light and may therefore also have contained some Collared Pratincoles.

In total, 1,905 pratincoles were seen in autumn 2013, but no ground use was recorded.

4.30 Armenian Gull

Global status: least concern

Status in Armenia: vulnerable

Only a few birds of this species were observed, usually flying towards the south at high altitude, and probably on their way to Spandarian reservoir. A few birds were present on Kechut reservoir in October 2013 (outside of the survey area), and could sometimes be seen circling around from watch point B.

4.31 Eurasian Eagle Owl

Global status: least concern

Status in Armenia: vulnerable

This species was present near the mining camp on Mt Amulsar, just south of the waste dump valley (area A4). One bird was occasionally seen sitting on the side of the gravel road close to this camp late at night.

4.32 Citrine Wagtail

Global status: least concern

Status in Armenia: vulnerable

At least 4 birds of this species were recorded, all in late August 2013. Two were merely flying through, while one first-winter bird was feeding in a muddy patch near watch point A on 25 August and another one was on the muddy shore of the small reservoir just east of Gndevaz on 26 August.

4.33 Eastern Rock Nuthatch

Global status: least concern

Status in Armenia: vulnerable

This species breeds in at least one gorge just east of Gndevaz. It was also still there in autumn 2013: one bird was seen during a specific visit to the area on 28 August.

4.34 Woodchat Shrike

Global status: least concern

Status in Armenia: vulnerable

Only one bird of this species was seen during the autumn survey, an adult in fields along the main road just south of Gndevaz on 5 September 2013.

5 Interpretation of implications under IFC Performance Standard 6

The spring report included a Critical Habitat Assessment with respect to bird species. The conclusion was that mining activities would not have significant impacts on critical habitat for any “trigger” species. However, more data was gathered in autumn 2013, and the analysis was therefore repeated using the criteria presented in IFC PS6.

The autumn survey also failed to reveal any significant congregation of migratory raptors; ground use did not exceed 1% of the global population for any species recorded. Also, the total number of migrating raptors and cranes did not exceed 20,000 in autumn 2013 (Birdlife International’s criterion A4).

Therefore, as in the spring report, the only relevant criterion is the presence of species listed as Endangered by IUCN or considered to have equivalent status at national level (International Finance Corporation’s PS6 tier 2 criteria):

- *“Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally important concentrations of a Red-listed EN species where that habitat could be considered a discrete management unit for that species/ subspecies.*
- *Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species.*
- *As appropriate, habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing.”*

Such species were the same in autumn 2013 as in spring, with the exception of Red Kite which was not observed in autumn. Thus, implications of the Project were reviewed for Egyptian Vulture and Saker Falcon, both globally endangered, and Black Vulture and Pallid Harrier, both nationally endangered.

To define ‘regionally important concentrations’ of ‘significant importance’, we used “bird days” as an indicator of use of the survey area by a species. Based on discussion with local and international specialists we established a lower limit of 108 “bird days” to indicate significant use of the area. For each species, this would require at least two birds to have been present on each day of the survey period of 54 days.

Applying this benchmark to the four endangered species, we see that Black Vulture and Pallid Harrier exceed the limit (110 and 112 “bird days”, respectively – see tables 5 and 6). With only 4 and 27 “bird days”, respectively, Saker Falcon and Egyptian Vulture did not meet this threshold. Even when we account for the fact that Egyptian Vulture, a migratory species, had left the survey area by 25 September, reducing the number of survey days for this species to 35, it still failed to meet the lower limit threshold of 70 “bird days”. However, one important consideration for this species is the potential new location of the Heap Leach Facility (site 28) close to the nest site in Arpa gorge. The

effects of development, disturbance and habitat loss in this area need to be considered in relation to the viability of the nest. Given that the local population in the Jermuk region has declined from 2-3 pairs in 1995³ to just one in 2013, any damage to the viability of this nest would pose a serious threat to the local survival of the species. Though the number of “bird days” suggests that Black Vultures used the survey area intensively, they actually showed minimal use of the ground there. This is a wide ranging species that spends a lot of time flying over vast areas looking for food (e.g. carcasses). The survey area is likely to have been only a small part of the feeding range; the wooded slopes west and north of Gndevaz and the wooded valleys north of Jermuk are probably more important. Pallid Harriers, on the other hand, clearly used the survey area, especially the Vorotan valley, as a stopover site during the autumn migration.

In conclusion, mining activities in the survey area, especially in the Vorotan valley, could have a significant impact on the numbers of Pallid Harriers using the ground in Autumn. Saker Falcon and Black Vulture will probably not be affected. The possibility of an impact on the local Egyptian Vultures, cannot be excluded at this stage due to the possibility of disturbance and loss of feeding area associated with the new proposed Heap Leach Facility location.

A number of species that are not globally threatened but that are red-listed as ‘vulnerable’ in Armenia also relied strongly on the survey area for food and shelter during autumn 2013, and are likely to be affected by mining activities. Using the figure of 108 “bird days” as a threshold, these species were:

- Booted Eagle
- Golden Eagle
- Lammergeier
- Lesser-spotted Eagle
- Short-toed Eagle
- Lesser Kestrel

For the eagles and Lammergeier, it can be argued that a local decline will probably not significantly affect the whole Armenian population. The number of Lesser Kestrels was significant on a national level, though, and the western part of the survey area appears to be a favourite stopover site during the autumn migration.

6 Recommendations

Mitigation, set-aside and offset measures have already been discussed in the spring report, and the results of the autumn survey reinforce their importance. In addition, the results of the autumn survey indicate the need for some additional measures as outlined below:

1. The Vorotan valley is important for migrating Pallid Harriers in autumn. Extensive disturbance and habitat loss should therefore be avoided in this area to safeguard autumn feeding habitat for this species.
2. The use of the area for the proposed Heap Leach Facility (Site 28) and surrounding areas by Egyptian Vultures using the nest in the Gorge should be monitored during the breeding season so that the need for any avoidance or mitigation measures can be clarified,

³ <http://www.birdlife.org/datazone/sitefactsheet.php?id=19757>

particularly in the land bordering the H42 road from Kechut reservoir southwest to Gndevaz and further.

3. Use of this area by Lesser Kestrels should also be monitored, particularly in autumn and the need for any avoidance or mitigation measures considered for this species including in the area around watch point B, which appears to be an important hunting area in autumn.

Key areas where ongoing monitoring of activity is recommended are shown in Figure 8.

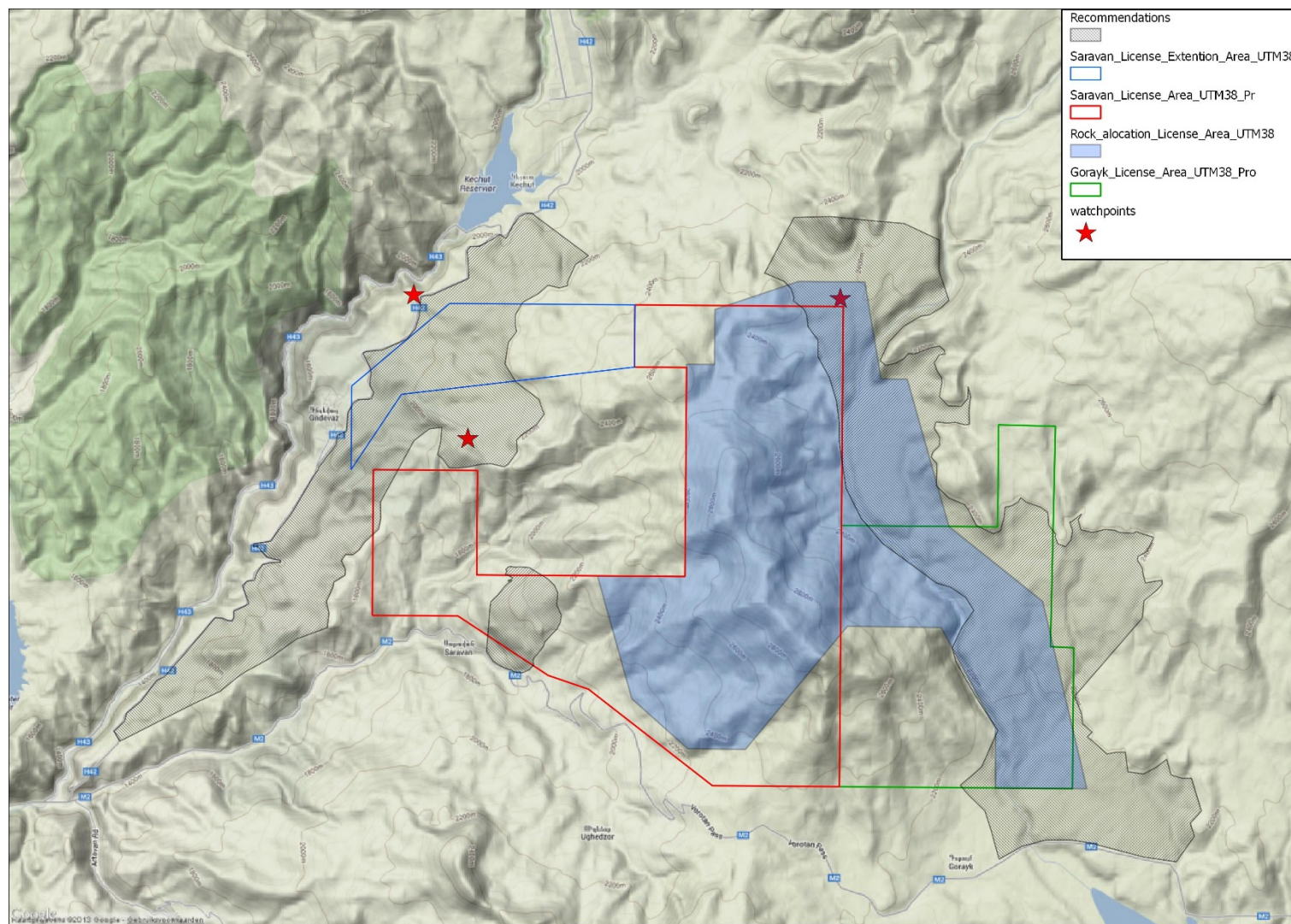


Figure 8. Areas considered sensitive for birds based on autumn survey results.

7 References

Aghasyan A. L. & Kalashyan M. Ju. (2010). Red Data Book of Armenia. Invertebrate and Vertebrate animals. Ministry of Nature Protection, Yerevan.

Iñigo, A., B. Barov (2010). Action plan for the lesser kestrel *Falco naumanni* in the European Union, 55 p. SEO|BirdLife and BirdLife International for the European Commission.

Kahlert J., Leito A., Laubek B., Luigujoe L., Kuresoo A., Aen K. & Luud A. (2012). Factors affecting the flight altitude of migrating waterbirds in western Estonia. *Ornis Fennica* 89:1-13

8 Annexes

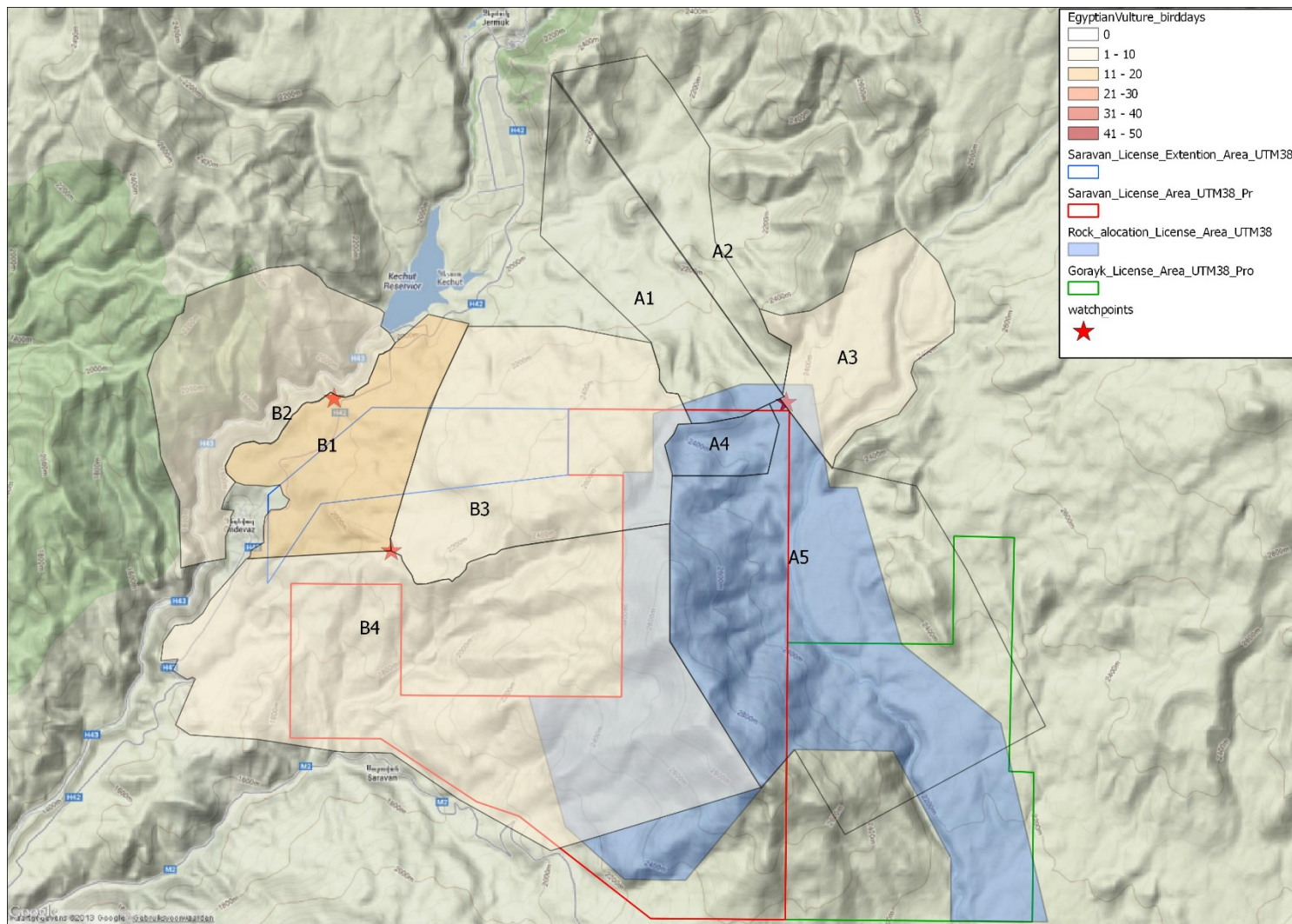


Figure 9. Ground use of Egyptian Vulture in the survey area in autumn 2013, expressed in “bird days”

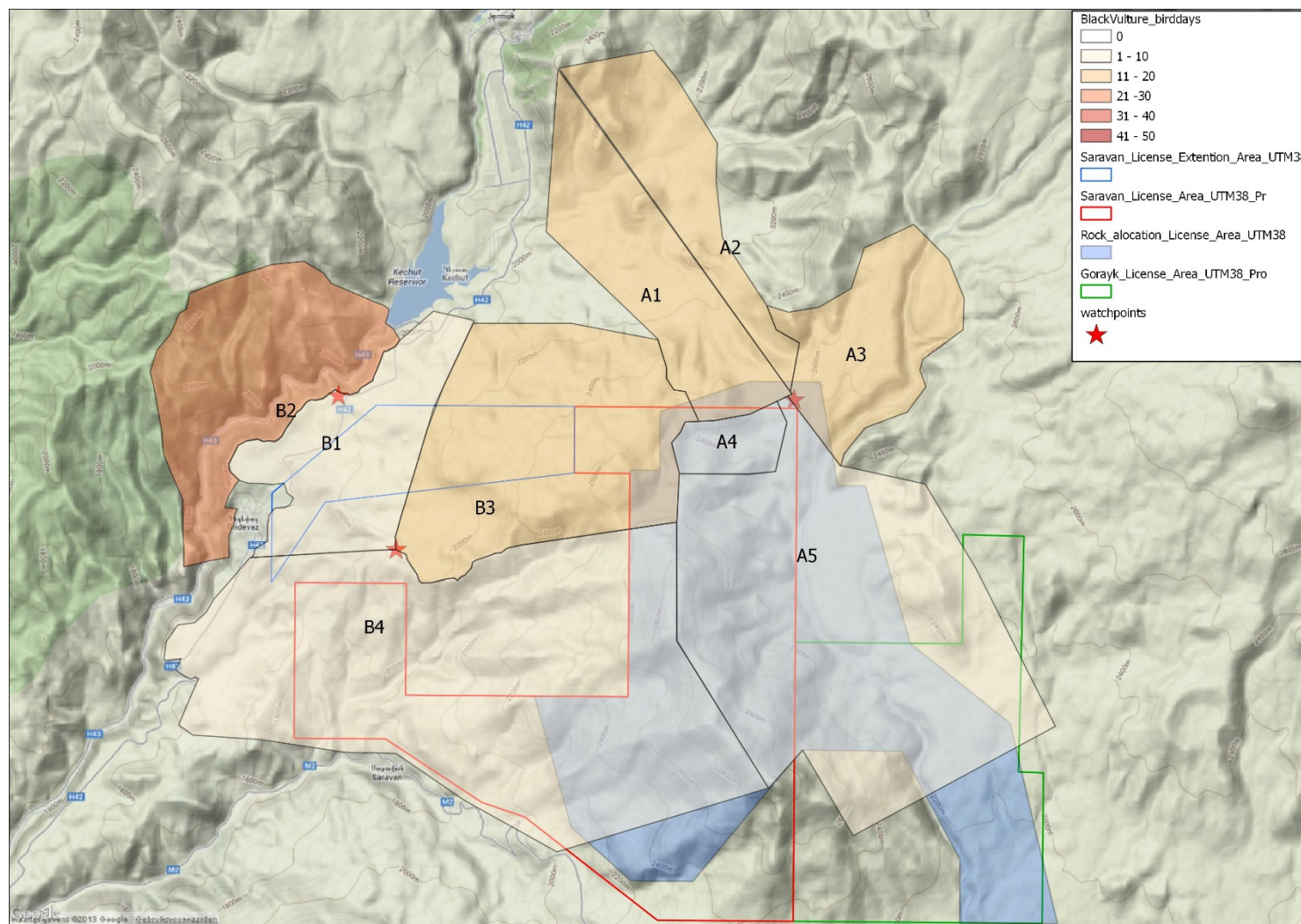


Figure 10. Ground use of Black Vulture in the survey area in autumn 2013, expressed in “bird days”

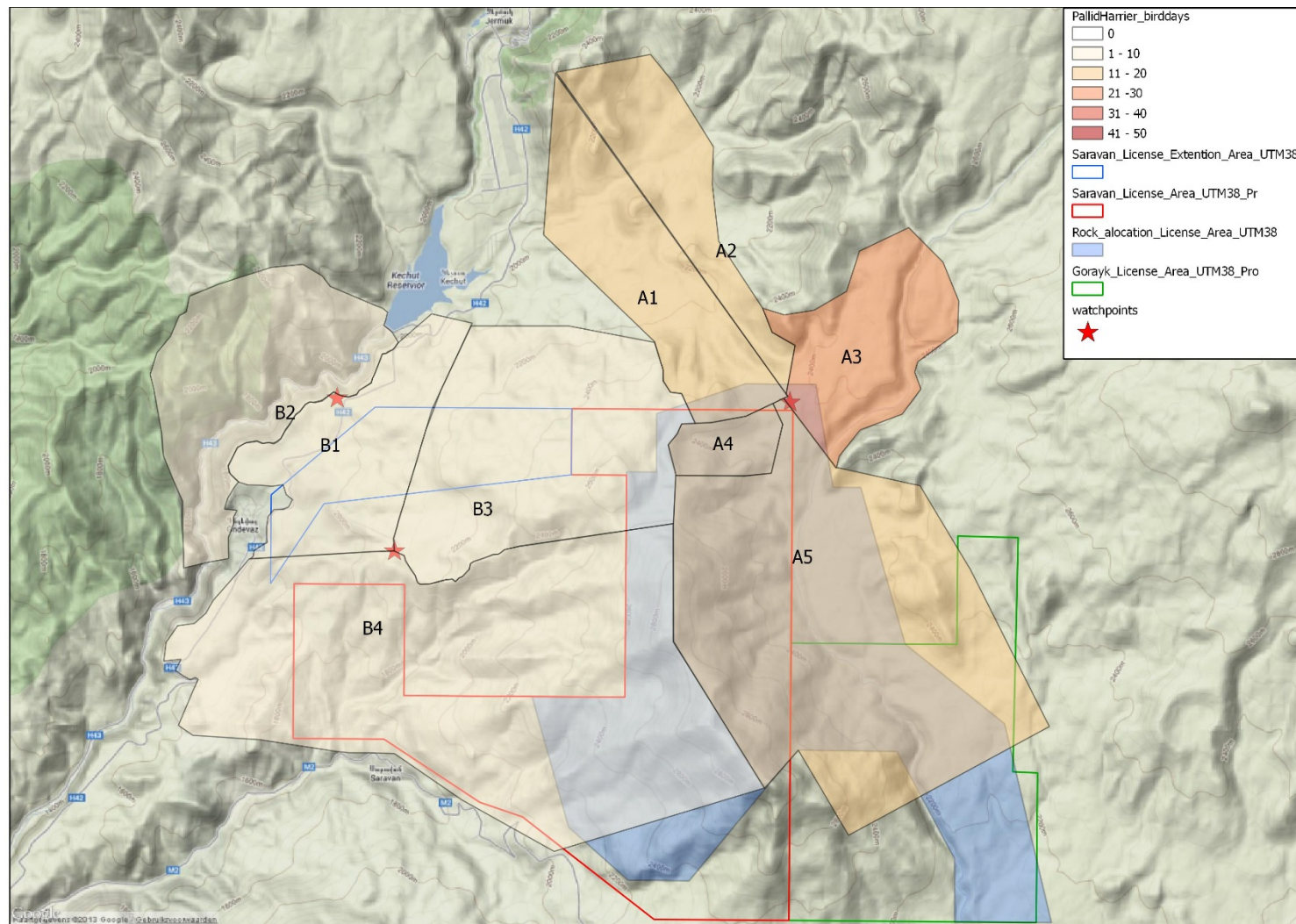


Figure 11. Ground use of Pallid Harrier in the survey area in autumn 2013, expressed in “bird days”

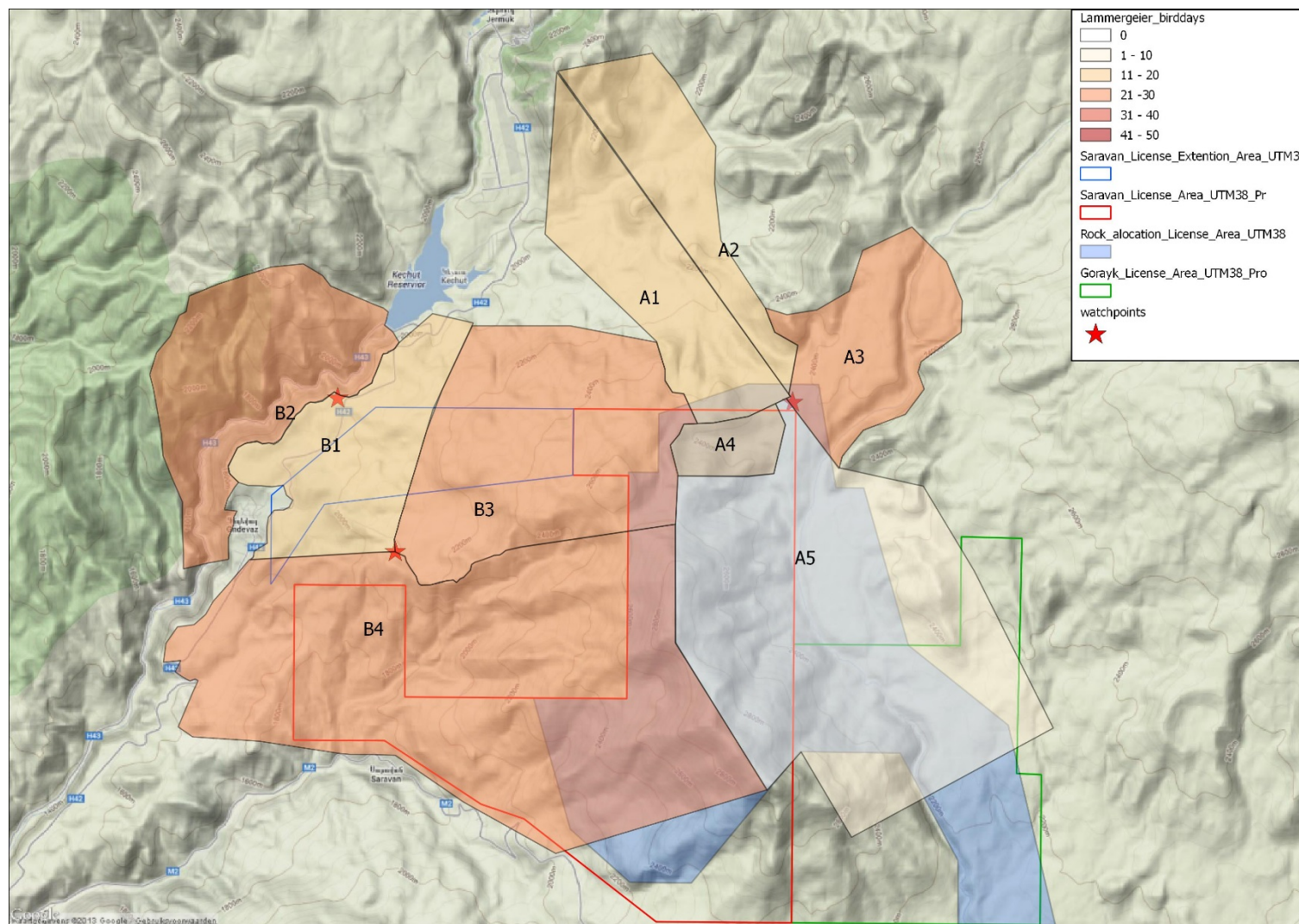


Figure 12. Ground use of Lammergeier in the survey area in autumn 2013, expressed in “bird days”

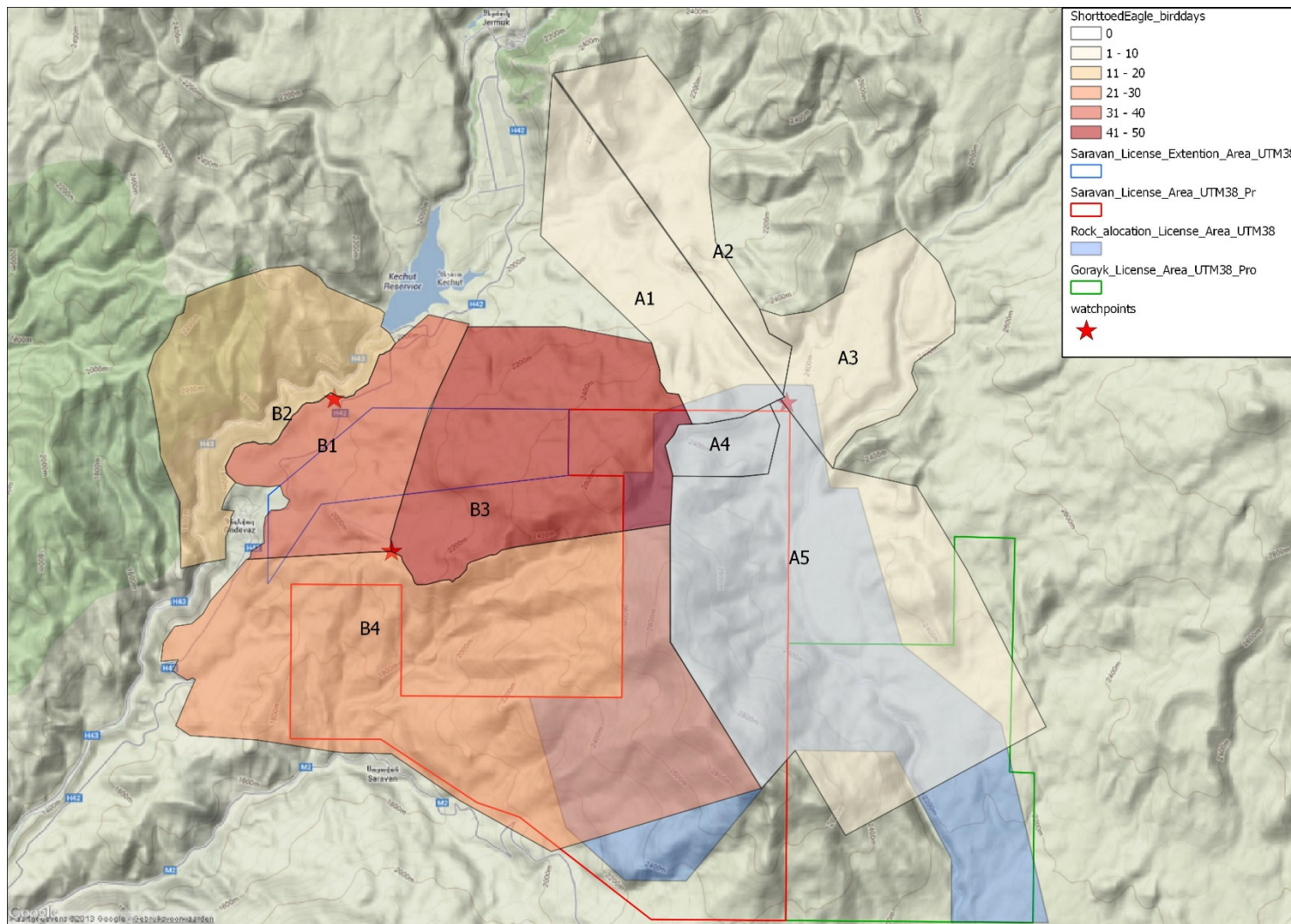


Figure 13. Ground use of Short-toed Eagle in the survey area in autumn 2013, expressed in “bird days”

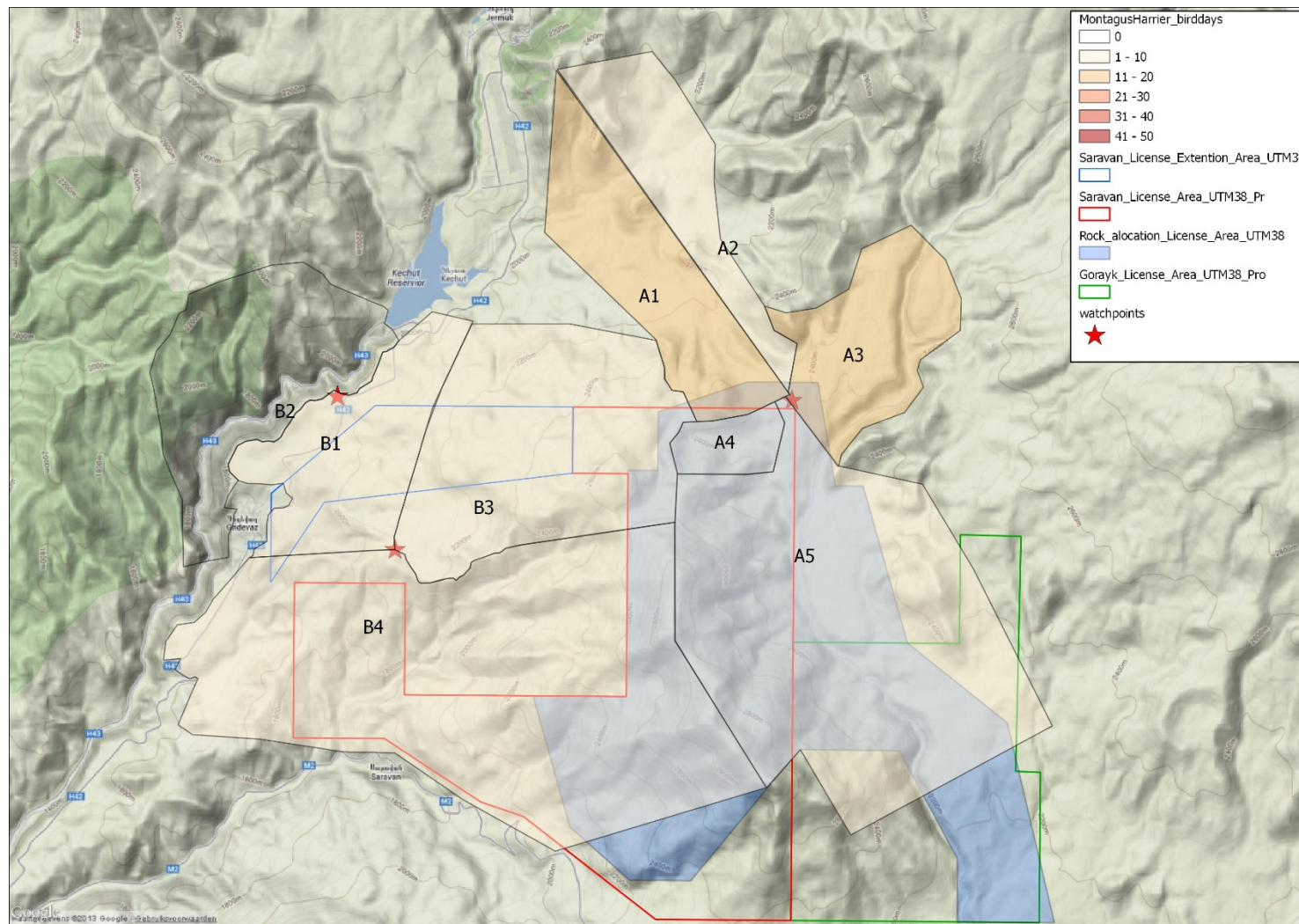


Figure 14. Ground use of Montagu's Harrier in the survey area in autumn 2013, expressed in "bird days"

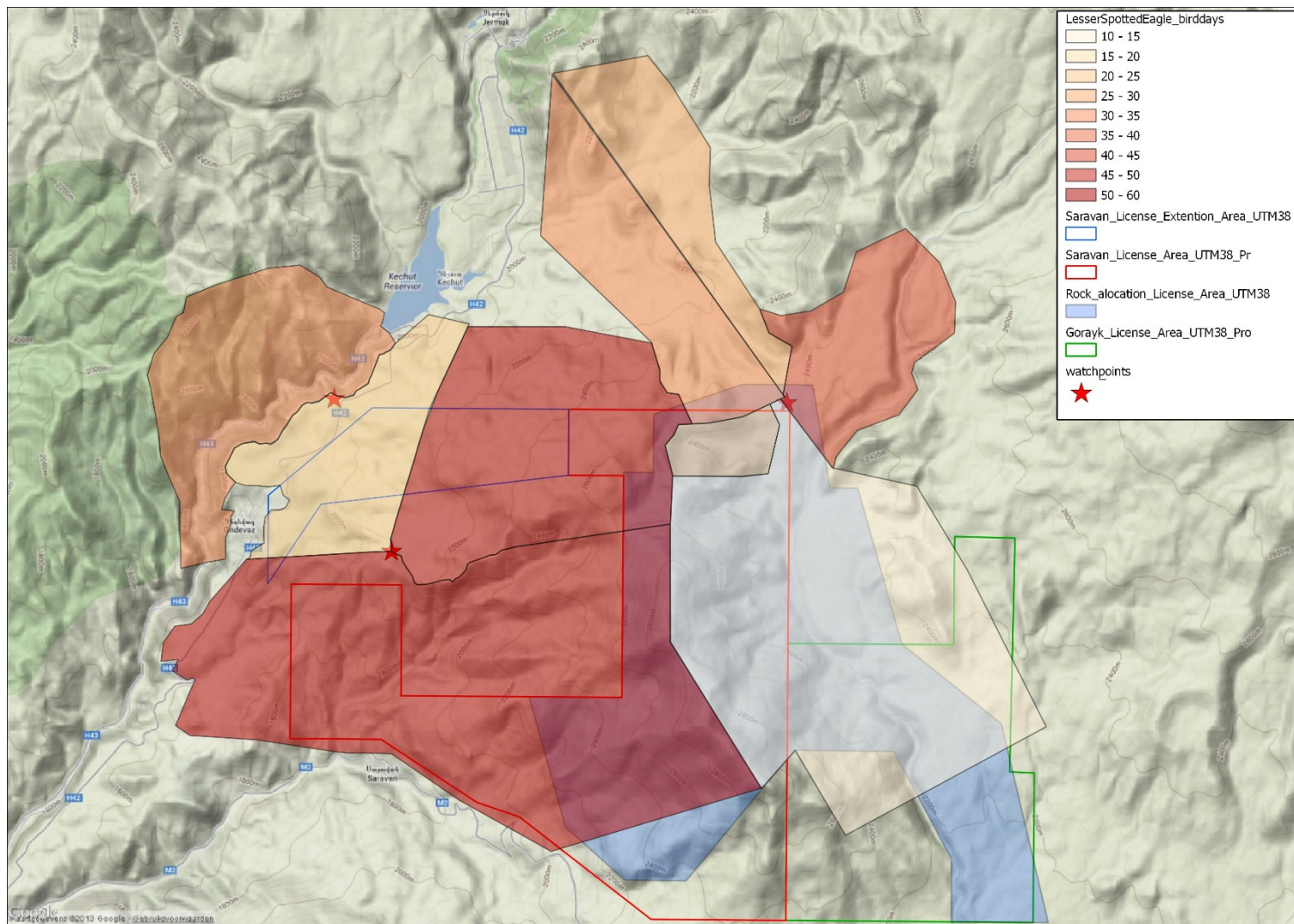


Figure 15. Ground use of Lesser Spotted Eagle in the survey area in autumn 2013, expressed in “bird days”

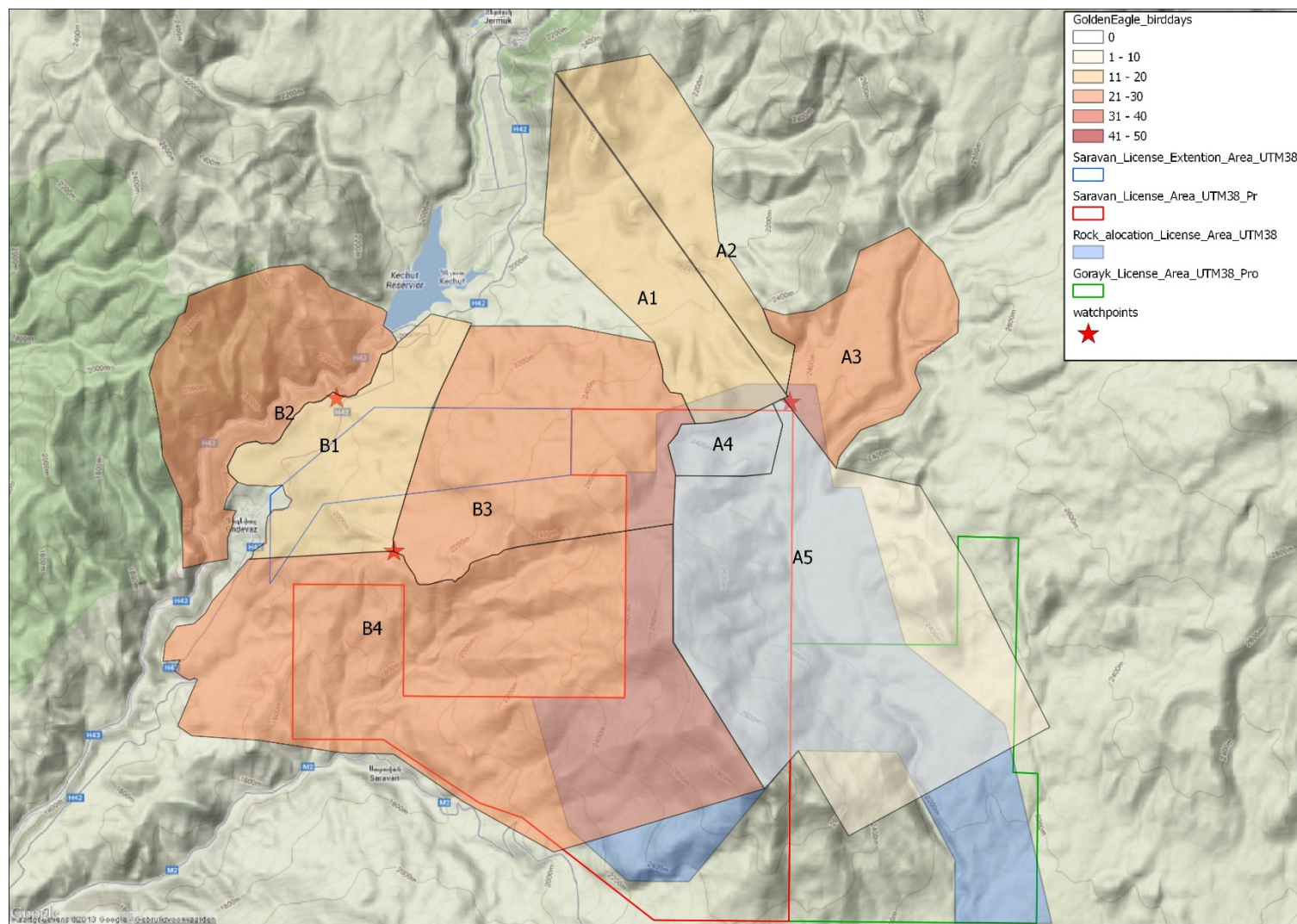


Figure 16. Ground use of Golden Eagle in the survey area in autumn 2013, expressed in “bird days”

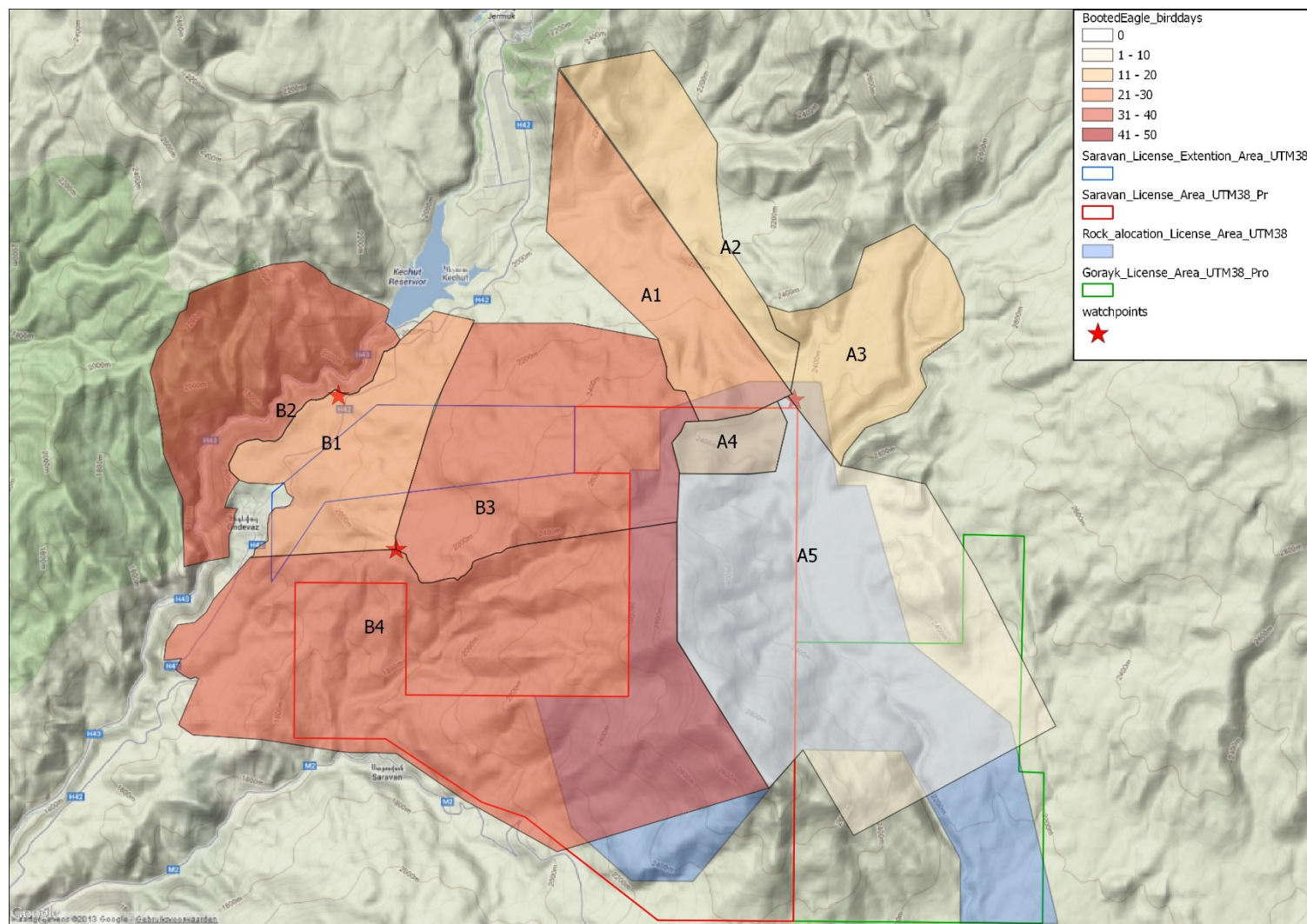


Figure 17. Ground use of Booted Eagle in the survey area in autumn 2013, expressed in “bird days”

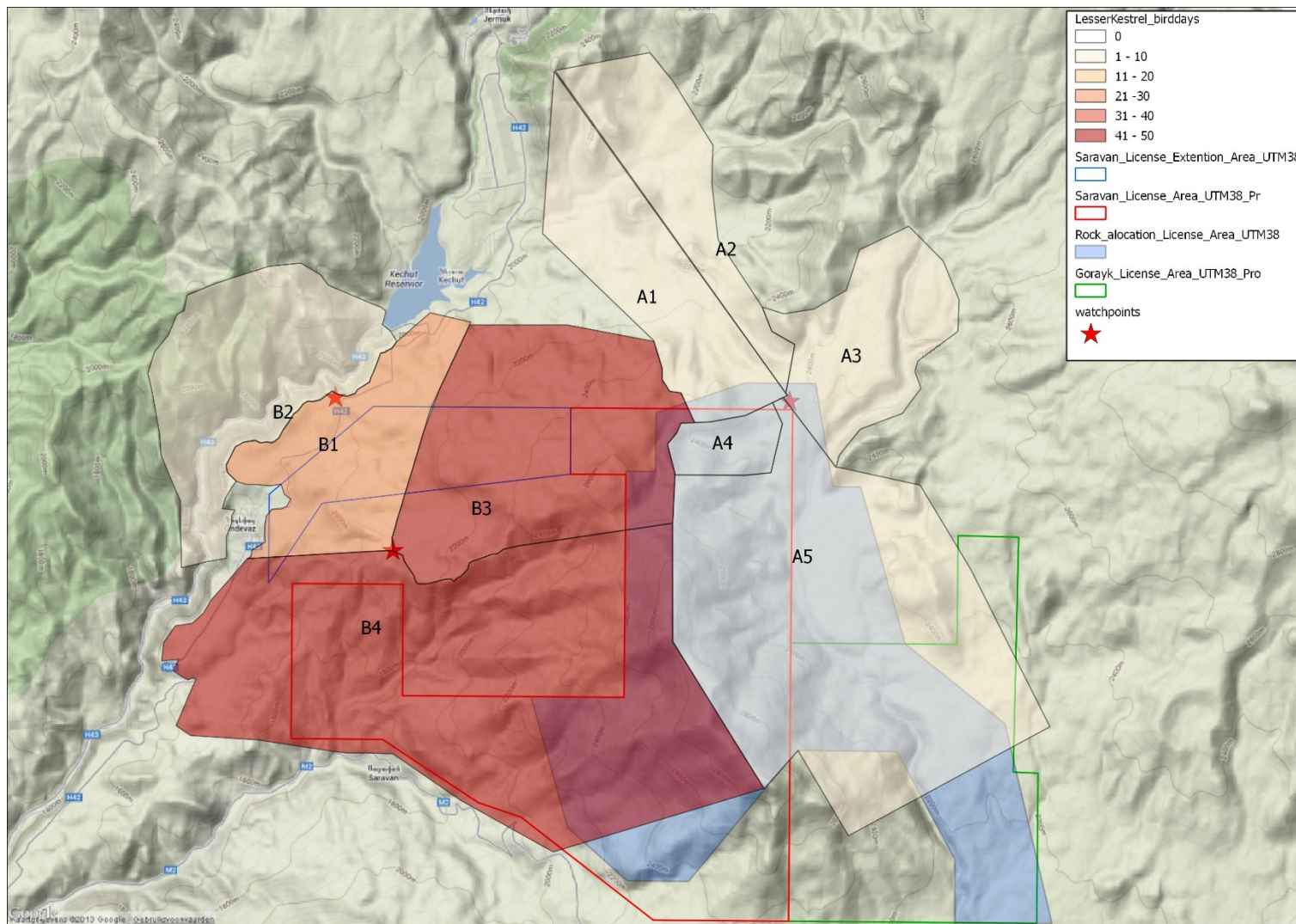


Figure 18. Ground use of Lesser Kestrel in the survey area in autumn 2013, expressed in “bird days”

Amulsar Bird Survey Report Spring 2014



TREWEEK
ENVIRONMENTAL CONSULTANTS

Chancery Cottage, Kentisbeare, Cullompton, Devon, EX15 2DS, UK. Tel. +44 (0)1884 266694. www.treweek.co.uk.

CONTENTS

1	Background.....	7
2	Methodology.....	7
2.1	Atlas survey	7
2.2	Monitoring of Egyptian Vulture	11
3	Results	14
3.1	Atlas survey	14
4	Monitoring of Egyptian Vulture	21
5	Red Data Species	24
5.1	Great Snipe	24
5.2	Ruddy Shelduck.....	24
5.3	Lammergeier.....	24
5.4	Griffon Vulture	26
5.5	Short-toed Eagle	26
5.6	Montagu's Harrier	28
5.7	Northern Goshawk.....	28
5.8	Lesser Spotted Eagle	28
5.9	Golden Eagle	28
5.10	Booted Eagle	30
5.11	Lesser Kestrel	32
5.12	Peregrine Falcon	34
5.13	Corncrake.....	34
5.14	White-throated Robin	34
5.15	Eastern Rock Nuthatch	37
5.16	Spanish Sparrow	39
6	Conclusions and recommendations	41
6.1	Breeding birds	41
6.2	Egyptian Vulture	44
7	References	45
8	Annexes	46

GLOSSARY OF ACRONYMS

the Project	Amulsar Mine Project
Geoteam	Geoteam CJSC
ASPB	Armenian Society for the Protection of Birds
ARD	Acid Rock Drainage
BAP	Biodiversity Action Plan
BRSF	Barren Rock Storage Facility
BBOP	Business and Biodiversity Offset Programme
BOMP	Biodiversity Offset Management Plan
BMP	Biodiversity Management Plan
CE	Critically Endangered
E	Endangered
EBRD	European Bank for Reconstruction and Development
ESIA	Environmental and Social Impact Assessment
ESMS	Environmental and Social Management System
fBMP	framework Biodiversity Management Plan
HLF	Heap Leach Facility
HLP	Heap Leach pad
IBA	Important Bird Area
ICMM	International Council for Mining and Minerals
IPIECA	International Petroleum Industry Environmental Conservation Association
IUCN	International Union for the Conservation of Nature

IFC	International Finance Corporation
KBA	Key Biodiversity Area
KBC	Key Biodiversity Component
Lydian	Lydian International Ltd
NGO	Non Government Organisation
NPI	Net Positive Impact
NNL	No Net Loss
PA	Protected Area
PAA	Project Affected Area
RA	Republic of Armenia
RA NAS	Republic of Armenia, National Academy of Science
SAP	Species Action Plan
SEP	Stakeholder Engagement Plan
TEC	Treweek Environmental Consultants
VU	Vulnerable
WAI	Wardell Armstrong International
WWF	World Wildlife Fund for Nature

SUMMARY

The Amulsar gold project (the 'Project') involves development of a gold deposit via open pit mining and heap leach processing techniques. The Project is owned by Lydian International (Lydian) and operated by a subsidiary company, Geoteam CJSC (Geoteam) in Armenia.

The Environmental and Social Impact Assessment (ESIA) produced in 2013 included information from a survey of migratory raptors and other bird species carried out in Spring and Autumn 2013 as well as information on breeding bird populations in the area potentially affected by the Project.

The need for a further survey of breeding birds was identified for Spring 2014 to assess the implications of a proposed new location for the Project's Heap Leach facility. Special attention was given to Egyptian Vulture, a globally threatened species breeding close to the new Heap Leach site and also to populations of breeding birds, as several species listed in the Republic of Armenia's Red Book are known to nest in the Project Affected Area. This report presents the results of the Spring Survey 2014.

CONTENTS

1	Background	7
2	Methodology	7
2.1	Atlas survey	7
2.2	Monitoring of Egyptian Vulture	11
3	Results	14
3.1	Atlas survey	14
4	Monitoring of Egyptian Vulture	21
5	Red Data Species	24
5.1	Great Snipe	24
5.2	Ruddy Shelduck	24
5.3	Lammergeier	24
5.4	Griffon Vulture	26
5.5	Short-toed Eagle	26
5.6	Montagu's Harrier	28
5.7	Northern Goshawk	28
5.8	Lesser Spotted Eagle	28
5.9	Golden Eagle	28
5.10	Booted Eagle	30
5.11	Lesser Kestrel	32
5.12	Peregrine Falcon	34
5.13	Corncrake	34
5.14	White-throated Robin	34
5.15	Eastern Rock Nuthatch	37
5.16	Spanish Sparrow	39
6	Conclusions and recommendations	41
6.1	Breeding birds	41
6.2	Egyptian Vulture	44

7	References	45
8	Annexes	46

1 Background

Treweek Environmental Consultants commissioned two experts on behalf of Lydian International Ltd. to carry out an ornithological survey on and in the vicinity of Mount Amulsar in Armenia in spring 2014. This survey supplemented bird surveys carried out in 2013 and focused on:

- detailed survey of the new proposed location for the Heap Leach pad ("Site 28"), and
- Monitoring of The craggy corrie surrounding the mountain lake south of the unnamed peak about 1km south of Arshak, an area set-aside from the operations and traffic associated with the proposed mine.

Lydian International is currently revising its September 2012 feasibility study, updating it with a revised mining infrastructure layout incorporating the new Valley fill, Heap Leach location and engineering options to maximise the mine's potential. From an environmental point of view, new infrastructure location entails the need for establishing whether there will be any further implications for management of biodiversity-related risks and opportunities. In addition, the autumn 2013 ornithological report recommended more specific research on Egyptian Vulture in the Amulsar area, a globally threatened species whose local feeding habits and ground use were still not clear after the spring and autumn 2013 surveys. For these purposes, field studies similar to those in spring 2013, were carried out in the two sub-areas outlined above. Special attention was paid to species listed in the Republic of Armenia's Red Data Book (Aghasyan & Kalashyan, 2010) and a close watch was kept on the local pair of Egyptian Vultures.

The survey was conducted by two of the same people as in 2013, namely Peter Adriaens (Belgium) and Mårten Wikstrom (Sweden). They cooperated closely with members of the Armenian Society for the Protection of Birds, namely Ando Gyonjyan, Edo Ghasabian, Luba Balyan and Tsovinar Hovhannisyan, who each joined the surveys for an extended amount of time. This report was drafted by Peter Adriaens (Belgium) and reviewed by Jo Treweek.

2 Methodology

Data on breeding birds in the two sub-areas were gathered through an atlas survey. For easy comparison with the 2013 results, the same methodology was followed as in spring 2013. For the monitoring of the local pair of Egyptian Vultures, a watchpoint with panoramic view was set up near their nest site.

2.1 *Atlas survey*

From 24 May to 2 June 2014 and 6 to 8 June 2014, daily searches were made in the sub-areas to record all bird species present and their (breeding) activity. These were recorded on a tetrad basis, i.e. a 2km by 2km square based on the map grid. The two sub-areas included the tetrads B5, B6, B7, C5 and C6 west of Amulsar ("Site 28"), as well as F7, F8, G7 and G8 south of the massif (set-aside area) – see figure 1. Each tetrad was visited at least twice, with a minimum of three days between the two visits. For most tetrads, at least one visit was made shortly after sunrise, when bird activity is at its peak. Visits were always made on foot, in a crisscross manner, covering all of the different

habitat types present in each square. In addition, a night drive was made through the tetrads B5, B6 and C5 specifically for Corncrakes, a rather nocturnal species.

Species' breeding status was determined by a slightly simplified version of the British Trust for Ornithology's Bird Atlas 2007-2011¹ - see Table 1.

Table 1. Survey criteria used for determining breeding status

Non-breeding
Species flying over
Species observed but suspected to be still on migration
Species observed but suspected to be summering non-breeder
Possible breeder
Species observed in breeding season in suitable nesting habitat
Singing male present in suitable breeding habitat
Probable breeding
Pair observed in suitable nesting habitat in breeding season
Permanent territory presumed through registration of territorial behaviour (song, etc.) on at least two different days a week or more apart at the same place
Bird visiting probable nest site
Agitated behaviour or anxiety calls from adults
Nest building or excavating nest-hole
Courtship and display in or near potential breeding habitat
Definite breeding
Nest building
Adults entering or leaving nest-site in circumstances indicating occupied Nest
Recently fledged young (nidicolous species) or downy young (nidifugous species)
Adult carrying faecal sac or food for young
Nest containing eggs or young

¹ <http://www.bto.org/volunteer-surveys/birdatlas/taking-part/breeding-evidence>

Weather placed some constraints on the survey work. Strong thunderstorms were rather frequent, especially in the afternoons and late evenings. The night drive had to be cut short due to this, and one morning round had to be postponed.

It should be noted that in spring 2013 the squares B6 and B7 were not included in the ornithological survey as they fall outside of the mining license area, and squares B5, C6, G8, and – to some extent – F8 and G7 were only partly covered. This should be taken into account when comparing these data to those from spring 2014.

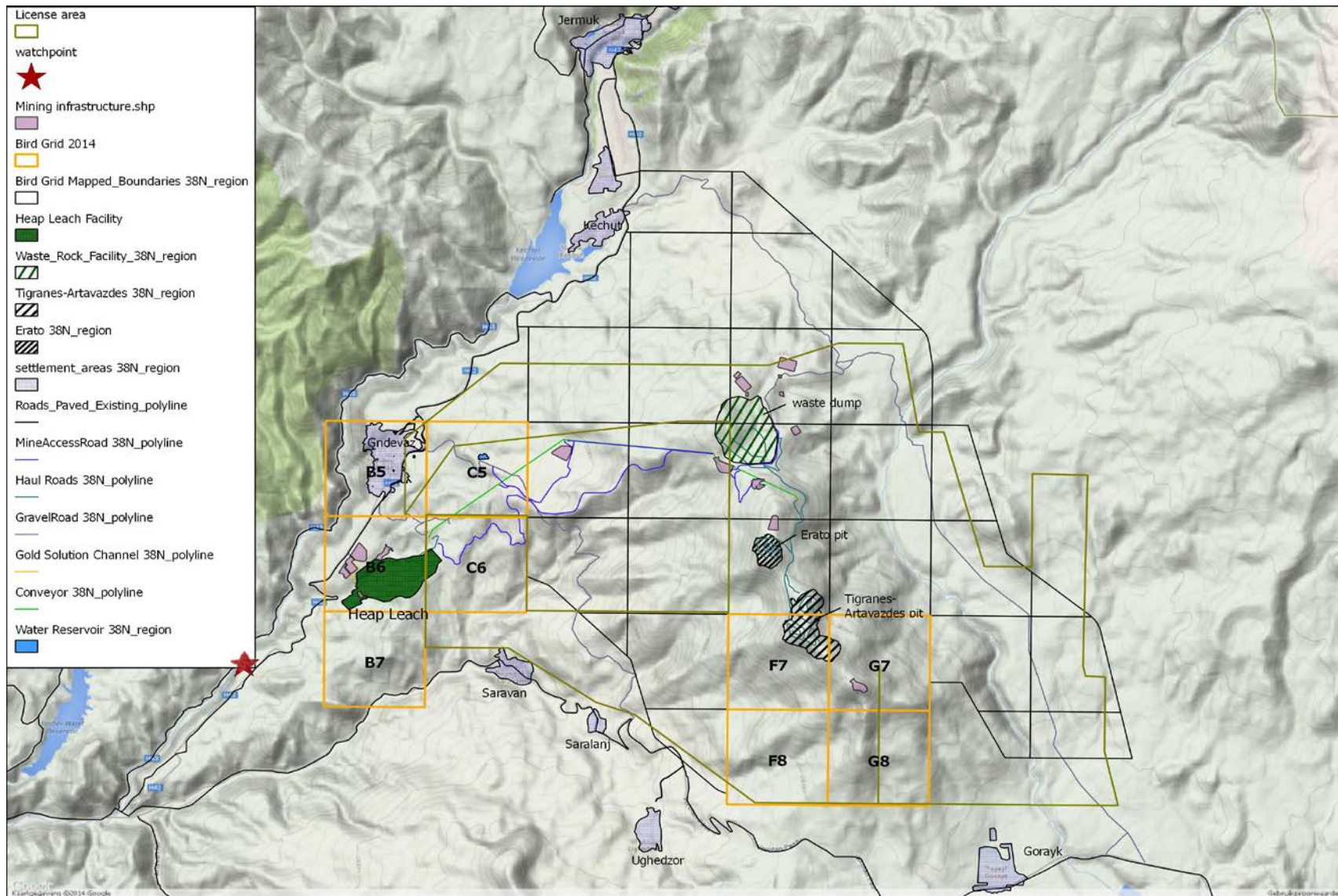


Figure 1. Tetrads surveyed during the spring 2014 ornithological survey, with indication of the Egyptian Vulture watchpoint.

2.2 Monitoring of Egyptian Vulture

To survey the flight paths and feeding areas used by the local pair of Egyptian Vultures breeding in Arpa gorge, southwest of the village of Gndevaz, we set up a watchpoint with a panoramic view towards all directions on top of the gorge, close to the nest cliffs (figure 1). From here, we not only had a good view of the nesting area, but also of the new Heap Leach area, and we could see all the way to the Amulsar massif in the east – see figure 2. Using powerful spotting scopes, we were therefore often able to follow the adult birds for miles when they flew out of the nest and started looking for food. This watchpoint was manned from 3 to 5 June and then again from 11 to 20 June, mainly from 10:00 (when temperature started rising, providing hot air and thermals for the birds to soar) to 17:00 or 18:00 each day. When an adult bird was observed from the watchpoint, we noted down what it was doing, which direction it was taking (using a compass), and how much time it spent in specific locations (e.g. in each survey tetrad). We also tried to identify the prey that it brought to the nest. The nest itself was not visible from the watchpoint as some protruding cliffs obstructed the view. It was located inside a cave and had to be viewed from low down in the gorge. However, we could easily see the adults come flying towards and into the nest cave.

Although it is generally not possible to sex Egyptian Vultures in the field (Forsman 1999), the plumage of adults often becomes a bit dirty and soiled, which may produce unique patterns. Indeed, we were able to find several individual differences between both adult birds, which easily allowed us to tell them apart even in flight, from a distance – see figure 3. On 13 June, we observed a mating attempt, which gave us certainty about the gender of each bird. Birds are less imaginative than humans: the male is always on top...



Figure 2.
Egyptian
Vulture
watchpoint
– view
towards
the
northeast,
with
indication
of the
vulture
nest site.



Figure 3. Individual differences (due to plumage staining) between the adult male (left) and adult female Egyptian Vulture breeding in Arpa gorge in spring 2014

3 Results

3.1 Atlas survey

A total of 102 bird species were recorded in the nine survey tetrads. These are listed in table 2 below, with the global and national threatened status of each provided, as well as their breeding activity per tetrad. Of these 102 species, 16 are listed in the Armenian Red Data Book and 1 is globally threatened.

Table 2 List of bird species recorded in the survey tetrads in spring 2014, with indication of their global and national rarity status: bold type indicates that the species is listed in the Armenian Red Data book, red type indicates that the species is on the IUCN Red List (i.e. globally threatened). Breeding activity of each species is shown per tetrad: X = present (without indication of breeding), POSS = possible breeding, PROB = probable breeding, DEF = definite breeding.

English name	Scientific name	B5	B6	B7	C5	C6	F7	F8	G7	G8
alpine accentor	<i>Prunella collaris</i>						poss		def	Poss
alpine swift	<i>Tachymarptis melba</i>	X	X	x		x				
armenian stonechat	<i>Saxicola maurus armenicus</i>		prob	def		def				
Asian crimson-winged finch	<i>Rhodopechys sanguineus</i>				X			poss	poss	Prob
barn swallow	<i>Hirundo rustica</i>				X					
barred warbler	<i>Sylvia nisoria</i>		prob		prob	def				
European bee-eater	<i>Merops apiaster</i>	X								
bimaculated lark	<i>Melanocorypha bimaculata</i>		poss	def		x				
black redstart	<i>Phoenicurus ochruros</i>	Def					poss		prob	Poss
black-billed magpie	<i>Pica pica</i>	Poss						X		
black-eared wheatear	<i>Oenanthe hispanica (melanoleuca)</i>	Poss	prob	def		poss				
black-headed bunting	<i>Emberiza melanocephala</i>	Poss	prob	poss	prob	poss				
blue rock thrush	<i>Monticola solitarius</i>	Poss	def	poss		poss		poss		
booted eagle	<i>Hieraaetus pennatus</i>	Prob	def	x		x				
caspian snowcock	<i>Tetraogallus caspius</i>								x	
cetti's warbler	<i>Cettia cetti</i>	Poss	poss	poss	prob					
chaffinch	<i>Fringilla coelebs</i>	Poss								
chukar	<i>Alectoris chukar</i>	Prob					poss			
Eurasian collared dove	<i>Streptopelia decaocto</i>	Poss								
common buzzard	<i>Buteo buteo (menetriesi)</i>		prob	prob	poss	prob	x			
common cuckoo	<i>Cuculus canorus</i>	Prob	def	poss	prob	poss	poss	poss		
common kestrel	<i>Falco tinnunculus</i>	X			X				def	
common quail	<i>Coturnix coturnix</i>	Poss	poss		prob	poss				
common raven	<i>Corvus corax</i>		X	poss				poss	def	
common rock thrush	<i>Monticola saxatilis</i>	Poss		poss	poss		poss	prob	def	poss

English name	Scientific name	B5	B6	B7	C5	C6	F7	F8	G7	G8
common rosefinch	<i>Carpodacus erythrinus</i>	Poss	poss	poss	poss	poss		def		
common starling	<i>Sturnus vulgaris</i>				Def					
common swift	<i>Apus apus</i>	Poss	X	x	X	x		def		
common whitethroat	<i>Sylvia communis</i>	Poss	poss		prob	poss		poss		poss
common woodpigeon	<i>Columba palumbus</i>	Poss			X	poss				
corn bunting	<i>Emberiza calandra</i>	Poss	poss	poss	poss	poss				
eastern rock nuthatch	<i>Sitta tephronota</i>	Prob	prob	poss						
egyptian vulture	<i>Neophron percnopterus</i>	X	X	x						
Eurasian blackbird	<i>Turdus merula</i>	Poss	poss	def	poss	poss				
Eurasian crag martin	<i>Ptyonoprogne rupestris</i>	Poss	def	poss	prob	prob	poss		poss	poss
Eurasian golden oriole	<i>Oriolus oriolus</i>	Poss	def							
Eurasian Griffon Vulture	<i>Gyps fulvus</i>									x
Eurasian hoopoe	<i>Upupa epops</i>	Poss	poss		poss	poss				
Eurasian jay	<i>Garrulus glandarius</i>	Poss	poss			poss				
Eurasian linnet	<i>Acanthis cannabina</i>	Prob	def	prob	prob	prob			prob	
Eurasian skylark	<i>Alauda arvensis</i>			poss	poss	poss	prob	prob	prob	prob
Eurasian sparrowhawk	<i>Accipiter nisus</i>					poss				
Eurasian wryneck	<i>Jynx torquilla</i>				poss					
European goldfinch	<i>Carduelis carduelis</i>	Poss	poss	poss	poss					
European honey buzzard	<i>Pernis apivorus</i>	X		x		x				
European stonechat	<i>Saxicola torquatus (rubicola)</i>		poss							
red-fronted serin	<i>Serinus pusillus</i>	Poss	X						poss	
garden warbler	<i>Sylvia borin</i>		X		poss	x				
golden eagle	<i>Aquila chrysaetos</i>	X	prob	prob	X					
great reed warbler	<i>Acrocephalus arundinaceus</i>		X							
great snipe	<i>Gallinago media</i>								x	
great tit	<i>Parus major</i>	Poss	def	poss		prob				
greater short-toed lark	<i>Calandrella brachydactyla</i>				prob					
grey partridge	<i>Perdix perdix</i>			prob					x	
grey wagtail	<i>Motacilla cinerea</i>	Def				def				
hooded crow	<i>Corvus cornix</i>	Poss	poss		poss					
shorelark	<i>Eremophila alpestris (penicillata)</i>						poss	poss	def	prob
lammergeier	<i>Gypaetus barbatus</i>		X	x			x		x	
lesser grey shrike	<i>Lanius minor</i>	Poss	poss	prob	poss	poss				
lesser kestrel	<i>Falco naumanni</i>						x	X	x	
lesser spotted eagle	<i>Aquila pomarina</i>			prob	X					
lesser whitethroat*	<i>Sylvia curruca (curruca/althea)</i>	Poss	def	def	poss	poss				
long-legged buzzard	<i>Buteo rufinus</i>	Poss	prob	def		poss	poss	X	x	
long-tailed tit	<i>Aegithalos caudatus</i>	Poss	poss	def		poss				
marsh warbler	<i>Acrocephalus palustris</i>	Poss	poss	poss	prob					
mistle thrush	<i>Turdus viscivorus</i>	Poss	prob			prob				
montagu's harrier	<i>Circus pygargus</i>						x			

English name	Scientific name	B5	B6	B7	C5	C6	F7	F8	G7	G8
European nightjar	<i>Caprimulgus europaeus</i>			prob		poss				
northern goshawk	<i>Accipiter gentilis</i>					poss				
northern house martin	<i>Delichon urbicum</i>	Def	X	x		x	poss	poss	poss	poss
northern wheatear	<i>Oenanthe oenanthe</i>	Def			Def			poss	prob	poss
orphan warbler	<i>Sylvia hortensis</i> (<i>crassirostris</i>)			poss						
ortolan bunting	<i>Emberiza hortulana</i>	Def	poss	def	Def	def				
peregrine falcon	<i>Falco peregrinus</i>			prob						
radde's accentor	<i>Prunella ocularis</i>								poss	poss
red-backed shrike	<i>Lanius collurio</i>	Def	def	def	prob	prob		poss		prob
red-billed chough	<i>Pyrrhocorax pyrrhocorax</i>	Def	prob	x					def	
ring ouzel	<i>Turdus torquatus</i>		def		prob	poss			prob	
rock bunting	<i>Emberiza cia</i>	Poss	def	def	Def	poss				
rock sparrow	<i>Petronia petronia</i>	Poss	poss	poss	poss			poss		
rose-coloured starling	<i>Sturnus roseus</i>			x						
ruddy shelduck	<i>Tadorna ferruginea</i>				X					
sedge warbler	<i>Acrocephalus schoenobaenus</i>		poss	poss						
short-toed eagle	<i>Circaetus gallicus</i>			x	X	prob			x	
spanish sparrow	<i>Passer hispaniolensis</i>		X							
spotted flycatcher	<i>Muscicapa striata</i>		X							
syrian woodpecker	<i>Dendrocopos syriacus</i>	Poss		poss						
tawny pipit	<i>Anthus campestris</i>	Prob	def	poss	prob	poss				
tree pipit	<i>Anthus trivialis</i>		poss					poss	poss	poss
twite	<i>Carduelis flavirostris</i>						def	poss	poss	prob
upcher's warbler	<i>Hippolais languida</i>			poss						
water pipit	<i>Anthus spinoletta</i>		poss		prob		poss	poss	def	def
western marsh harrier	<i>Circus aeruginosus</i>				X					
western rock nuthatch	<i>Sitta neumayer</i>	Poss	def	poss	prob	poss				
whinchat	<i>Saxicola rubetra</i>							prob		poss
white wagtail	<i>Motacilla alba</i>	Poss	poss	poss	poss					
white-throated dipper	<i>Cinclus cinclus</i>	Def		poss		poss				
white-throated robin	<i>Irania gutturalis</i>	Def	def	poss	Def	poss				
white-winged snowfinch	<i>Montifringilla nivalis</i>						prob		def	prob
willow warbler	<i>Phylloscopus trochilus</i>		X		X					
winter wren	<i>Troglodytes troglodytes</i>	Poss								
woodlark	<i>Lullula arborea</i>	Poss	def	poss	poss	poss				

*Two taxa of Lesser Whitethroat were observed: most were *curruca* (considered *caucasica* in the region by some authors) but we also made recordings of a few birds singing like the Central Asian taxon *althea*.

The number of species by tetrad is shown in table 3 and in figures 4 (all species) and 5 (breeding only). Species diversity is clearly high in all of the western squares (near Gndevaz). Each of these squares holds a variety of habitats such as wooded valleys, scattered Juniper trees, rocky gorges, small agricultural fields, etc, so it is no surprise that they are rich in species – as was already established in spring 2013. Square B5 was the most notable one, with over 50 species recorded with

evidence of breeding. This may come as a surprise since it consists largely of the village of Gndevaz. However, it also includes part of Arpa gorge (an Important Bird Area) along its western edge, and part of another gorge in its south-eastern corner. By contrast, the four southern squares (on the southern slopes of Amulsar) held distinctly fewer species. The habitat on these mountain slopes is rather monotonous and barren, with short vegetation only, and is only suitable for those species typical of and restricted to high altitudes.

Table 3. Number of bird species by tetrad. Second column shows the total number of species recorded, while the third column shows for how many of those evidence of breeding was observed. Fourth column shows the total number of (Armenian) Red List species recorded; last column indicates how many of those were found breeding.

Tetrad	Species	Breeding	Red List ALL	Red List BREEDING
B5	56	51	4	4
B6	59	48	6	4
B7	53	45	9	6
C5	47	37	5	1
C6	45	38	4	3
F7	17	13	3	0
F8	22	19	1	0
G7	27	20	5	0
G8	18	17	1	0

The number of Red List species by tetrad is also shown in the same table. Square B7 was the most notable, with no less than 6 Red List species found breeding. B5 and B6 each held 4. Although the squares south of Amulsar were used by a number of Red List species (e.g. feeding Lesser Kestrels), no evidence of breeding was observed. In spring 2013, not more than one Red List species was found breeding per square in the whole survey area. This number may have been underestimated.

For the Red List species, the number of individuals present and the number of pairs (possibly) breeding with their exact location is shown in figure 6. Most of the western squares held 5 breeding pairs of Red List species, but squares B7 and C5 each held 4. In square B6, no breeding pairs of Red List species were found on the exact locations of the planned mining infrastructure (such as the Heap Leach pad), but 4 were recorded just north of it: one pair of Eastern Rock Nuthatches 150 m north of the planned Detention Pond, and three pairs of White-throated Robins, the closest breeding 200 m north of the planned Heap Leach pad. A pair of Booted Eagles observed about 300 m east of the planned Heap Leach was likely breeding a bit further east still, in Arpa gorge. One area that appeared important to Red List species was the rocky gorge that winds its way from the north-eastern corner of B6 through the south-eastern corner of B5 (close to Gndevaz) and then further east, through most of the southern half of C5. This area held one pair of Eastern Rock Nuthatches and at least four pairs of White-throated Robin. In spring 2013, a pair of Ruddy Shelduck was only breeding there.

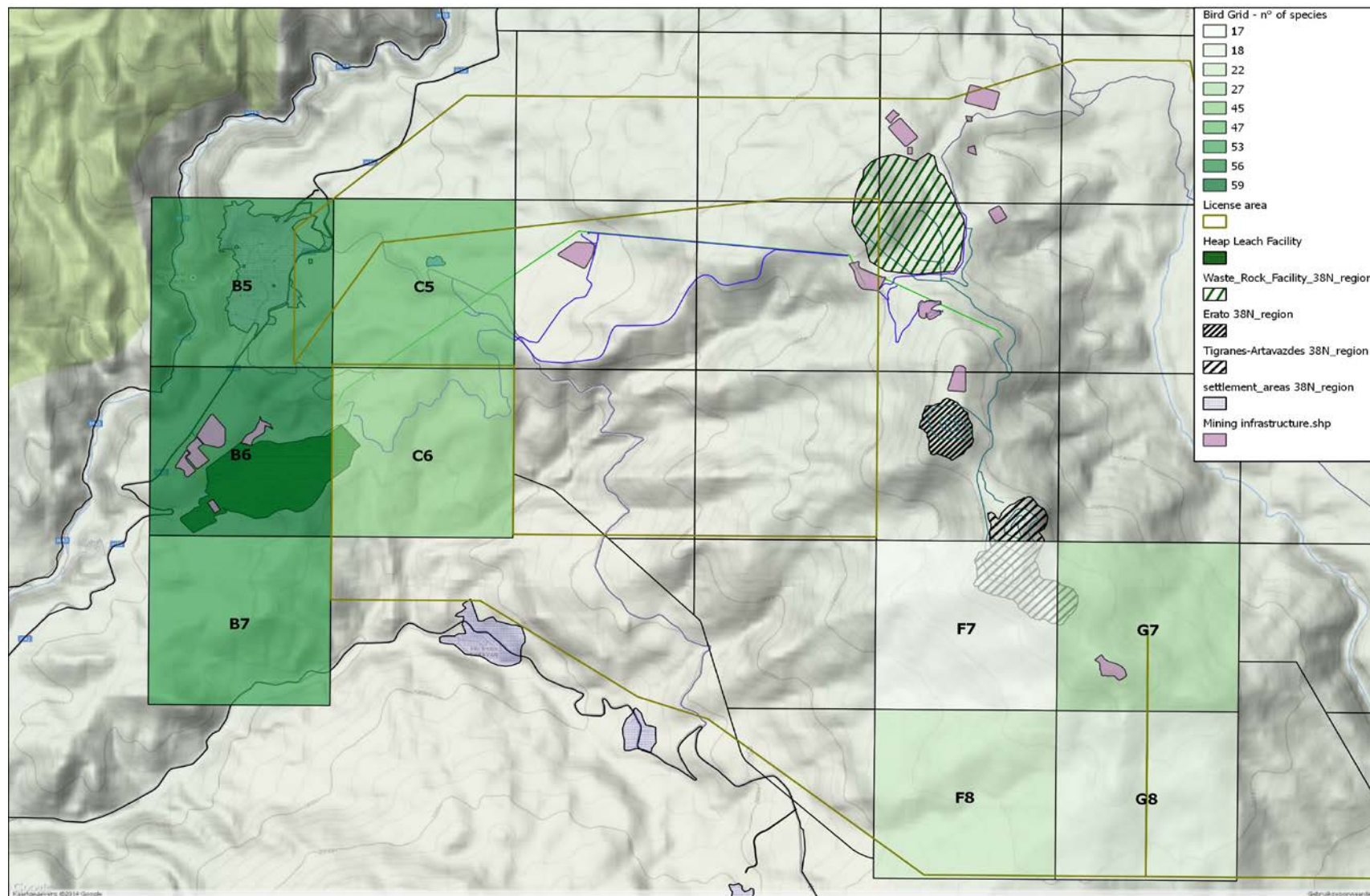


Figure 4.
Number of
bird species
observed by
tetrad in
spring 2014

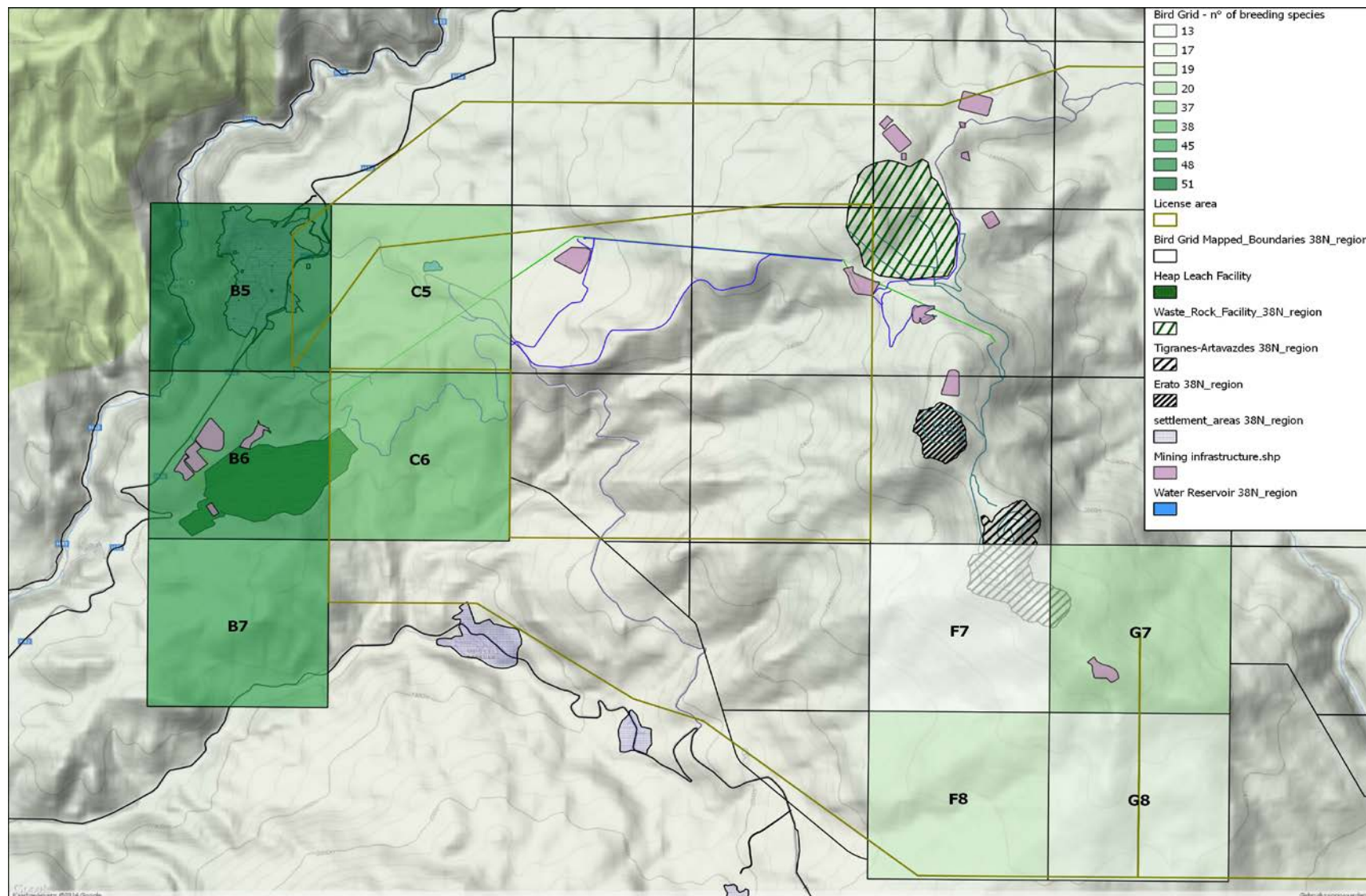


Figure 5.
Number of
breeding
species
observed by
tetrad in
spring 2014

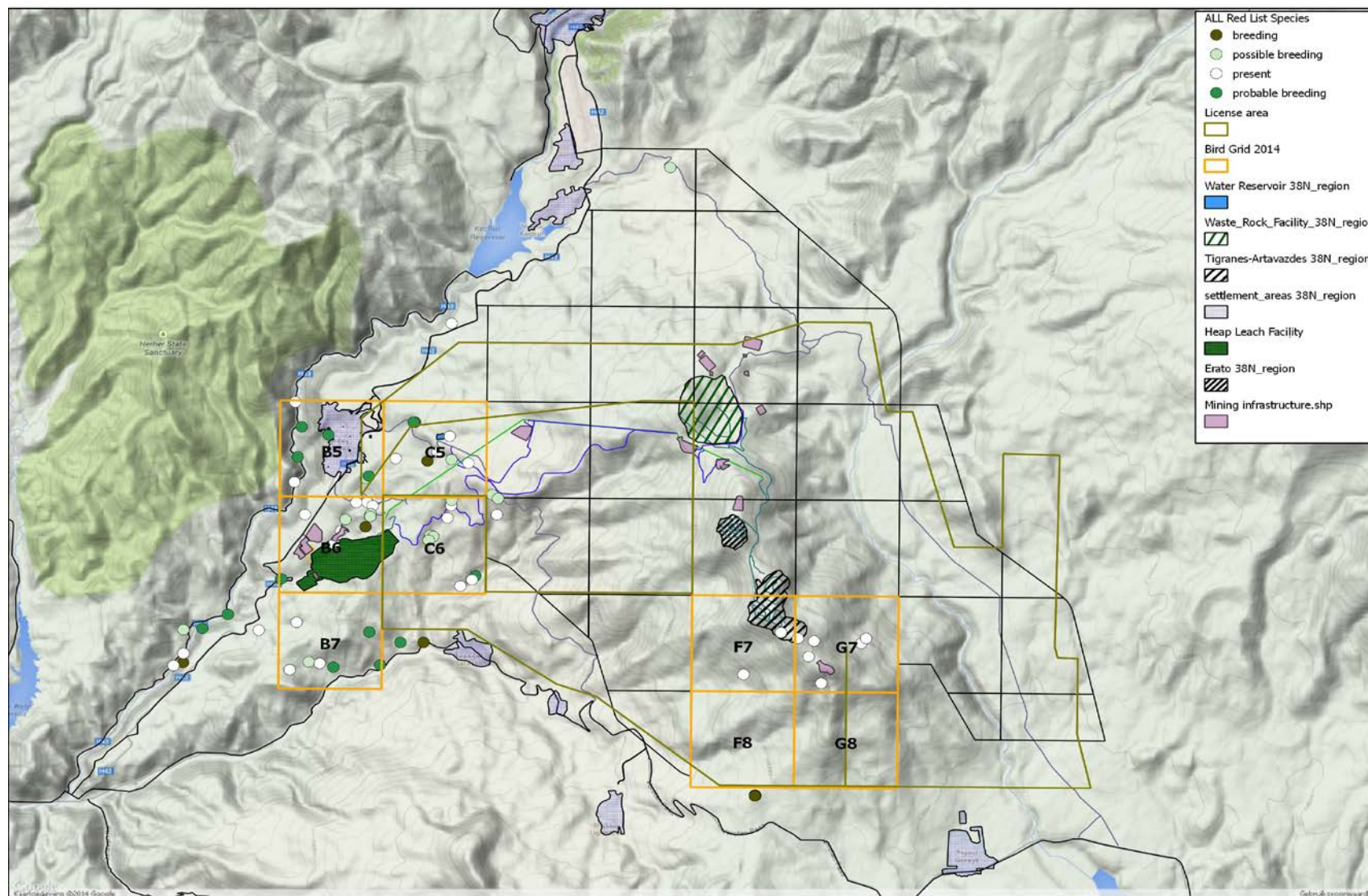


Figure 6.
Point
locations of
Red List
species
observed in
spring 2014,
with
indication of
their
breeding
activity

4 Monitoring of Egyptian Vulture

On the 12 days of monitoring from the watchpoint, we were able to record 10 hours 39 minutes of activity by the pair of Egyptian Vultures. This total does not include time spent on the nest. Table 4 shows the activity duration by location; the complete activity log is shown in Annex I. Before 13 June only the male was actively looking for food; the female spent all its time in the nest then. From 13 June, both parents became active, as they now had at least one growing young, which must have hatched around 10 June.

Table 4. Amount of minutes the adult Egyptian Vultures were observed being active, by location. “fields” = agricultural fields between Arpa gorge and the H42 road; “gorge” = Arpa gorge; “out” = outside of Arpa gorge (incl. “fields”) and outside of all survey tetrads

Location	Duration (minutes)	%
B5	33	5%
B6	17	3%
B7	16	3%
fields	43	7%
gorge	455	71%
out	75	12%
total	639	

Clearly, the pair of vultures spent most of their time (71%) in Arpa gorge, near the nest site. They only used the survey area for 10% of the time they were observed being active. This is even less than the 18% recorded in spring 2013. In spring 2014, the birds were seen using the ground within the survey area on only three occasions: on 16 June, 15:09, the male briefly landed just north of the power line in square B7, and 37 minutes later it briefly landed centrally in B6, when it was accompanied by the female, which landed a bit further west in B6. On seven more occasions birds were seen soaring above the survey area, sometimes quite low, but never picking up food from the ground. By contrast, the birds were seen perched or landing in Arpa gorge or in fields nearby on 26 occasions. The ground use locations and observed flight paths are shown in figure 7. When looking for food, the adult birds seemed to prefer flying above Arpa gorge or above the H42 road, although the male was also seen flying off north to northwest into the hills of Herher State Sanctuary on four occasions.

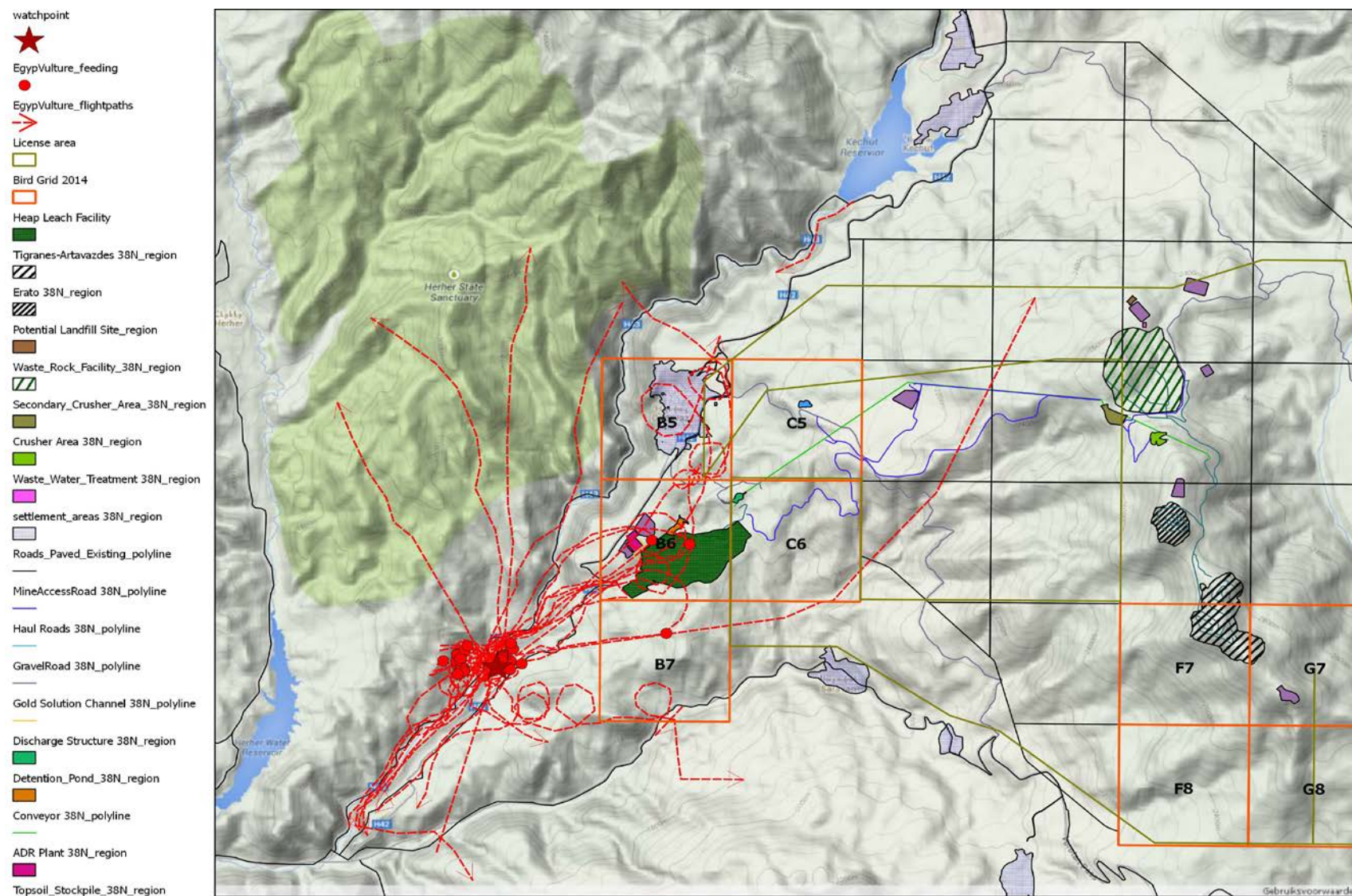


Figure 7.
Observed
flight paths
and feeding
spots
(ground
use) of the
pair of
Egyptian
Vultures in
spring 2014

We observed Egyptian Vultures with food on eight occasions. Usually, the food was delivered to the nest, but in the evening of 3 June the male was seen eating a vole in Arpa gorge for half an hour. Prey (or carrion) delivered to the nest included 4 voles, one mouse and one Weasel (*Mustela sp.*). Most often, food had been obtained far from the watchpoint, out of our sight. Only once did we see one of the birds pick up food, namely on 5 June when the male landed on the H42 road just east of the watchpoint and pickup up a dead mouse (road kill). When the adult birds were observed landing in the survey tetrads, they came flying back into the Arpa gorge without food, so their feeding attempts did not seem to be successful in the survey area.

On 17 and 18 June no birds were observed, even though the watchpoint was manned all day. Presumably the female was in the nest then and the male was out looking for food all day, far from the watchpoint.

5 Red Data Species

In addition to Egyptian Vulture, the survey tetrads were used by a number of nationally threatened bird species. The area could therefore be potentially important for the continued survival of these species in Armenia. Data about these species is presented below and can be used in the Critical Habitat Assessment. The exact locations of the breeding territories of these birds is shown in figures 8 – 15.

5.1 *Great Snipe*

Global status: near threatened

Status in Armenia: vulnerable

(figure 15)

A single bird seen on top of Tigranes on 29 May was probably a late migrant. The species does not breed in Armenia (Adamian & Klem 1997).

5.2 *Ruddy Shelduck*

Global status: least concern

Status in Armenia: vulnerable

(figure 15)

While in spring 2013 this species was found breeding in squares C5, F7 and G7, it was only present in square C5 in spring 2014, without indication of breeding. Only one bird was observed, near the small water reservoir in the square.

5.3 *Lammergeier*

Global status: least concern

Status in Armenia: vulnerable

Single adult birds were observed in squares F7, G7, B6 and B7. At least in B7 the bird was using the ground, and was seen feeding (dropping a bone to shatter it on the rocks and eat the bone marrow). A pair was present in Arpa gorge north of the vulture watchpoint. In March they were seen nesting in the Egyptian Vulture cave (M. Ghasabian *pers. comm.*), but their breeding attempt must have been unsuccessful as no juveniles were observed in spring 2014. They abandoned the nest cave when the Egyptian Vultures returned from their wintering quarters.

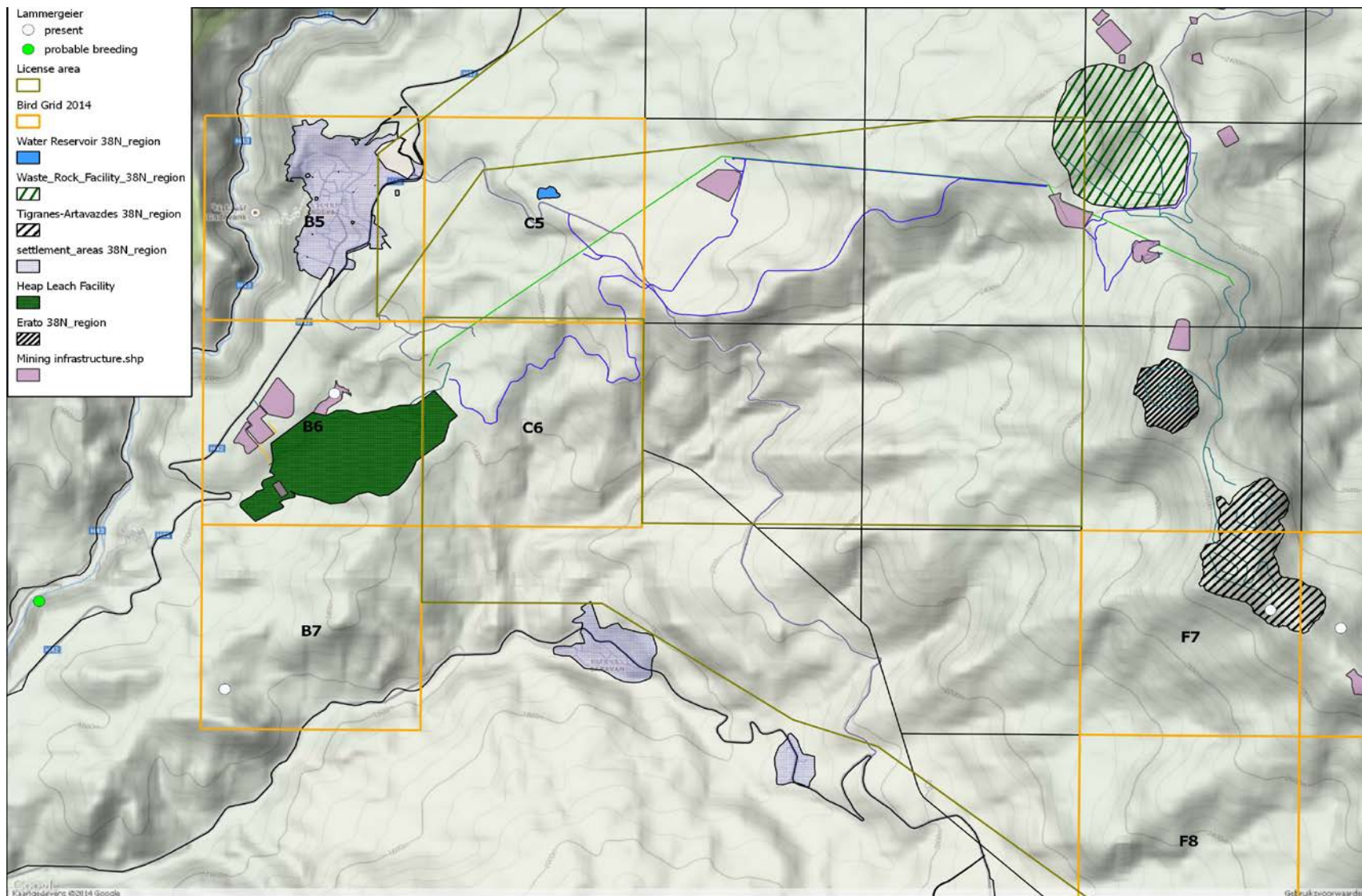


Figure 8.
Point
locations of
Lammergeiers
observed in
spring 2014,
with
indication of
breeding
activity

5.4 Griffon Vulture

Global status: least concern

Status in Armenia: vulnerable

Two birds were seen flying west over square G8 on 30 May. Single birds were also seen from the Egyptian vulture watchpoint occasionally. There was no indication of breeding anywhere near the survey area.

5.5 Short-toed Eagle

Global status: least concern

Status in Armenia: vulnerable

Short-toed Eagles were observed in squares C5, C6, B7, and G7. A pair was observed hunting over the green valley in the south-eastern corner of C6 and must have been breeding nearby. The arid, rocky area north and west of Saravan appears suitable breeding habitat, and there is no shortage of reptiles as a food source. One bird was seen perched on top of a bush in square D6, just outside of the spring 2014 survey squares.

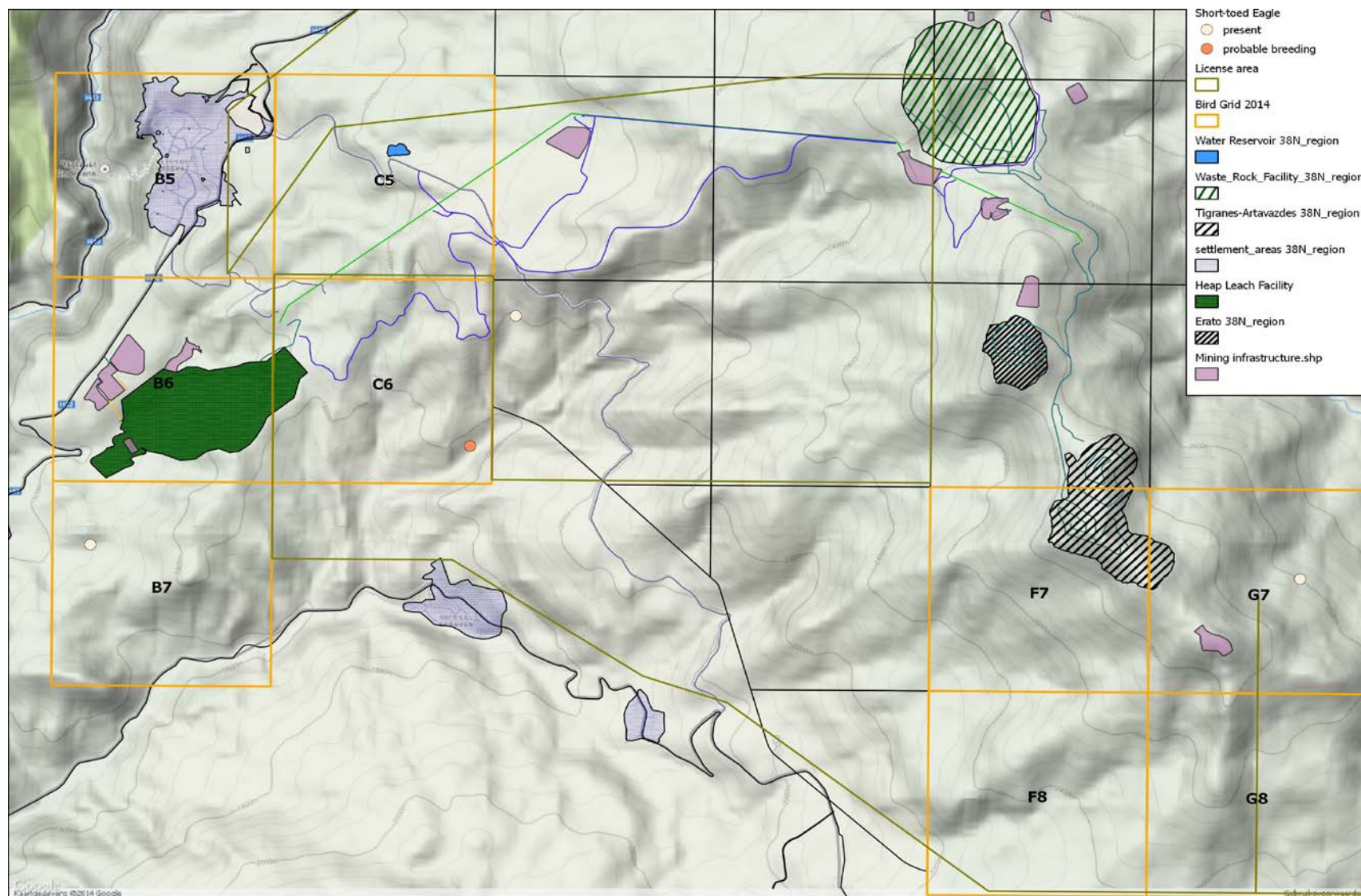


Figure 9.
Point
locations of
Short-toed
Eagles
observed in
spring 2014,
with
indication of
breeding
activity

5.6 Montagu's Harrier

Global status: least concern

Status in Armenia: vulnerable

[figure 15]

Only one bird was seen, an adult male hunting over the grassy slopes of Tigranes (square F7) on 7 June. The ground use and the late date suggest that this was a bird breeding somewhere in the vicinity, but the possibility of a late migrant cannot be excluded.

5.7 Northern Goshawk

Global status: least concern

Status in Armenia: vulnerable

[figure 15]

An adult bird was seen flying over the valley in the south-eastern part of C6 on 20/6. The area holds suitable habitat and the species is mainly a year-round resident in Armenia. It can be argued that this bird was therefore more likely a local breeder than a migrant.

5.8 Lesser Spotted Eagle

Global status: least concern

Status in Armenia: vulnerable

[figure 15]

This species seemed surprisingly scarce in spring 2014. There was a probable breeding pair in square B7, and one bird was seen hunting frogs in C5. The species was also seen above the Arpa gorge, south of the vulture watchpoint, but those were the only observations. In spring 2013, the species was found breeding in tetrad F7, but it appeared completely absent there now.

5.9 Golden Eagle

Global status: least concern

Status in Armenia: vulnerable

As in spring 2013, at least two pairs of Golden Eagles were breeding in Arpa gorge: a pair was present in square B5 just west of Gndevaz, and a displaying pair was observed just north of the vulture watchpoint. Single adult birds seen hunting in B6 and C5 probably belonged to either of these two pairs. An adult was also seen perched on a pylon between the H42 road and square B7.

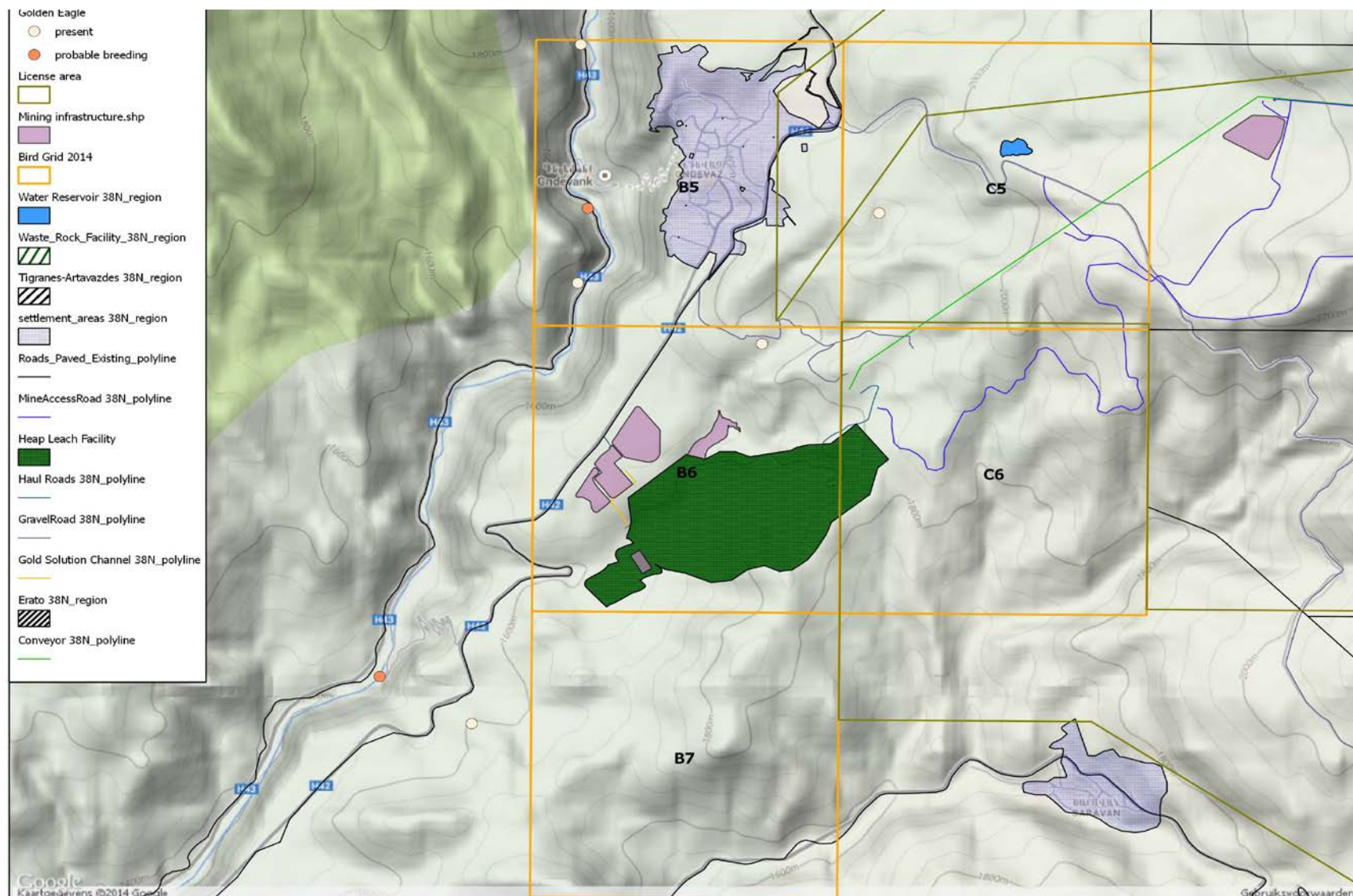


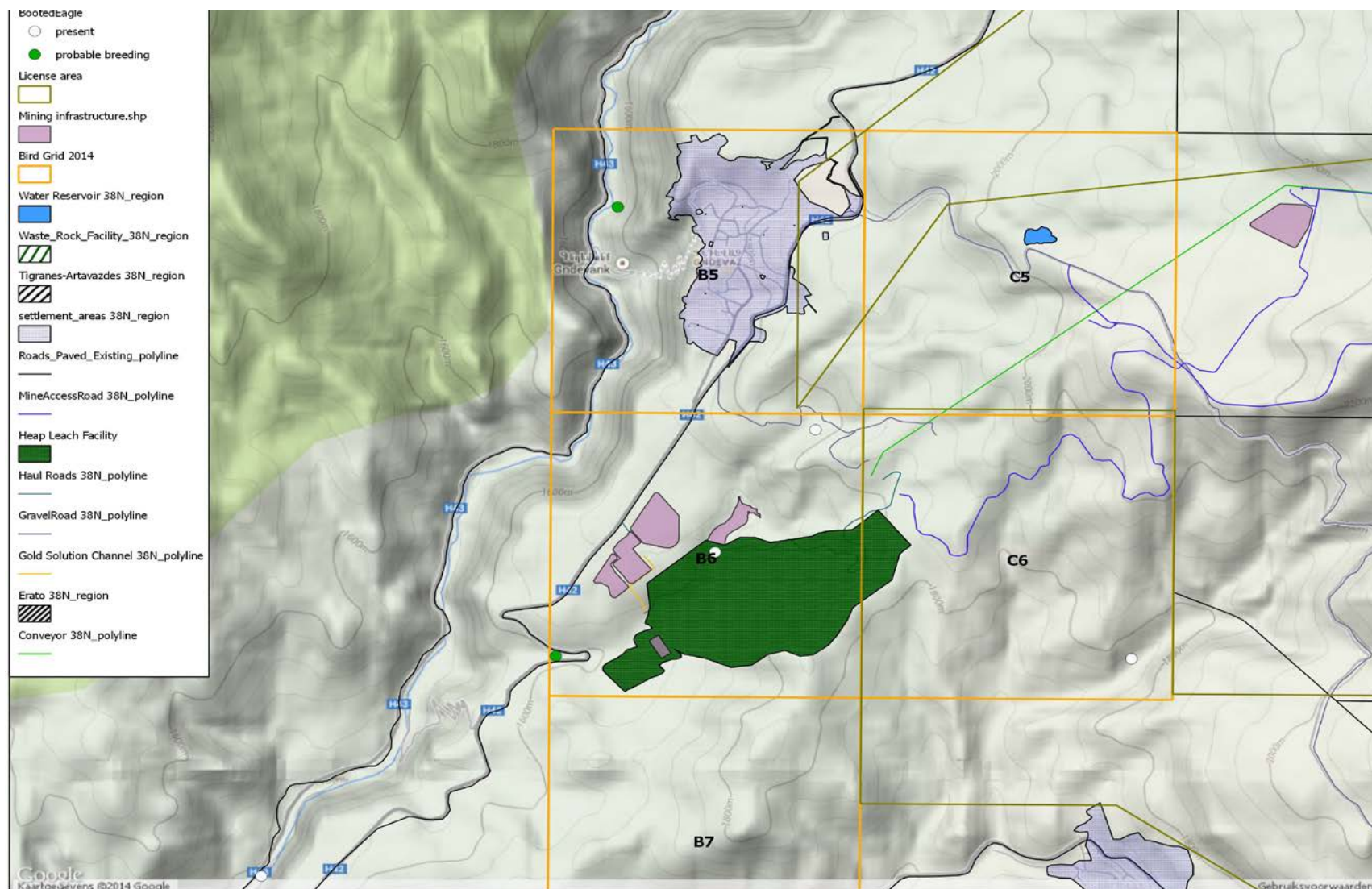
Figure 10.
Point
locations of
Golden
Eagles
observed in
spring 2014,
with
indication of
breeding
activity

5.10 Booted Eagle

Global status: least concern

Status in Armenia: vulnerable

Two pairs were probably breeding in Arpa gorge: one in B5 just west of Gndevaz, and one along the western edge of B6. Single birds were seen hunting in C6 as well as in B6, where one was seen flying around with a snake in its talons. Single birds were also observed around the vulture watchpoint (outside of the survey squares).



5.11 Lesser Kestrel

Global status: least concern

Status in Armenia: vulnerable

Though this species is not threatened worldwide, it is important on an Armenian level as the Gorayk region just south of the license area holds one of the only two known breeding sites in the country (the other being in Sisian). The Armenian breeding population is estimated at only 20 – 35 breeding pairs (Iñigo & Barov 2010). Moreover, the 2013 surveys indicated that parts of the survey area are important for feeding Lesser Kestrels.

As in spring 2013, a small colony of probably 8 pairs of Lesser Kestrels was located in a military tower just south of square F8. These birds were regularly seen flying into the square and coming back with food for their young (mainly voles). In addition, 8 birds were observed hunting on the grassy slopes of Tigranes (square G7) on 8 June, and a female was seen hunting over the grassy slopes on the eastern side of Arshak (G7 also) on 19 June. Clearly, this small colony uses the grassy slopes of Amulsar to hunt for voles for the young. This reemphasizes the importance of the set-aside area on the southern slopes of the Amulsar massif. In this survey, the craggy corrie in G7-G8 seemed particularly important, but also the grassy slopes around it.

No Lesser Kestrels were observed near square F4 (previous location of Barren Rock Storage Facility), unlike in spring 2013. The birds appear to use different grassy slopes on the Amulsar massif from year to year. In 2013, a lot of effort was made to try to establish a link between the birds feeding near F4 and the birds of the main colony, the TV tower east of Gorayk. A team of observers was posted in the Vorotan Valley to this purpose, but they failed to prove a clear link. It now seems that not enough attention was given to the other, smaller colony in the military tower between Gorayk and Saralanj. It is entirely possible that most of the birds feeding in or near square F4 in spring 2013 were from that small colony, and were also feeding on various grassy slopes on the Amulsar massif, between the colony and the previous location of the waste rock facility.

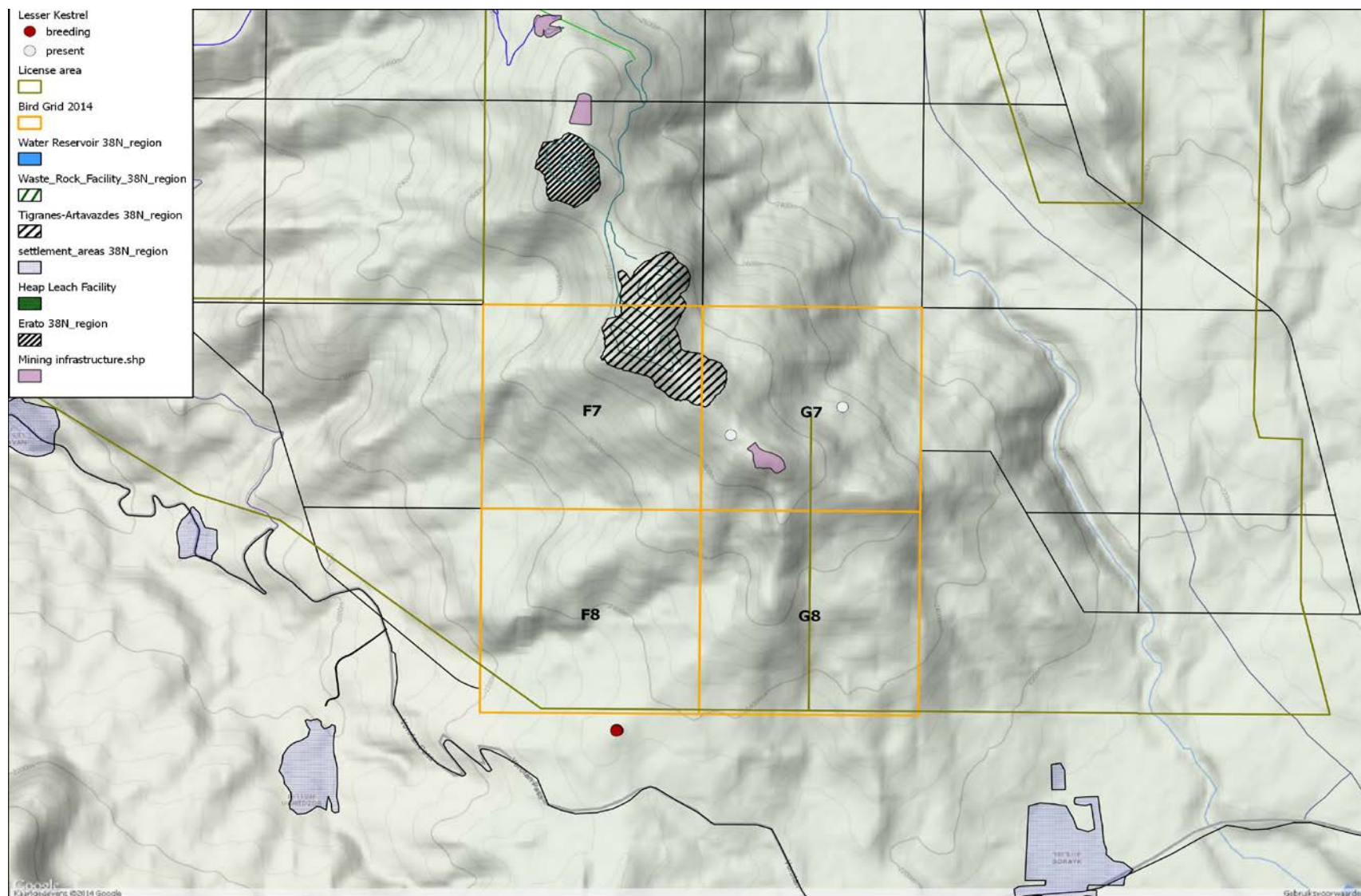


Figure 12.
Point
locations of
Lesser
Kestrels
observed in
spring 2014,
with
indication of
breeding
activity

5.12 Peregrine Falcon

Global status: least concern

Status in Armenia: vulnerable

[figure 15]

A pair of Peregrine Falcons was seen hunting in the southern part of B7 on 27 May. These birds were at 3 km from Arpa gorge, where a pair bred on cliffs south of the vulture watchpoint and produced two juveniles. Quite possibly the pair in B7 was the same as the one in the gorge; the feeding territory can extend for many miles. In spring 2013 there was no clear evidence of breeding anywhere near the survey area. The species is a rare breeding bird in Armenia (Adamian & Klem 1997).

5.13 Corncrake

Global status: least concern

Status in Armenia: vulnerable

[figure 15]

A night drive through the survey tetrads with the specific intent to locate this species (which is a nocturnal singer) produced no results, though it had to be cut short due to a thunderstorm. However, on 19 June, we located a male singing in broad daylight in the very north of the 2013 survey area. More precisely, it was in square E2, east of Kechut village. Given the late date, this was much more likely a breeding bird than a migrant.

The absence of the species in the 2014 survey tetrads does not come as a total surprise. In spring 2013, the species was not recorded in any of the 9 squares either – only in tetrads D6, E3, E8 and F3.

5.14 White-throated Robin

Global status: least concern

Status in Armenia: data deficient

This species was much more numerous than the previous year. While the spring 2013 atlas work only produced 3 breeding pairs in the whole survey area (35 tetrads), no less than 14 were found in spring 2014 - in only nine tetrads. Three more pairs were found just outside these tetrads: one in D5, one in D6 and one in C7.

As in spring 2013, the distribution was limited to the western part of the Amulsar region. Here, the species finds wooded valleys, rocky gorges and scattered Juniper trees that form the ideal breeding habitat. The number of breeding pairs by tetrad is shown in table 5.

Table 5. Number of breeding pairs of White-throated Robin by survey tetrad in spring 2014

SURVEY TETRAD	NUMBER OF BREEDING PAIRS
B5	2
B6	3
B7	1
C5	4
C6	4

In particular, the craggy gorge winding its way through squares B6, B5 and C5 seems important to this species. It held 4 breeding pairs in 2014 and one in 2013.

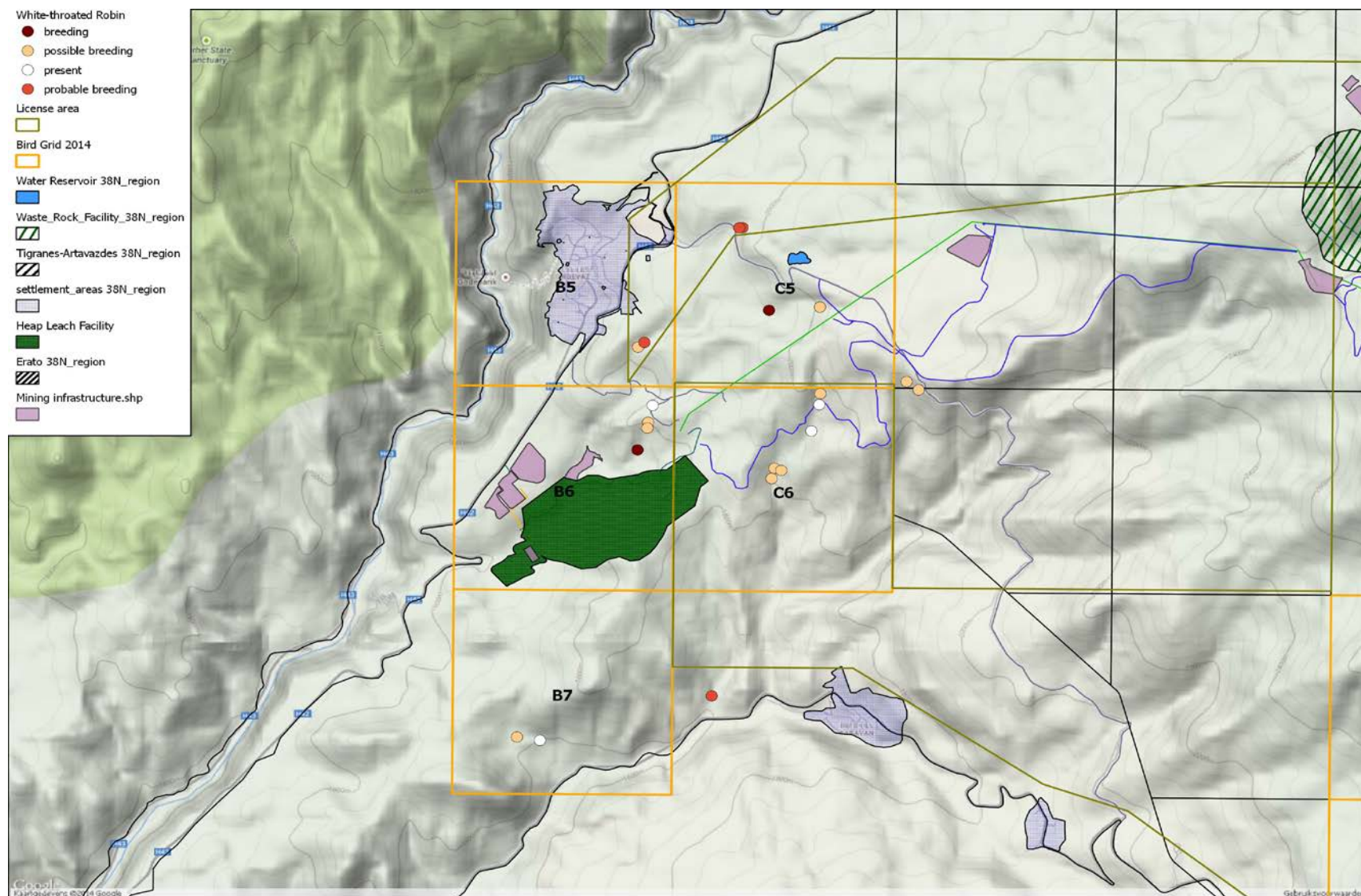


Figure 13.
Point
locations of
White-
throated
Robins
observed in
spring 2014,
with
indication of
breeding
activity

5.15 Eastern Rock Nuthatch

Global status: least concern

Status in Armenia: vulnerable

This species was found breeding in three survey tetrads: a singing pair was present on the upper slopes of Arpa gorge just outside the village of Gndevaz (B5), a pair was found at the entrance of the craggy gorge in B6 (where it was also present in 2013), and a singing bird was near the main road in the south-eastern corner of B7. Furthermore, an occupied nest was found along the main road just west of Saravan (square C7) and a family party was present in Arpa gorge just northwest of the vulture watchpoint.

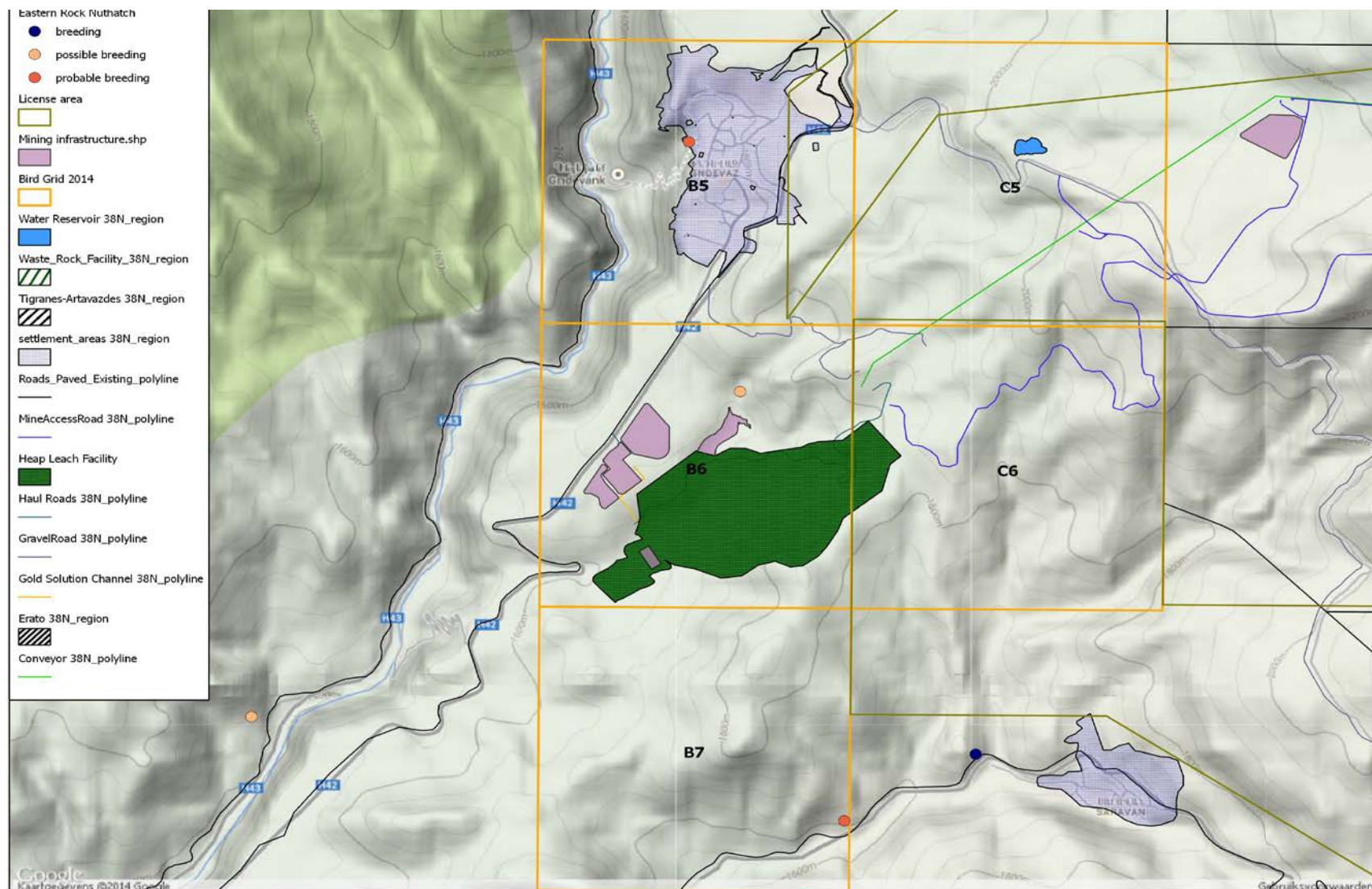


Figure 14.
Point
locations of
Eastern
Rock
Nuthatches
observed in
spring 2014,
with
indication of
breeding
activity

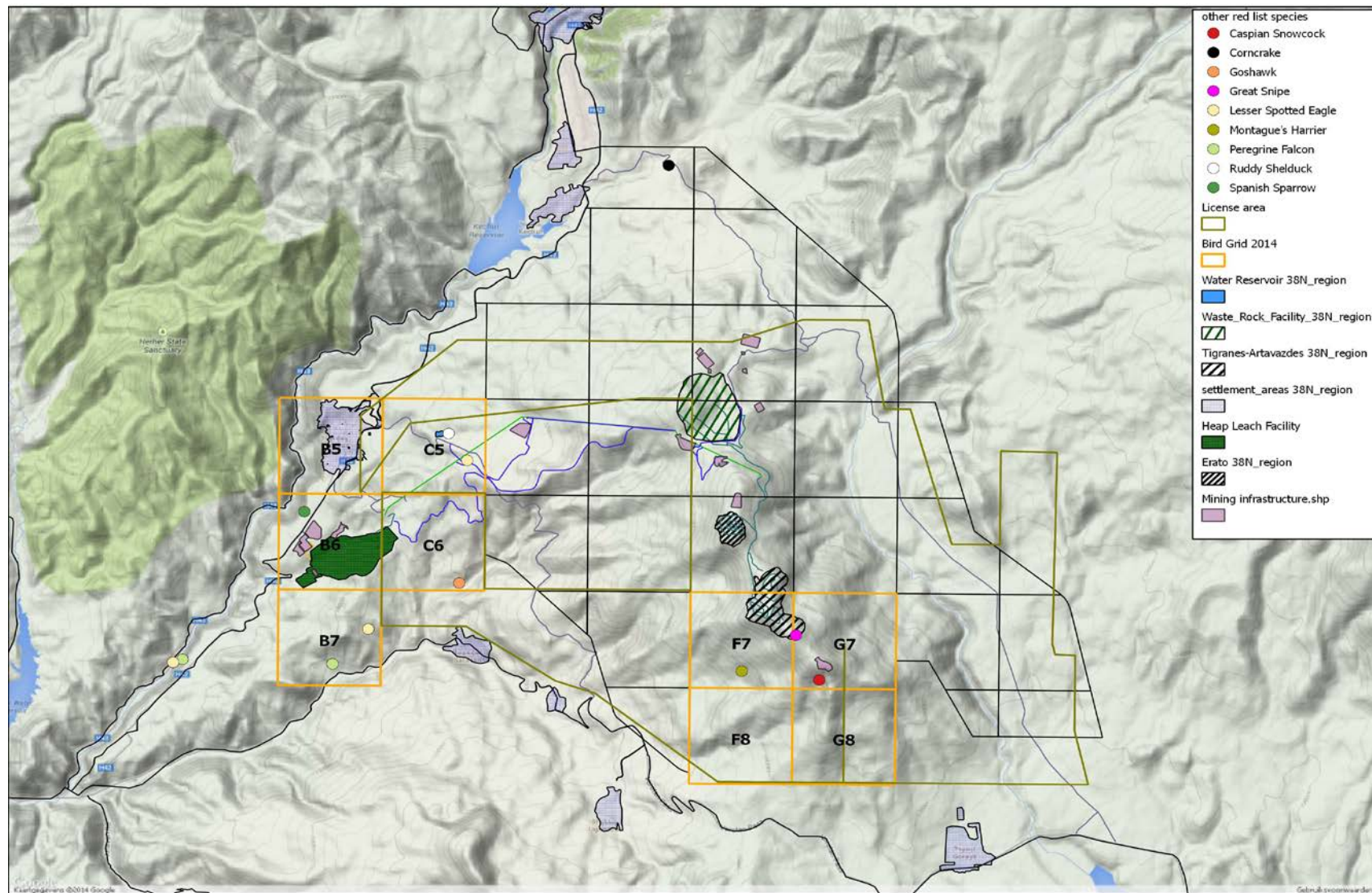
5.16 Spanish Sparrow

Global status: least concern

Status in Armenia: vulnerable

[figure 15]

A female was seen (and videoed) just west of the H42 road in B6 on 1 June. It was also heard calling. There was no evidence of breeding.



6 Conclusions and recommendations

6.1 *Breeding birds*

In spring 2014, a number of species that are not globally threatened but that are red-listed as 'vulnerable' in Armenia were found breeding or feeding within the area that will likely be affected by mining activities. These species and their respective numbers of breeding pairs within the 9 tetrads surveyed are listed in chapter 5 above.

For most of these species, it can be argued that a local decline will probably not significantly affect the whole Armenian population. The spring 2014 survey produced two new insights though:

- Lesser Kestrels from the small colony between Gorayk and Saranlanj appear to depend on the high, grassy slopes of the Amulsar massif for food. They are likely to benefit from the set-aside, which has already been established. It is recommended to ensure that the set aside also includes grassy slopes surrounding the rock crags (see figure 16).
- The craggy gorge just south and east of Gndevaz village appears to be important to a number of RA Red List bird species. This importance needs to be stressed, since mining infrastructure such as the Heap Leach pad and conveyor belt are planned very close to this site. We recommend working around this gorge and leaving it untouched (figure 16). The situation seems particularly delicate at the eastern end of this gorge: both the conveyor belt and a mine access road are planned to cross the gorge (see figure 17). Especially for the latter there seems to be a good alternative, since a gravel road already exists just 200 m further east, outside of the gorge. Why not convert this to the mine access road? As for the conveyor belt, we also recommend avoiding the gorge. It would be sufficient to move the belt 200 m south.

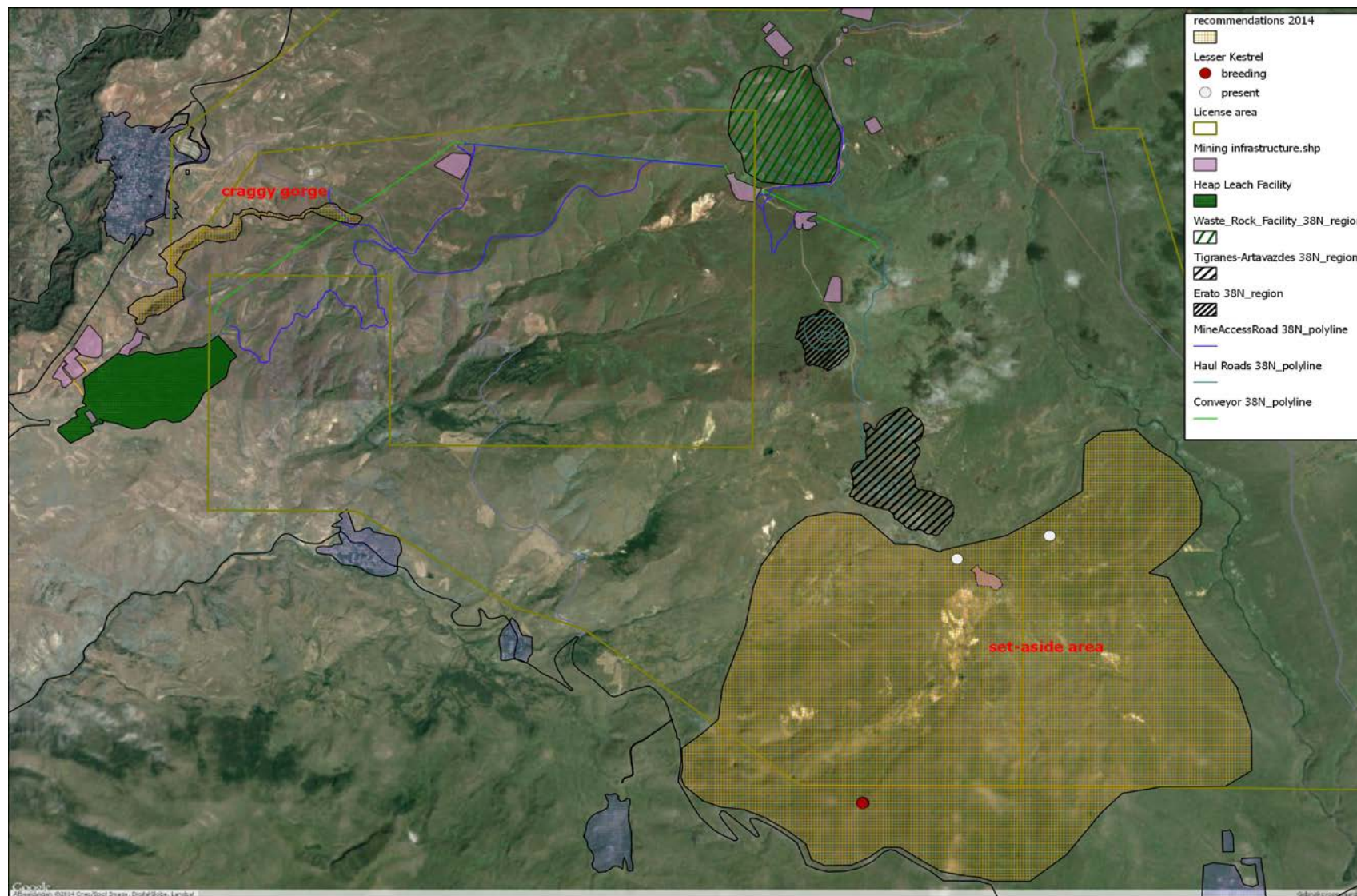


Figure 16.
Recommendations
for set-aside
areas, based on
the spring 2014
bird survey
results

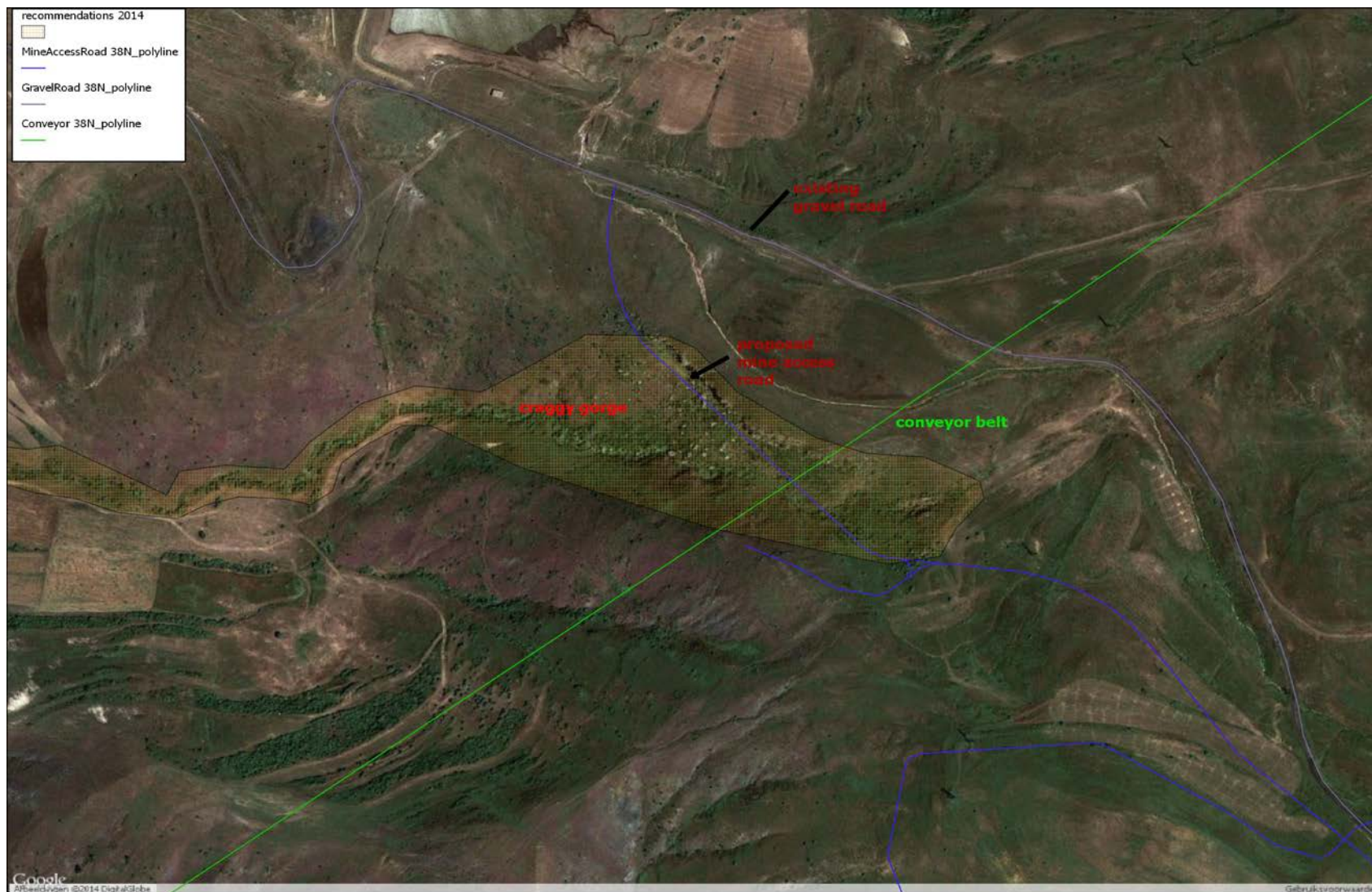


Figure 17. Detail of recommendations 2014 (eastern end of craggy gorge, east of Gndevaz).

Note that if the proposed mine access road is moved to the already existing gravel road and if the planned conveyor belt is moved 200 m south, the craggy gorge can be set aside for Red List birds.

6.2 Egyptian Vulture

The autumn 2013 report stated: *“one important consideration for Egyptian Vulture is the potential new location of the Heap Leach facility (site 28) close to the nest site in Arpa gorge. The effects of development, disturbance and habitat loss in this area need to be considered in relation to the viability of the nest. Given that the local population in the Jermuk region has declined from 2-3 pairs in 1995² to just one in 2013, any damage to the viability of this nest would pose a serious threat to the local survival of the species. The possibility of an impact on the local Egyptian Vultures cannot be excluded at this stage due to the possibility of disturbance and loss of feeding area associated with the new proposed Heap Leach Facility location”*.

Specific monitoring of the Egyptian Vultures in spring 2014 seems to indicate, however, that the proposed Heap Leach area does not form a crucial part of the feeding territory. The birds only spent 10% of their time here, and during our observation time they were not successful in finding food in this area. Instead, they preferred to look for food in Arpa gorge and, to a lesser extent, in Herher State Sanctuary. It is therefore unlikely that the proposed new location of the Heap Leach facility will have any significant impact on the continued survival of the local Egyptian Vultures. No specific mitigation measures are considered necessary for maintaining adequate foraging habitat for the current population of the species.

² <http://www.birdlife.org/datazone/sitefactsheet.php?id=19757>

7 References

- Adamian M. S. & Klem D. Jr. (1997). A field guide to Birds of Armenia. American University of Armenia, Yerevan.
- Aghasyan A. L. & Kalashyan M. Ju. (2010). Red Data Book of Armenia. Invertebrate and Vertebrate animals. Ministry of Nature Protection, Yerevan.
- Iñigo, A., B. Barov (2010). Action plan for the lesser kestrel *Falco naumanni* in the European Union, 55 p. SEO|BirdLife and BirdLife International for the European Commission.

8 Annexes

Egyptian Vulture activity log – spring 2014

DATE	START TIME	END TIME	ACTIVITY
24/5	14:00	14:00	ad male S in gorge
31/5	11:25	11:44	ad male soaring over nesting area
			ad male soaring over B6
			ad male soaring over B5
			ad male NNE
31/5	14:23	14:39	ad male arriving from N and soaring over nesting area
			ad male perches on cliffs on western slope of Arpa gorge
31/5	14:40	14:47	ad male visits cliffs near nest, then perches on western slope of Arpa gorge again
31/5	14:48	14:56	perches on plowed field just east of nest site
31/5	14:57	15:21	perches again on western slope Arpa gorge
31/5	15:22	15:23	visits nest
31/5	15:24	15:31	flies off high to E, then NE (over lower Amulsar)
3/6	14:25	14:40	ad male flies S low over Arpa gorge
			soars towards E, high over southern edge B7
			flies off high to S, then E
3/6	15:21	15:36	ad male flies along nest cliffs
			ad male flies off high to N
3/6	16:23	16:46	ad male flies along nest cliffs with Weasel in beak
3/6	16:47	16:48	ad male visits nest and drops off Weasel
3/6	16:48	17:17	ad male soars over gorge, first S, then high off to NE
3/6	18:00	18:35	ad male lands on western slope of gorge, eating a big vole
4/6	15:42	15:55	ad male flies in and above Arpa gorge, then S
			ad male changes direction over southern end of gorge, flying E to SE
5/6	11:05	11:06	ad male flies S from Kechut reservoir low in gorge
5/6	13:25	13:48	ad male circles over nest site, then perches on pylon on western slope of Arpa gorge
5/6	13:49	13:50	ad male visits nest
5/6	13:51	14:12	flies E and soars above B6 for 2 minutes
			soars low above B5 for 5 min
			soars above chicken farm (B5) for 14 min
5/6	14:12	14:18	flies off high to NW
5/6	16:05	16:09	soars above nest site, then lands on main road and picks up dead mouse
5/6	16:10	16:11	visits nest and drops off dead mouse
5/6	16:11	16:28	soars high up over gorge, then flies off N and then NW
11/6	15:42	15:56	ad male soars above nest cliffs, then lands on second pylon east from nest
11/6	15:57	15:57	briefly visits nest
11/6	15:57	16:09	starts soaring, then flies off NW
11/6	17:08	17:23	flies low in gorge along nest cliffs
11/6	17:24	17:26	soars low above B7

DATE	START TIME	END TIME	ACTIVITY
11/6	17:26	17:43	flies off S above main road
13/6	11:52	11:59	ad male is perched on 2nd pylon east of nest
13/6	12:00	12:07	lands on field, at foot of pylon closest to the nest
13/6	12:08	12:50	soars in and above gorge, and also perches on western slope
13/6	12:51	12:51	male visits nest, then both male and female fly out
13/6	12:51	13:08	both male and female soar in gorge, land on nest cliffs, fly around again, then land on western slope. A mating attempt is observed.
13/6	13:09	13:09	male briefly visits the nest
13/6	13:09	13:27	both male and female fly around in gorge, sometimes perching
13/6	13:28	14:04	male visits the nest and stays there for half an hour. Then flies out, soars very low in gorge and disappears over hill with pylons on western slope.
13/6	13:28	13:32	female lands near the nest, then flies off SE over main road, disappearing behind hill just east of watchpoint
13/6	14:21	?	male visits nest again (and probably stays there)
13/6	15:04	15:13	female visits nest with food in her talons, then flies off S quite low along main road
13/6	16:55	16:55	female visits nest again, with a vole in her beak
13/6	16:55	17:05	female flies off NNE over B6, then hunting low over slopes just north of cow farm in B5
14/6	11:37	11:40	female flies low in gorge and lands on western slope
14/6	11:41	?	female flies into nest and stays there
14/6	11:41	11:51	male flies out of nest, lands on western slope, then starts soaring and glides off west, disappearing over ridge of western slope
15/6	18:05	18:06	both male and female arrive in gorge, coming from west
15/6	18:06	18:06	female visits nest, with vole in her beak
15/6	18:07	18:08	both male and female soar in gorge, disappearing behind corner of cliffs just N of nest site
15/6	18:14	18:17	both birds soar low over fields just east of nest cliffs, then land on northern edge of fields
16/6	11:54	11:55	male arrives in gorge with vole in his beak
16/6	11:56	12:06	male delivers vole to the nest, then flies west, disappearing over ridge south of pylons on western slope
16/6	12:03	12:03	female flies into gorge and lands north of nest site (out of sight)
16/6	14:58	15:06	male soars over main road near watchpoint, then flies NE
16/6	15:07	15:09	male lands in B7, just north of line of pylons
16/6	15:10	15:45	male flies low over B6 westwards and into gorge, where it starts soaring and occasionally perches on western slope
16/6	15:18	15:45	female flies out of nest and starts soaring together with male
16/6	15:46	15:53	both birds land in the middle of B6
16/6	15:53	15:55	both fly into gorge towards nest site
16/6	15:56	?	male enters nest (without food) and stays there
16/6	15:56	16:06	female keeps soaring over western slope of gorge, then follows the gorge all the way south, disappearing over southern edge
17/6			(no sightings)
18/6			(no sightings)
20/6	13:50	14:33	Female flies into gorge and starts soaring, sometimes perching on western slope. Also flies over fields east and south of watchpoint.
20/6	14:34	14:37	Female flies low down into B6 (just along the southern edge of the square).
20/6	14:38	15:00	Female appears along nest cliffs again, soars over western slope of gorge (together with male) and then flies off south in gorge.
20/6	14:58	15:02	Male soars over western slope of gorge (together with female), then disappears over southern edge of gorge.

Mount Amulsar Ornithological Survey Spring 2013

Final Report



Lesser Spotted Eagle

For:
Treview Environmental Consultants
Chancery Cottage
Kentisbeare
Cullompton
Devon
EX15 2DS



1 BACKGROUND

Xenus Ecology was commissioned by Treweek Environmental Consultants on behalf of Lydian International Ltd. to carry out ornithological surveys on and in the vicinity of Mount Amulsar in Armenia in light of proposals to develop a gold mine. The surveys were to provide additional baseline data for use in an updated version of the Environmental and Social Impact Assessment. Field surveys were undertaken during the spring migration period of 2013 to establish the numbers of raptors passing through the concession area and the amount of time they spent feeding, roosting or otherwise using the proposed mine site and its immediate vicinity, with special consideration given to Egyptian Vulture (full scientific names are provided in Table 1).

A survey team was recruited from ornithologists specialising in raptor migration counts from across Europe, thus: Phillip Edwards, Mike Duckham, Zoe Smith (UK); Ramaz Gokhelasvili (Georgia); Nicolas Vandestrade, Peter Adriaens (Belgium); Gael Foilleret, Simon Cavailles (France); Marta Perlis Cabré (Spain); and Mårten Wikström and Raul Vincente (Sweden).

2 METHODOLOGY

2.1 Raptor Migration Counts

Migrant raptors were counted from two watch points located either side of the main Amulsar massif on hills with panoramic views. Counts were made by teams of 2-4 persons between 08.00 and 17.00 or as weather permitted over the period 15th April to 29th May 2013 inclusive (466 hours in total). Although the migration was underway at the time the counts commenced, and the main period of migration for some species e.g. Eurasian Sparrowhawk^{1,2} was considered to have passed, it was considered that, since snow was still covering most of the area, such migrants could not be making use of the ground and the gold mining operations proposed would not have any impact on birds migrating at altitude. Initial surveys prior to 15th April showed that almost no birds passed the watch points prior to 08.00. Double counting was effectively negligible since birds were migrating south to north on either side of a massif with a broadly south to north alignment; birds were effectively visible throughout to only one watch point and no birds were observed crossing the mountain between the two watch points.

Weather placed considerable constraints on the survey. During 17th-23rd April heavy snow and/or low cloud meant that access to both watch points was curtailed. To overcome this, and to continue to provide some indication of the numbers of birds passing through, the team used the ski-lift on the outskirts of Jermuk to access a different point from which to survey. The ski lift was located fairly close to where the two local migration routes came back into proximity having been separated by Mount Amulsar which meant that most birds flying by could be recorded, but it was too distant from the mountain to record ground use there by any birds. On 18th and 21st April, the cloud base was low enough to obscure the top of the ski-lift hence counts were made from the main river bridge in the town. In late May, prolonged heavy rain restricted fieldwork (and migration), particularly in the afternoons.

2.2 Use of Area by Migrants and Local Birds

Migrant and local birds could be distinguished by their behaviour and through repeated sightings of individuals, as determined by plumage characteristics, moult patterns and feather damage. The survey area proved too large and too undulating to observe birds that were physically on the ground feeding, resting or roosting. Therefore, all migrant birds that were recorded under a height of 200 feet (67 metres) above the surface were counted as “using” the area since they may have been hunting, or just taken off or be about to land. For each watch point, the land in view was divided into “visual areas” based on landscape features such as ridge tops, rivers, roads, or man-made structures. Birds were recorded as using each and every such area that they passed through such that a single

¹ Species nomenclature follows BirdLife International.

² Scientific names are listed in Tables

individual bird could be recorded in multiple areas while passing through the vicinity of the mountain. The time of day such birds passed through was not recorded since this made data collection and analysis too complex. Local birds were similarly recorded using the same visual areas, but in their case there was no height restriction since they were often displaying, contesting territories, or searching for prey or carrion from greater heights than migrants.

Data recorded from these “visual areas” were analysed as “bird-days”, that is the total number of birds using a given area over a number of days, e.g. two birds using one area on one day equals two “bird-days”, while one bird recorded from the same area on two different days also equals two “bird-days”. This is necessary since one bird could be recorded from more than one area in a single day. The term “bird-day” should not be taken to imply any measure of time spent in a given area – a bird taking less than a minute to fly through an area produces a record of one “bird-day” the same as does a single bird spending several hours circling over it.

In addition to observing migrants and local birds from fixed watch points, a two-man team criss-crossed the area throughout the same period looking for raptors on the ground or for signs thereof, e.g. prey/carrion, nests. Additional direct ground sightings were made from the watch points.

2.3 Atlas survey

Searches were also made across the area for raptors physically on the ground or hunting very close to it. Species are involved, of which Lesser Spotted Eagle was most recorded.

While looking for ground-using raptors, the two-man survey team also recorded all other bird species seen and their activity. These were recorded on a tetrad basis, i.e. a 2km by 2km square based on the map grid. Almost all squares or parts of squares within the survey area boundary were visited at least twice with some being visited up to six times. Only squares F8 and G8 were visited just once; this because the initial visits were delayed by restricted access from snow, and the second visit planned for late May could not be made because of prolonged heavy rain.

Species' breeding status was determined by a simplified and slightly modified version of the British Trust for Ornithology's Bird Atlas 2007-2011³ - see Table 1.

Table 1 Survey Criteria Used for Determining Breeding Status

Present
Species flying over
Species observed but suspected to be still on migration
Species observed but suspected to be summering non-breeder
Possibly breeding
Species observed in breeding season in suitable nesting habitat
Singing male present in suitable breeding habitat
Probably breeding
Pair observed in suitable nesting habitat in breeding season
Courtship and display in or near potential breeding habitat
Definite breeding
Nest building
Adults entering or leaving nest-site in circumstances indicating occupied Nest
Nest containing eggs or young

³ <http://www.bto.org/volunteer-surveys/birdatlas/taking-part/breeding-evidence>

2.4 Lesser Kestrel Studies

Although the global status of Lesser Kestrel has improved so that it is now categorised by BirdLife International/IUCN as of Least Concern, it remains listed in the Armenian Red Data Book as Vulnerable since only one colony is known to be present in the country, that at the old telecommunications tower just east of Gorayk. As a result, the species was studied to determine what use was made of the lower Vorotan valley as a feeding area.



Lesser Kestrel

Three survey points were established close to the colony and along the lower Vorotan valley and the surrounding area again divided into “visual areas” based on landscape features. These areas were watched for five minute periods every fifteen minutes and the maximum number of Lesser Kestrels hunting in each during that time was recorded. Surveys were made between 07.30 and 16.00 or as weather permitted, one day at each survey point per week for a period of four weeks during the period 3rd to 26th May inclusive. In addition, a team made random surveys along the whole of the valley and around the colony itself to determine the main direction birds were heading and to try to establish or refute a link between the colony and birds seen feeding around watch point A during the main migration survey.

3 RESULTS

A total of 137 bird species were recorded within the survey boundary during the various surveys. These are listed in Table 2 according to their breeding status and with the global and national threatened status of each provided.

3.1 Raptor Migration Counts

A total of 4,536 raptors made up of 28 species was counted over the period 15th April to 29th May 2013 inclusive. This is a relatively small number– the autumn counts for Batumi on the Black Sea coast of Georgia just to the north (and the nearest location from where reliable quantitative data are available) shows that, in 2012, over one million birds passed there in a similar length period. Allowing for the fact that counts in autumn can be at least double spring counts (because a given year’s young birds will also be involved), spring migration may be in the region of 400,000-500,000 birds at Batumi. The count made at Mt. Amulsar in 2013 amounts to about 1% of this total.



A breakdown of the species comprising the total count is given in Table 3 and Table 4 in both alphabetic and numerical order, together with the percentage contribution made by each species to of the total recorded. Not all birds could be identified to species so identification of these was made to genus (e.g. *Buteo* (buzzards)) or to a species pair (e.g. Montagu’s and Pallid Harrier or Common and Lesser Kestrel). Two species, Common Buzzard⁴ and European Honey-buzzard, comprised 63.8% of all the migrants recorded, while another two, Montagu’s and Pallid Harrier, accounted for a further 9.15% between them.

⁴ All Common Buzzards were identified as the distinctive sub-species Steppe Buzzard *Buteo buteo vulpinus*.

Table 2 Species recorded within survey area during Spring 2013 with global and national rarity status

Present in survey area with evidence of breeding											
Species		IUCN	ARDB	Species		IUCN	ARDB	Species		IUCN	ARDB
Alpine Accentor	<i>Prunella collaris</i>	Lc		Common Whitethroat	<i>Sylvia communis</i>	Lc		Northern House Martin	<i>Delichon urbicum</i>	Lc	
Asian Crimson-winged Finch	<i>Rhodopechys sanguineus</i>	Lc		Common Wood-pigeon	<i>Columba palumbus</i>	Lc		Northern Wheatear	<i>Oenanthe oenanthe</i>	Lc	
Barred Warbler	<i>Sylvia nisoria</i>	Lc		Corn Bunting	<i>Emberiza calandra</i>	Lc		Orphean Warbler	<i>Sylvia hortensis</i>	Lc	
Black Redstart	<i>Phoenicurus ochruros</i>	Lc		Corncrake	<i>Crex crex</i>	Lc	VU	Ortolan Bunting	<i>Emberiza hortulana</i>	Lc	
Black-billed Magpie	<i>Pica pica</i>	Lc		Eurasian Blackbird	<i>Turdus merula</i>	Lc		Radde's Accentor	<i>Prunella ocularis</i>	Lc	
Black-headed Bunting	<i>Emberiza melanocephala</i>	Lc		Eurasian Crag Martin	<i>Ptyonoprogne rupestris</i>	Lc		Red-backed Shrike	<i>Lanius collurio</i>	Lc	
Blue Tit	<i>Parus caeruleus</i>	Lc		Eurasian Golden Oriole	<i>Oriolus oriolus</i>	Lc		Red-billed Chough	<i>Pyrrhocorax pyrrhocorax</i>	Lc	
Bluethroat	<i>Luscinia svecica</i>	Lc		Eurasian Hoopoe	<i>Upupa epops</i>	Lc		Ring Ouzel	<i>Turdus torquatus</i>	Lc	
Bonelli's Warbler	<i>Phylloscopus bonelli</i>	Lc		Eurasian Jackdaw	<i>Corvus monedula</i>	Lc		Rock Bunting	<i>Emberiza cia</i>	Lc	
Cetti's Warbler	<i>Cettia cetti</i>	Lc		Eurasian Linnet	<i>Acanthis cannabina</i>	Lc		Rock Sparrow	<i>Petronia petronia</i>	Lc	
Chaffinch	<i>Fringilla coelebs</i>	Lc		Eurasian Skylark	<i>Alauda arvensis</i>	Lc		Ruddy Shelduck	<i>Tadorna ferruginea</i>	Lc	VU
Chukar	<i>Alectoris chukar</i>	Lc		European Honey Buzzard	<i>Pernis apivorus</i>	Lc		Saker Falcon	<i>Falco cherrug</i>	EN	EN
Common Buzzard	<i>Buteo buteo</i>	Lc		Fire-fronted Serin	<i>Serinus pusillus</i>	Lc		Sedge Warbler	<i>Acrocephalus schoenobaenus</i>	Lc	
Common Chiffchaff	<i>Phylloscopus collybita</i>	Lc		Great Tit	<i>Parus major</i>	Lc		Tawny Pipit	<i>Anthus campestris</i>	Lc	
Common Cuckoo	<i>Cuculus canorus</i>	Lc		Green Warbler	<i>Phylloscopus nitidus</i>	Lc		Tree Pipit	<i>Anthus trivialis</i>	Lc	
Common Kestrel	<i>Falco tinnunculus</i>	Lc		Grey Partridge	<i>Perdix perdix</i>	Lc		Twite	<i>Carduelis flavirostris</i>	Lc	
Common Quail	<i>Coturnix coturnix</i>	Lc		Grey Wagtail	<i>Motacilla cinerea</i>	Lc		Water Pipit	<i>Anthus spinoletta</i>	Lc	
Common Raven	<i>Corvus corax</i>	Lc		Hooded Crow	<i>Corvus cornix</i>	Lc		Western Rock Nuthatch	<i>Sitta neumayer</i>	Lc	
Common Redshank	<i>Tringa totanus</i>	Lc		Horned Lark	<i>Eremophila alpestris</i>	Lc		Whinchat	<i>Saxicola rubetra</i>	Lc	
Common Redstart	<i>Phoenicurus phoenicurus</i>	Lc		Lesser Grey Shrike	<i>Lanius minor</i>	Lc		White Wagtail	<i>Motacilla alba</i>	Lc	
Common Rock Thrush	<i>Monticola saxatilis</i>	Lc		Lesser Spotted Eagle	<i>Aquila pomarina</i>	Lc	VU	White-throated Dipper	<i>Cinclus cinclus</i>	Lc	
Common Rosefinch	<i>Carpodacus erythrinus</i>	Lc		Lesser Whitethroat	<i>Sylvia curruca</i>	Lc		White-throated Robin	<i>Irania gutturalis</i>	Lc	DD
Common Sandpiper	<i>Actitis hypoleucos</i>	Lc		Long-legged Buzzard	<i>Buteo rufinus</i>	Lc		White-winged Snowfinch	<i>Montifringilla nivalis</i>	Lc	
Common Starling	<i>Sturnus vulgaris</i>	Lc		Mallard	<i>Anas platyrhynchos</i>	Lc		Willow Warbler	<i>Phylloscopus trochilus</i>	Lc	
Common Stonechat	<i>Saxicola torquatus</i>	Lc		Marsh Warbler	<i>Acrocephalus palustris</i>	Lc		Winter Wren	<i>Troglodytes troglodytes</i>	Lc	
Common Swift	<i>Apus apus</i>	Lc		Mistle Thrush	<i>Turdus viscivorus</i>	Lc		Woodlark	<i>Lullula arborea</i>	Lc	
Common Teal	<i>Anas crecca</i>	Lc		Mountain Chiffchaff	<i>Phylloscopus sindianus</i>	Lc		Yellow Wagtail	<i>Motacilla flava</i>	Lc	

Breeding close-by, using survey area											
Species		IUCN	ARDB	Species		IUCN	ARDB	Species		IUCN	ARDB
Booted Eagle	<i>Hieraaetus pennatus</i>	Lc	VU	Eurasian Griffon Vulture	<i>Gyps fulvus</i>	Lc	VU	Lesser Kestrel	<i>Falco naumanni</i>	Lc	VU
Cinereous Vulture	<i>Aegypius monachus</i>	NT	EN	Golden Eagle	<i>Aquila chrysaetos</i>	Lc	VU	Northern Goshawk	<i>Accipiter gentilis</i>	Lc	VU
Egyptian Vulture	<i>Neophron percnopterus</i>	EN	EN	Lammergeier	<i>Gypaetus barbatus</i>	Lc	VU	Short-toed Snake Eagle	<i>Circaetus gallicus</i>	Lc	VU
Present in survey area without evidence of breeding											
Species		IUCN	ARDB	Species		IUCN	ARDB	Species		IUCN	ARDB
Alpine Swift	<i>Tachymarptis melba</i>	Lc		European Goldfinch	<i>Carduelis carduelis</i>	Lc		Purple Heron	<i>Ardea purpurea</i>	Lc	
Barn Swallow	<i>Hirundo rustica</i>	Lc		European Roller	<i>Coracias garrulus</i>	NT	VU	Red Kite	<i>Milvus milvus</i>	NT	EN
Black Kite	<i>Milvus migrans</i>	Lc		European Turtle Dove	<i>Streptopelia turtur</i>	Lc		Red-footed Falcon	<i>Falco vespertinus</i>	NT	VU
Black Stork	<i>Ciconia nigra</i>	Lc	VU	Garden Warbler	<i>Sylvia borin</i>	Lc		Red-throated Pipit	<i>Anthus cervinus</i>	Lc	
Black-winged Pratincole	<i>Glareola nordmanni</i>	NT	VU	Great Snipe	<i>Gallinago media</i>	NT	VU	Rock Dove	<i>Columba livia</i>	Lc	
Black-winged Stilt	<i>Himantopus himantopus</i>	Lc	VU	Great Spotted Woodpecker	<i>Dendrocopos major</i>	Lc		Rose-coloured Starling	<i>Sturnus roseus</i>	Lc	
Blue-cheeked Bee-eater	<i>Merops persicus</i>	Lc	VU	Greater Short-toed Lark	<i>Calandrella brachydactyla</i>	Lc		Sand Martin	<i>Riparia riparia</i>	Lc	
Caspian Snowcock	<i>Tetraogallus caspius</i>	Lc		Green Sandpiper	<i>Tringa ochropus</i>	Lc		Spotted Flycatcher	<i>Muscicapa striata</i>	Lc	
Eastern Olivaceous Warbler	<i>Hippolais pallida</i>	Lc		Eastern Imperial Eagle	<i>Aquila heliaca</i>	VU	VU	Steppe Eagle	<i>Aquila nipalensis</i>	Lc	VU
Eurasian Hobby	<i>Falco subbuteo</i>	Lc		Levant Sparrowhawk	<i>Accipiter brevipes</i>	Lc	VU	Thrush Nightingale	<i>Luscinia luscinia</i>	Lc	
Eurasian Jay	<i>Garrulus glandarius</i>	Lc		Menetries Warbler	<i>Sylvia mystacea</i>	Lc		Western Marsh Harrier	<i>Circus aeruginosus</i>	Lc	
Eurasian Reed Warbler	<i>Acrocephalus scirpaceus</i>	Lc		Merlin	<i>Falco columbarius</i>	Lc	DD	White Stork	<i>Ciconia ciconia</i>	Lc	
Eurasian Siskin	<i>Carduelis spinus</i>	Lc		Montagu's Harrier	<i>Circus pygargus</i>	Lc	VU	White-winged Tern	<i>Chlidonias leucopterus</i>	Lc	
Eurasian Sparrowhawk	<i>Accipiter nisus</i>	Lc		Oriental Honey Buzzard	<i>Pernis ptilorhynchus</i>	Lc		Wood Sandpiper	<i>Tringa glareola</i>	Lc	
Eurasian Wryneck	<i>Jynx torquilla</i>	Lc		Pallid Harrier	<i>Circus macrourus</i>	NT	EN	Woodchat Shrike	<i>Lanius senator</i>	Lc	VU
European Bee-eater	<i>Merops apiaster</i>	Lc		Peregrine Falcon	<i>Falco peregrinus</i>	Lc	VU				

Only three species considered to be globally-threatened were recorded as migrants, namely Egyptian Vulture (3 bird days) and Saker Falcon (1 bird day) (both Endangered) and Eastern Imperial Eagle (5 bird days) (Vulnerable). Taken together, the total number of birds and the numbers of individual globally-threatened species migrating past Mt. Amulsar, are below the minimum required to identify the area as Critical Habitat as defined by the International Finance Corporation's Performance Standard #6, i.e.:

"Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the species' life-cycle where that habitat could be considered a discrete management unit for that species.

Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment.

For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance."

where BirdLife International's relevant Criterion A4 is:

"The site is known or thought to hold, on a regular basis, 1% or more of a biogeographic population of a congregatory terrestrial species; or

The site is known or thought to be a 'bottleneck site' where at least 20,000 storks (Ciconiidae), raptors (Accipitriformes or Falconiformes) or cranes (Gruidae) pass regularly during spring or autumn migration."

Table 3: Total number of migrant raptors passing Mt. Amulsar in spring 2013 (alphabetic order)

Species	Migrants passing	Migrants using ground	Total	%
<i>Accipiter</i> sp.	34	2	36	0.79
<i>Aquila</i> sp.	14	1	15	0.33
Black Kite	178	11	189	4.17
Booted Eagle	54	5	59	1.30
<i>Buteo</i> sp.	30	1	31	0.68
Cinereous Vulture	1		1	0.02
<i>Circus</i> sp.	3		3	0.07
Common Buzzard	1,535	19	1,554	34.26
Common Kestrel	48	8	56	1.23
Common/Lesser Kestrel	82	7	89	1.96
Eastern Imperial Eagle	5		5	0.11
Egyptian Vulture	2	1	3	0.07
Eurasian Griffon Vulture	21		21	0.46
Eurasian Hobby	34	4	38	0.84
Eurasian Sparrowhawk	147	8	155	3.42
European Honey-buzzard	1,337	3	1,340	29.54
<i>Falco</i> sp.	1		1	0.02
Golden Eagle	2		2	0.04
Lesser Kestrel	12	12	24	0.53

Lesser Spotted Eagle	37	5	42	0.93
Levant Sparrowhawk	78	2	80	1.76
Long-legged Buzzard	64	5	69	1.52
Merlin	20		20	0.44
Montagu's Harrier	196	26	222	4.89
Montagu's/Pallid Harrier	169	5	174	3.84
Northern Goshawk	2		2	0.04
Oriental Honey Buzzard	1		1	0.02
Pallid Harrier	19		19	0.42
Peregrine Falcon	1	2	3	0.07
Red Kite	1		1	0.02
Red-footed Falcon	2		2	0.04
Saker Falcon	1		1	0.02
Short-toed Eagle	3	2	5	0.11
Steppe Eagle	110	2	112	2.47
Western Marsh-harrier	157	4	161	3.55
Total	4,401	135	4,536	100.00

Table 4: Total number of migrant raptors passing Mt. Amulsar in spring 2013 (numerical order)

Species	Migrants passing	Migrants using ground	Total	%
Common Buzzard	1,535	19	1,554	34.26
European Honey-buzzard	1,337	3	1,340	29.54
Montagu's Harrier	196	26	222	4.89
Black Kite	178	11	189	4.17
Montagu's/Pallid Harrier	169	5	174	3.84
Western Marsh-harrier	157	4	161	3.55
Eurasian Sparrowhawk	147	8	155	3.42
Steppe Eagle	110	2	112	2.47
Common/Lesser Kestrel	82	7	89	1.96
Levant Sparrowhawk	78	2	80	1.76
Long-legged Buzzard	64	5	69	1.52
Booted Eagle	54	5	59	1.30
Common Kestrel	48	8	56	1.23
Lesser Spotted Eagle	37	5	42	0.93
Eurasian Hobby	34	4	38	0.84
<i>Accipiter</i> sp.	34	2	36	0.79
<i>Buteo</i> sp.	30	1	31	0.68
Lesser Kestrel	12	12	24	0.53
Eurasian Griffon Vulture	21		21	0.46
Merlin	20		20	0.44
Pallid Harrier	19		19	0.42
<i>Aquila</i> sp.	14	1	15	0.33
Eastern Imperial Eagle	5		5	0.11
Short-toed Eagle	3	2	5	0.11
<i>Circus</i> sp.	3		3	0.07
Egyptian Vulture	2	1	3	0.07

Peregrine Falcon	1	2	3	0.07
Golden Eagle	2		2	0.04
Northern Goshawk	2		2	0.04
Red-footed Falcon	2		2	0.04
Cinereous Vulture	1		1	0.02
<i>Falco</i> sp.	1		1	0.02
Oriental Honey Buzzard ⁵	1		1	0.02
Red Kite	1		1	0.02
Saker Falcon	1		1	0.02
Total	4,401	135	4,536	100.00

The original supposition was that the Vorotan River Valley to the east of Mt. Amulsar would be the major conduit for raptor migration since it provided a low pass through the mountainous area and was oriented south-east to north-west. This proved not to be the case. Of the 4,401 raptors migrating past the mountain, 1,332 were recorded during the period when bad weather forced the counts to be made from the top of the ski-lift or from the main bridge in Jermuk town making it impossible to determine the route that these had taken. Of the remaining 3,069 birds plus the 135 migrants observed using the ground, 2,853 passed along the western slopes of Mt. Amulsar, nine times as many as passed through the Vorotan Valley – see Table 5. For some species, this ratio was much higher (e.g. European Honey-buzzard 19.5; Western Marsh Harrier 12.5; European Hobby 11.5) while only Lesser Spotted Eagle and Merlin had a higher totals passing up the Vorotan Valley. The main reason for this dichotomy was the orographic climate of the Vorotan Valley. Low cloud was extremely common, with the valley obliterated by cloud on many days when the western slopes of the massif were clear, and it experienced strong and unpredictable katabatic winds particularly when the snow was still lying heavily on the mountain but when it had thawed from the valley floor. Both made flight northward along the valley at best difficult and at worst impossible.

Table 5: Number of migrating raptors passing Watch Points A (Vorotan Valley) and B (western slope) during Spring 2013

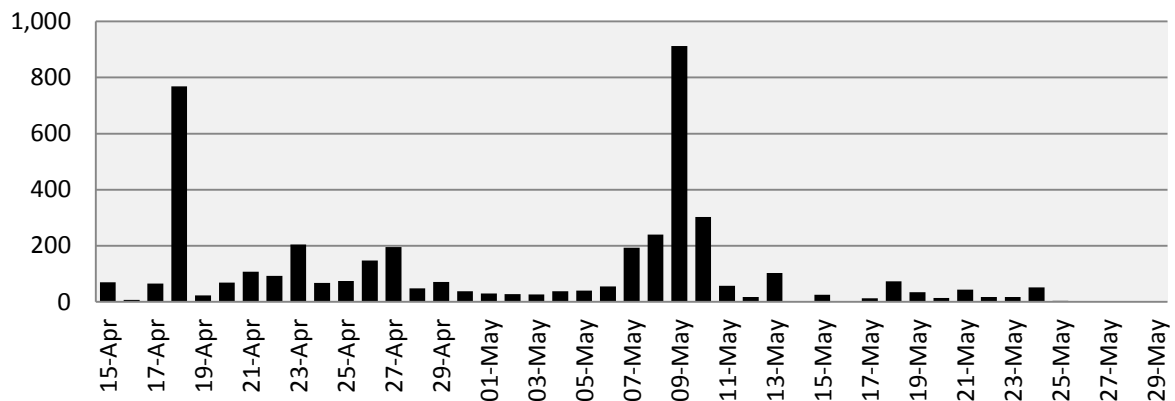
Species	Watch Point A			Watch Point B			Total	Ratio B:A
	Passing	Ground	Total	Passing	Ground	Total		
European Honey-buzzard	65		65	1,267	3	1,270	1,335	19.5
Common Buzzard	73	4	77	710	15	725	802	9.4
Western Marsh-harrier	10		10	121	4	125	135	12.5
Montagu's Harrier	17	10	27	98	16	114	141	4.2
Montagu's/Pallid Harrier	17	2	19	88	3	91	110	4.8
Eurasian Sparrowhawk	9	2	11	77	6	83	94	7.5
Levant Sparrowhawk	17	1	18	54	1	55	73	3.1
Common/Lesser Kestrel	10	2	12	49	5	54	66	4.5
Long-legged Buzzard	6	2	8	53	3	56	64	7.0
Black Kite	9	4	13	37	7	44	57	3.4
Common Kestrel	6	2	8	31	6	37	45	4.6
Accipiter sp.	5	2	7	28		28	35	4.0
Lesser Spotted Eagle	17	4	21	13	1	14	35	0.7
Buteo sp.	12		12	17	1	18	30	1.5
Steppe Eagle	3		3	25	2	27	30	9.0
Booted Eagle	5	1	6	18	4	22	28	3.7

⁵ This is the first ever record of this species from Armenia.

Eurasian Hobby	1	1	2	20	3	23	25	11.5
Merlin	9		9	8		8	17	0.9
Eurasian Griffon Vulture	3		3	12		12	15	4.0
Lesser Kestrel	1	5	6	11	7	18	24	3.0
Aquila sp.	3	1	4	7		7	11	1.8
Pallid Harrier	2		2	8		8	10	4.0
Circus sp.			0	3		3	3	
Short-toed Eagle	1	2	3	2		2	5	0.7
Eastern Imperial Eagle	1		1	1		1	2	1.0
Egyptian Vulture			0	2	1	3	3	
Northern Goshawk	1		1	1		1	2	1.0
Red-footed Falcon			0	2		2	2	
Oriental Honey Buzzard			0	1		1	1	
Peregrine Falcon	1	1	2		1	1	3	0.5
Red Kite	1		1			0	1	0.0
Total	305	46	351	2,764	89	2,853	3,204	9.1

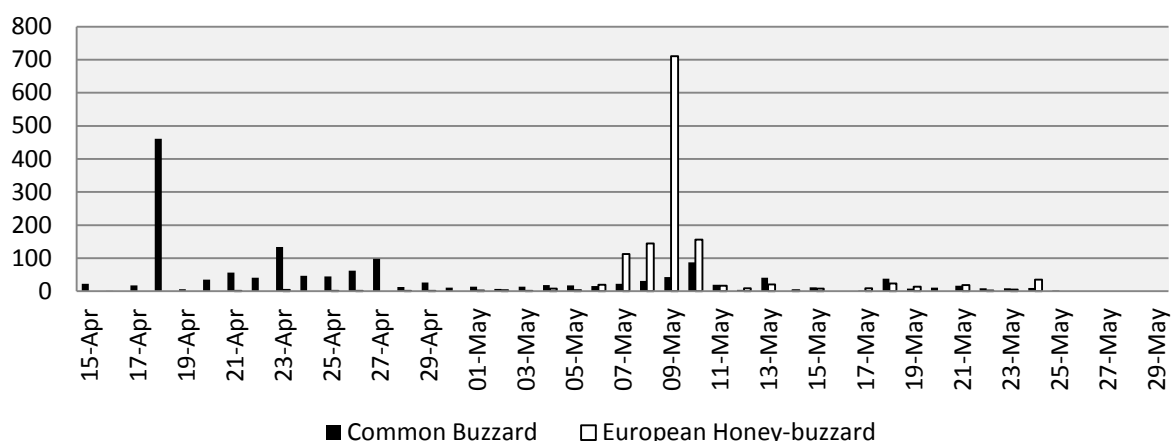
Temporally, the migration fell into two main periods, namely that of April and the second week of May. Migration was already underway when the survey began and increased through April before declining towards the end of the month – see Figure 1. A surge was apparent in the second week in May but numbers then fell sharply before the final stragglers were observed on 25th May. This was as expected. The two peaks seen on 18th April and 9th May represent days with particularly favourable weather conditions following periods of inclement weather.

Figure 1: Number of migrant raptors passing Mt. Amulsar by date in Spring 2013.



The increase in numbers seen in the second week of May was caused by the passage of European Honey-buzzards, a species with a noted late migration which has evolved to ensure that sufficient insects (bees, wasps and their nests) are present to support its specialised diet on arrival in its northern breeding grounds. The difference in temporal migration patterns between it and the Common Buzzard (the other most numerous species passing Mt. Amulsar) is apparent in Figure 2.

Figure 2: Number of Common Buzzards and European Honey-buzzards passing Mt. Amulsar by date in Spring 2013.



The diurnal pattern of migration showed two peaks – one occurring around mid-morning between 10.00 and 11.00 when the day has become hot enough to produce the thermals that the raptors depend upon for migrating, and another larger peak in early afternoon (14.00-15.00) – see Figure 3. This double peak appears to be an artefact of combining all the species data, since while most species appear to pass Mt. Amulsar throughout the day, each exhibits a different timing of peak numbers. The double peak is heavily influenced by the two most numerous species, Common Buzzard and European Honey-buzzard, but while both exhibit this pattern European Honey-buzzard tends to pass the massif later in the day – see Figure 4. As an alternative example, both Eurasian and Levant Sparrowhawks exhibit a marked early morning peak (10.00-11.00) but whereas few Levant Sparrowhawks pass during the afternoon, numbers of Eurasian Sparrowhawk continue to remain reasonably high – see Figure 5.

Figure 3: Number of raptors passing Mt. Amulsar by time of day in Spring 2013.

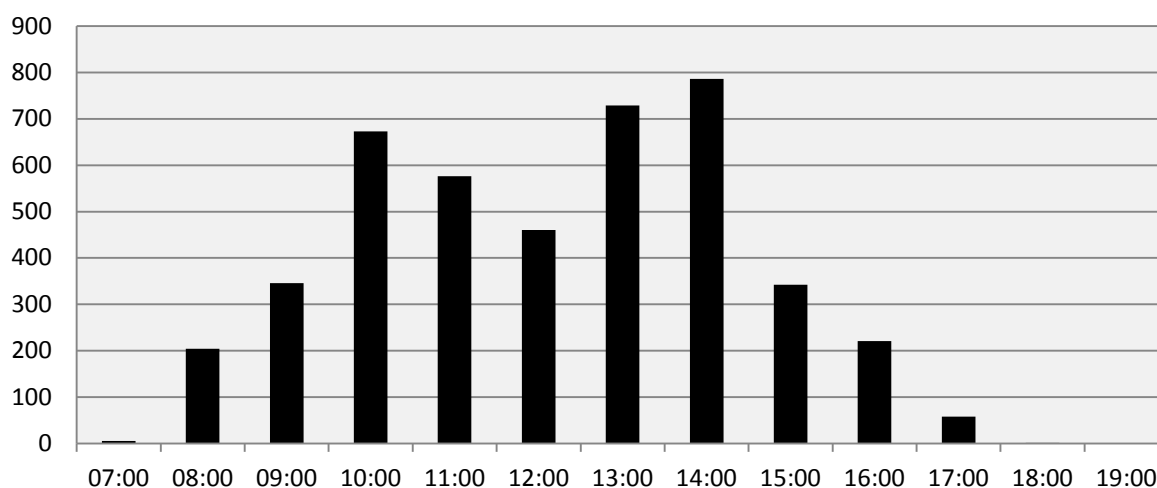


Figure 4: Number of Common Buzzards and European Honey-buzzards passing Mt. Amulsar by time of day in Spring 2013.

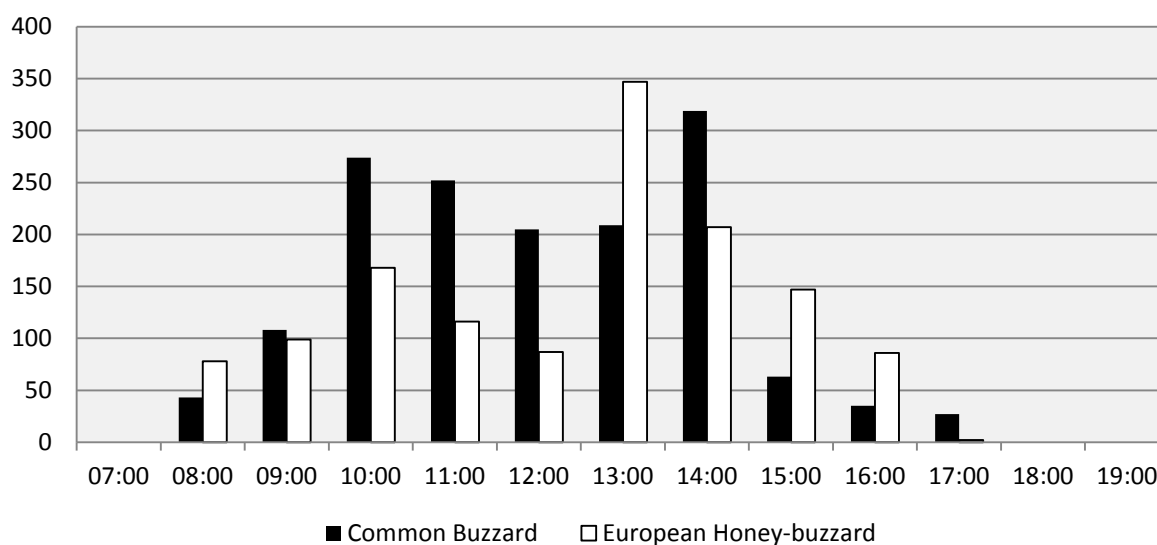
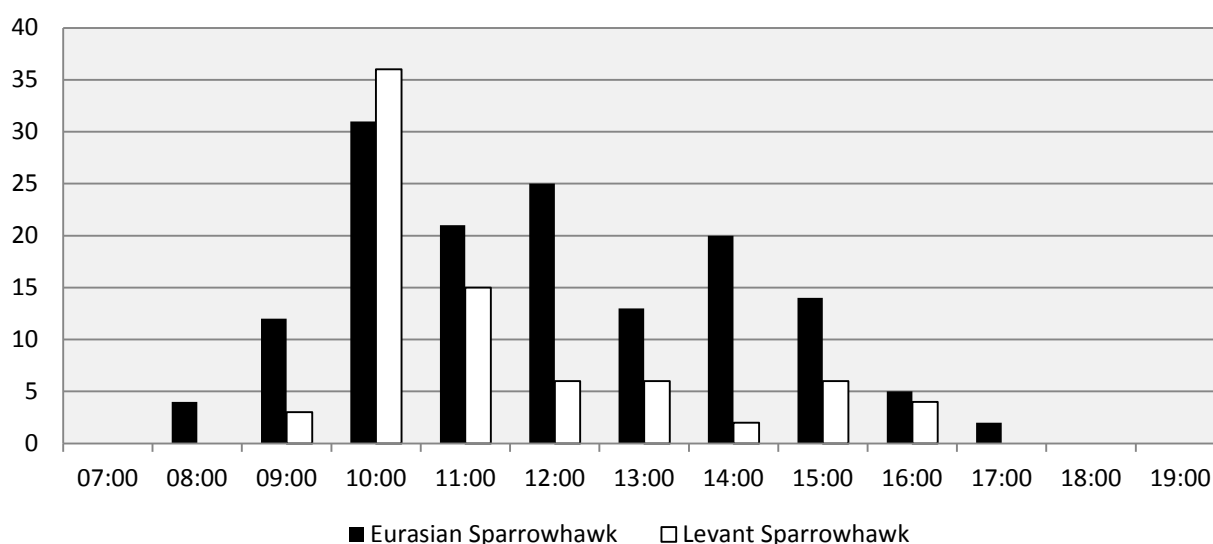


Figure 5: Number of Eurasian and Levant Sparrowhawks passing Mt. Amulsar by time of day in Spring 2013.



3.2 Use of Area by Migrants

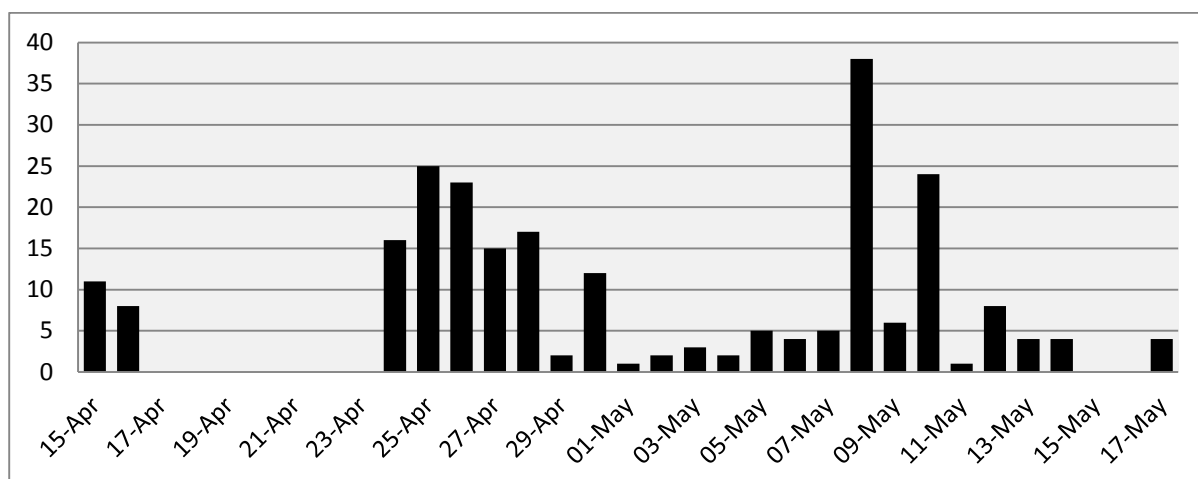
Table 6 indicates that a total of 135 migrant raptors were considered to have been possibly using Mt. Amulsar during the migration for food or rest. Since birds were recorded as they passed through different “visual areas”, a single bird could generate multiple records, so the figure given is the minimum number of birds using the ground. Ground usage could be recorded only when the surveys were being conducted from Watch Points A and B (not from the top of the ski lift or from the bridge in Jermuk). The 135 raptors recorded using the mountain in some way represents just 4.2% of the total of 3,339 raptors recorded passing Watch Points A and B. This is largely because the two most numerous migrant species made very little use of the mountain with only 0.2% of European Honey-buzzards and 2.4% of Common Buzzards recorded as doing so. However, a greater proportion of some of the less numerous species made use of the mountain, e.g. 66.7% of the Peregrines, 50.0% of the Lesser Kestrels, and 40.0% of the Short-toed Snake Eagles. Montagu’s Harrier was the most numerous species recorded as using the ground.

Table 6: Number of migrating raptors recorded using the ground during Spring 2013

Species	Migrants passing	Migrants using ground	%
Montagu's Harrier	141	26	18.4
Common Buzzard	802	19	2.4
Lesser Kestrel	24	12	50.0
Black Kite	57	11	19.3
Common Kestrel	45	8	17.8
Eurasian Sparrowhawk	94	8	8.5
Common/Lesser Kestrel	66	7	10.6
Booted Eagle	28	5	17.9
Lesser Spotted Eagle	35	5	14.3
Long-legged Buzzard	64	5	7.8
Montagu's/Pallid Harrier	110	5	4.5
Eurasian Hobby	25	4	16.0
Western Marsh-harrier	135	4	3.0
European Honey-buzzard	1,335	3	0.2
Peregrine Falcon	3	2	66.7
Short-toed Snake Eagle	5	2	40.0
Steppe Eagle	30	2	6.7
Accipiter sp.	35	2	5.7
Levant Sparrowhawk	73	2	2.7
Egyptian Vulture	3	1	33.3
<i>Aquila</i> sp.	11	1	9.1
<i>Buteo</i> sp.	30	1	3.3
Total	3,204	135	4.2

Raptors' temporal use of the ground mirrors the variations observed in the main passage. Figure 6 shows two main peaks in ground use – one in late April and one in the second week of May. The latter is somewhat surprising since almost no European Honey-buzzards, the species most responsible for the peak in numbers passing the mountain in the second week of May, were recorded using the ground. The gap in data between 17th and 23rd April in Figure 6 corresponds to the period of bad weather when the survey points were moved to the top of the ski lift.

Figure 6: Number of raptors using the ground on Mt. Amulsar by date in Spring 2013.



A total of 240 “bird-days” (see methodology) of ground use by migrant raptors was recorded during Spring 2013. Table 7 and Figure 6 show the distribution of these. Concentrations of use appear to lie over the northern and western slopes of the Mt. Amulsar with the heaviest use corresponding to the areas that include the proposed heap leach pile and the waste rock dump. While some of this result may be caused by observer bias in that these areas were also the closest to the watch points, the range of species and the large difference in numbers suggest that such bias can be counted as only a small factor. However, it is important to note that while heaviest ground usage by migrating raptors does occur in areas that include proposed mine operations, such usage was not confined entirely to the mine operational areas and the total number of birds involved is only small, representing a maximum only 4.2% of the total number of migrants passing through – a total itself which is considered to be small by regional standards.

Table 7: Number of “bird-days” recorded for migrating raptors using the ground by survey area during Spring 2013

Species	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B8	B9	Total
<i>Accipiter</i> sp.	1	1			1										3
<i>Aquila</i> sp.			1												1
Black Kite			4	3	3	2	2		1		1		2	6	24
Booted Eagle	1	1		1		2						3	1	3	12
<i>Buteo</i> sp.														1	1
Common Buzzard	1	1	3	1	1	5	2	2	2	1	1	3	1	10	34
Common Kestrel		1	1		1	2						3	1	5	14
Common/Lesser Kestrel	1	1	2		2	2						2		4	14
Egyptian Vulture										1					1
Eurasian Hobby	1		1		1	3								1	7
Eurasian Sparrowhawk	1		1		1	4		2			1	2		3	15
European Honey-buzzard						3		1						2	6
Lesser Kestrel			4		5	1						3		6	19
Lesser Spotted Eagle		1	4	1										1	7
Levant Sparrowhawk				1	1							1		1	4
Long-legged Buzzard			2	1	1	1								3	8
Montagu's Harrier		2	8		5	3		2			3	3	3	13	42
Montagu's/Pallid Harrier		1	1		1	1		2				1		2	9


Peregrine Falcon					1		1	1				1			4
Short-toed Eagle		1	1	1	1										4
Steppe Eagle						1		1				1			3
Western Marsh-harrier						2					1	1		4	8
Total	6	10	33	9	25	32	5	11	3	2	7	24	8	65	240
Proportion (%)	2.5	4.2	13.8	3.8	10.4	13.3	2.1	4.6	1.3	0.8	2.9	10.0	3.3	27.1	

0.1-5.0; 5.1-10.0; 10.1-15.0; 15.1-20; >20.0

3.3 Use of Area by Local Birds

A total of 20 species of raptors were recorded from the survey area which were either proven to breed or suspected of breeding within it or nearby. Estimates of the actual number of pairs breeding were made, but this proved possible for only certain species. These are given in Table 8.

Table 8: Estimated breeding status of raptors in vicinity of Mt. Amulsar, Spring 2013

Species	Evidence of breeding
Black Kite	A few present around the municipal waste tip on a regular basis and in the upper Vorotan Valley, but no nests found. No estimate of breeding pairs possible.
Booted Eagle	A paired dark phase and pale phase bird seen regularly over Watch Point B and two other pale phase birds present repeatedly suggests two pairs present, one pair probably breeding on steep wooded slopes near Jermuk or in Jermuk Gorge, and another on the wooded slopes near Ughedzor. 
Cinereous Vulture	Single birds present on a few occasions. Not nesting in Jermuk Gorge and birds believed to be breeding to the north of the survey area in Jermuk IBA
Common Buzzard	Fairly common – no estimate made. A single nest located in a wooded valley immediately south of the municipal waste tip.
Common Kestrel	Fairly common – no estimate made. A single nest located on the southern craggy slopes south of Arshak.
Egyptian Vulture	A single nest present in Jermuk Gorge. Sightings suggest this is the only pair in the vicinity.
Eurasian Griffon Vulture	No nests found, even in Jermuk Gorge. Maximum of four birds over the western slopes of the massif suggest two pairs, but these appear to be nesting further north in the Jermuk IBA.
Eurasian Sparrowhawk	A few present – no nests located; no estimate of breeding pairs possible.
European Honey-buzzard	A small number of records over the western slopes of Mt. Amulsar – no nests located; no estimate of breeding pairs possible.
Golden Eagle	Two nests located in Jermuk Gorge. Heavy use of the north-eastern part of the Vorotan Valley suggests that a third pair were nesting somewhere in that area.
Lammergeier	One nest located in Jermuk Gorge. One other pair present there but information provided by ASPB suggests that only one pair breed in the Gorge in any given year despite the presence of multiple pairs. A bird seen on several days dropping bones to break them to feed over the area immediately west of the proposed waste rock dump may have been one of these or from a third un-located pair.
Lesser Kestrel	Colony present in the old TV tower east of Gorayk (within Gorayk IBA). Further breeding pairs located in the TV tower west of Gorayk, in Gorayk itself, and in Sisian.
Lesser Spotted Eagle	One nest located in woodland north of ski lift. Strong indications of two pairs breeding in wooded valleys on south-western slopes of massif (pair mating, adult

	carrying food into woodland) plus two pairs in display flights simultaneously and a territorial interaction between two birds in same area. Repeated presence of a pair over upper part of Vorotan Valley suggests a fourth pair present.
Levant Sparrowhawk	A few present in the upper Vorotan Valley – no nests located; no estimate of breeding pairs possible.
Long-legged Buzzard	Commonest species, no estimate made, but maximum of 12 birds recorded at the same time within the survey area suggests at least 6 pairs present.
Montagu's Harrier	A single bird seen hunting over the upper Vorotan Valley on two consecutive days. No nest located – possibly a stop-over migrant.
Northern Goshawk	A few present – no nests located; no estimate of breeding pairs possible.
Peregrine Falcon	A few present – no nests located; no estimate of breeding pairs possible.
Saker Falcon	Three sightings – a pair hunting over the mountainside immediately south of the proposed waste rock dump and a single bird close by; and a single bird over the south-western slopes south of Watch Point B. No nest located.
Short-toed Snake Eagle	A single pair displaying and hunting regularly over the western slopes of Mt. Amulsar. Nest not located.

Ground use by local birds was recorded in the same way as that for migrant birds. The total of 2,067 “bird-days” is much higher than that for migrants as expected since local birds were present using the area every day. Table 9 shows that the heaviest areas of use by all species combined was the upper Vorotan Valley around the proposed waste rock dump and to the north-east of it, and the western slope of Mt. Amulsar including the site of the proposed heap leach pile and around Gndevaz.

Table 9: Number of “bird-days” recorded for local raptors using the ground by survey area during Spring 2013

Species	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B8	B9	Total
Long-legged Buzzard	39	66	69	8	67	58	29	45	10	19	29	60	19	56	574
Lesser Spotted Eagle	22	30	34	11	44	39	35	24	12	10	10	19	15	34	339
Booted Eagle	5	12	16	3	10	31	26	23	14	14	19	37	10	16	236
Common Kestrel	3	12	28	2	16	22	3	12		1	5	17	2	33	156
Common Buzzard	5	4	25		13	24	9	17	2	3	5	19	3	25	154
Short-toed Snake Eagle	3	5	4	3	2	18	6	13	5	3	10	19	9	19	119
Golden Eagle	1	7	4	2	22	12	3	11	6	4	9	12	6	13	112
Lammergeier	4	4	4	1	6	7	2	4	2	2	4	8	8	7	63
Eurasian Griffon Vulture			1		2	7	3	12		3	2	14	1	9	54
Lesser Kestrel	2	5	37	2	3										49
Common/Lesser Kestrel	6	6	8		5	3	1	1		2		3	1	5	41
Eurasian Sparrowhawk	1	2	2		1	6		5			1	6	1	5	30
Black Kite	3	2	5	1	6	1		2				3		3	26
Egyptian Vulture					1	2	3	2	1	2	2	4	2	4	23
Levant Sparrowhawk	1	2	8	8											19
Northern Goshawk	3	1			3	1	2				1	3		2	16
Peregrine Falcon			1		1	3					2	5		4	16
European Honey-buzzard								2	1	1		3	1	4	12
Cinereous Vulture	2		2		1						2	1	1	1	10
<i>Buteo</i> sp.		3			1		3			1		1			9
Saker Falcon	1		1			1	1	1							5
Montagu's Harrier			2		1										3
<i>Accipiter</i> sp.									1						1
Total	101	161	251	41	205	235	126	174	54	65	101	234	79	240	2,067

Proportion (%)	4.8	7.8	12.2	2.0	9.9	11.4	6.1	8.4	2.6	3.1	4.8	11.3	3.8	11.6	
----------------	-----	-----	------	-----	-----	------	-----	-----	-----	-----	-----	------	-----	------	--

3.4 Atlas survey

A total of 128 bird species were recorded from the survey area during the atlas work. Full details of the results are provided in Annexes I and II. Of these, 33 were recorded from more than 25% of the 36 tetrads surveyed and these are shown in Table 8 together with the number of tetrads in which breeding was recorded as “possible”, “probable”, or “confirmed” (see methodology). Skylark and Water Pipit were the two most widespread species.



Skylark –
most widespread species

While some species were recorded breeding in almost all the tetrads from which they were recorded, others were not. This is for a variety of reasons. Some species are altitudinal migrants and withdrew to higher ground to breed (e.g. Water Pipit, Horned Lark); some were passage migrants (e.g. European Bee-eater); some used the area for feeding but there were no suitable nest sites within it (e.g. Barn Swallow, Common Swift); and some had behaviour that made recording evidence of breeding difficult (e.g. Twite remained in flocks rather than forming pairs, Common Buzzard and Lesser Spotted Eagle do not sing).

Table 10: Species recorded in at least one-quarter of tetrads surveyed during Spring 2013 together with the number of tetrads from which there was some evidence of breeding

Species	Present	Breeding	Species	Present	Breeding
Eurasian Skylark	35	35	Ring Ouzel	16	13
Water Pipit	32	23	Corn Bunting	15	15
Twite	29	12	Lesser Spotted Eagle	15	4
Whinchat	28	22	European Bee-eater	14	0
Common Cuckoo	26	25	Ortolan Bunting	13	12
Northern Wheatear	26	20	Willow Warbler	13	2
Tree Pipit	25	23	Tawny Pipit	12	4
Eurasian Linnet	25	16	Woodlark	11	11
Long-legged Buzzard	24	10	Rock Bunting	11	8
Common Whitethroat	23	19	Horned Lark	11	5
Red-backed Shrike	23	17	White Wagtail	11	3
Common Rock Thrush	22	15	Barred Warbler	10	9
Common Rosefinch	22	15	Eurasian Hoopoe	10	7
Barn Swallow	18	0	Common Kestrel	10	2
Common Raven	17	11	Common Swift	10	1
Common Buzzard	17	2	Radde's Accentor	9	9
Eurasian Blackbird	16	13			

Square E2 held the greatest diversity with 63 species while square F5 on the north slope of North Erato (where the work camp is located) held least with just eight. [Square F8 held just six, but this was the only tetrad to have just one visit.] Diversity was clearly highest in the north-west and western parts of the survey area, and this corresponded to the widest range of habitats being present – woodland, wetlands, scrub, grassland, etc. – while the least diverse areas corresponded to the mountain peaks of the Amulsar massif where high ground, singular and simple habitat – montane grassland – and harsh climatic conditions combined to limit attractiveness to just a handful of hardy species, e.g. Water Pipit.



Water Pipit

While numbers of breeding species were lower, the pattern is roughly the same with the north-west and west having the most diverse breeding community and the montane areas the least. Square E2 again has the greatest diversity followed closely by D5 which includes part of the heap leach pile. However, it is important to note that most of the habitat types that support most of the breeding species occur to the south of the area proposed for the heap leach pile and that the heap leach pile will occupy largely agricultural land with some small areas of scrub.

Twenty-two species present in IUCN's Red List or in the Armenian Red Data Book were recorded during the atlas survey. These are listed in Table 8 with the number of tetrads they were recorded as present in and the number in which evidence of breeding was found. Thirteen of these were raptors. The greatest number is in the north-west with a marked



White-throated Robin – data deficient



Corncrake

concentration in square C5 which lies between the proposed heap leach pile and Gndevaz. No tetrad held more than one breeding threatened species and the bias towards the north-west is yet again evident, although some species were present in the upper part of the Voroatan Valley and on the southern slopes of the Amulsar massif. No threatened species were recorded breeding from the main operational mine sites.

Table 11: Number of tetrads in which threatened species were recorded as present or with evidence of breeding during Spring 2013.

Species	IUCN	ARDB	Present	Breeding	Species	IUCN	ARDB	Present	Breeding
Black-winged Pratincole	NT	VU	1		Lesser-spotted Eagle	Lc	VU	1	1
Black-winged Stilt	Lc	VU	1		Levant Sparrowhawk	Lc	VU	1	
Blue-cheeked Bee-eater	Lc	VU	2		Merlin	Lc	DD	1	
Booted Eagle	Lc	VU	7		Montagu's Harrier	Lc	VU	2	
Corncrake	Lc	VU	4	4	Pallid Harrier	NT	EN	1	
Eurasian Griffon Vulture	Lc	VU	1		Red Kite	NT	EN	1	

European Roller	NT	VU	4		Ruddy Shelduck	Lc	VU	8	7
Golden Eagle	Lc	VU	1		Saker Falcon	EN	EN	1	1
Great Snipe	NT	VU	2		Short-toed Snake Eagle	Lc	VU	5	
Lammergeier	Lc	VU	7		White-throated Robin	Lc	DD	4	3
Lesser Kestrel	Lc	VU	5		Woodchat Shrike	Lc	VU	5	

3.5 Lesser Kestrel Studies

Lesser Kestrel was given special consideration because its only known breeding location in Armenia was by the television tower about 4km east of Gorayk at the bottom of the Vorotan Valley. During this survey, new nesting locations were located in the buildings around the television tower about 3km west-north-west of Gorayk, in Gorayk village itself, and in Sisian.

The situation regarding the species' use of the Vorotan Valley for feeding remains a little confused. Shortly after their arrival back at the colony east of Gorayk, birds were observed feeding on the south-facing slopes of the hill where Watch Point A was located. Here they were capturing the flightless final instar larvae of a large species of grasshopper. Initially, these birds were considered to be likely migrants, but as the same birds were present day after day, the fact that they may have been from the colony became more likely. This supposition appeared to be confirmed by the presence of a bird ringed by the ASPB at the colony the previous year. Furthermore, although most birds were taking single insects and feeding on them immediately, one bird was observed taking three larvae and carrying them off down the valley towards the colony. While a round trip of about 28km from the colony to this site and back again would seem excessive for provisioning a mate or young, the species is known to travel up to 40km from roost sites to feeding grounds in its winter quarters⁶. Birds were not seen flying to and fro from the hill, rather just appearing and feeding for a prolonged period. It is assumed that the bird carrying food would have been making its return journey to the colony and taking extra food with it for later consumption there.

Direct evidence of a connection between the colony and the birds foraging over the hill at Watch Point A remains scant. Only a single bird (6th May) was located in the middle areas of the valley despite considerable survey effort, and none were seen flying up or down the valley. Further survey work at the colony revealed that while most birds appeared to be feeding locally, a number of birds would circle on thermals and then when at a considerable height set out in straight lines for distant locations. Two birds were observed to set out directly to the north-west towards the hill. If birds are commuting between the colony and distant feeding sites at height, this would explain the absence of records from points in between.



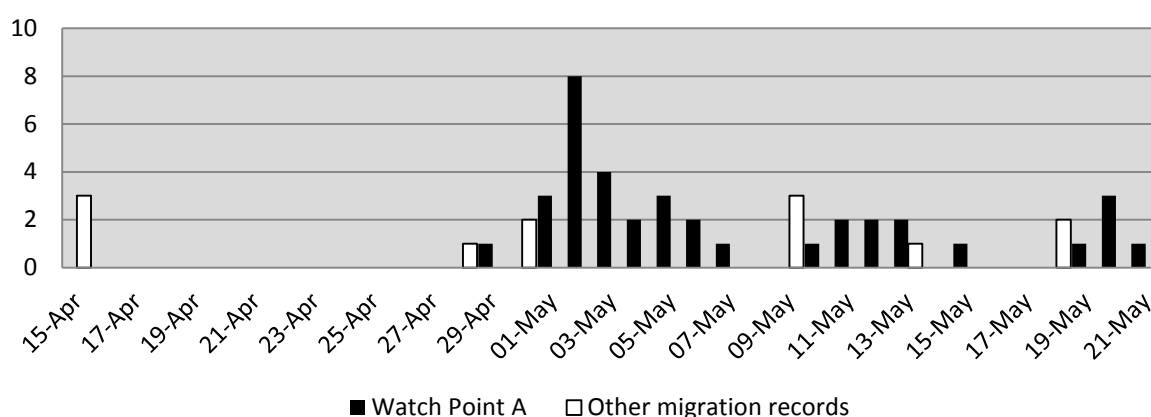
Lesser Kestrel

The numbers feeding on the hill at Watch Point A peaked at eight birds – see Figure 7 – but small numbers were present during much of late Spring, throughout the period that migrant Lesser Kestrels

⁶ Pilard, P., Lelong, V., Sonko, A., and Riols, C.. 2011. Suivi et conservation du dortoir de rapaces insectivores (Faucon Crécerellette *Falco naumanni* et Elanion Naucier *Chelictinia riocourii*) de l'île de Kousmar (Kaolack/Sénégal). *Alauda* 79 (4): 295-312.

were observed from Watch Points A and B. Lesser Kestrels were not observed hunting in this way over any other hill away from the direct vicinity of the colony. Furthermore, while larval grasshoppers of this species were seen occasionally on other hillsides with short, herb-rich grass, they were not present in the same high densities. However, it remains unknown as to whether the grasshopper population on this hill is always high and Lesser kestrels have learned to feed there, or whether it was high just in Spring 2013 and the Lesser Kestrels were simply being opportunistic. Undoubtedly it provided a significant source of food for recently-returned birds breeding at the colony and probably for a number of migrant birds still heading north.

Figure 7: Number of Lesser Kestrels feeding on south-facing slope of Watch Point A by date in Spring 2013.



The detailed study of the feeding behaviour of Lesser Kestrels in the lower part of the Vorotan Valley also proved a little indecisive, since poor weather (fog, heavy rain) hampered observations. Wind direction also appears to have a significant influence of where birds feed, since they seem to favour hovering into the wind over the windward sides of slopes. The maximum count of birds made each fifteen minute period throughout the day have been transformed into a figure representing the mean maximum number recorded per hour of observation. These figures are given in (Table 8 and clearly show that birds prefer to feed close to the colony and that the lower parts of the Vorotan Valley are little used during spring. However, information from the ASPB suggests that this pattern changes during the summer as a) the grass in the valley meadowlands grows and provides cover for an increasing population of small mammals; and b) the birds start to feed chicks which require a good supply of small mammals relatively near to the colony. Thus, ASPB indicate that Lesser Kestrels use the lower parts of the Vorotan Valley extensively and intensively during the summer.

Table 12

Numbers per hour			
	Point 1	Point 2	Point 3
X	0.29	0.07	0.11
Y	0.21	0.21	0.00
Z	5.26	3.83	0.08

4 CRITICAL HABITAT ASSESSMENT

Critical habitat is a concept within Performance Standard 6 of the International Finance Corporation and in Performance Requirement 6 of the European Bank of Reconstruction and Development. The overarching criteria defining critical habitat are five-fold, thus:

- Critically endangered and endangered species;
- Endemic and restricted range species;
- Migratory and congregatory species;
- Unique assemblages of species; and

- Key evolutionary processes.

In relation to birds, the Mount Amulsar site does not contain any endemic or restricted range species; unique assemblages of species; nor any examples of key evolutionary processes. The current surveys have indicated that for at least spring migration, it does not support any significant congregation of migratory raptors, that is as defined by tier 2 criteria given in paragraph GN 89 of the IFC's *Guidance Notes*, thus:

"Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species' life-cycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment."

However, a number of species have been recorded that are listed in IUCN's Red List and the Armenian Red Data Book as Endangered. These include Egyptian Vulture and Saker Falcon, both globally Endangered; and Cinereous Vulture, Pallid Harrier, and Red Kite, all of which are globally Near-threatened but nationally Endangered.

All five species are assessed in the following sections according to the IFC's tier 2 criteria tabulated under paragraph GN89 of its Guidance Notes, thus:

- *"Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally- important concentrations of a Red-listed EN species where that habitat could be considered a discrete management unit for that species/ subspecies."*
- *Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species."*
- *As appropriate, habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing."*

4.1 Egyptian Vulture

The ASPB estimates the population of Egyptian Vultures breeding in Armenia to be around 55-60 pairs, though reliable monitoring data are not available. Historical data suggest that 2-3 pairs of Egyptian Vultures nested in Jermuk IBA in 1995⁷ and 1-2 pairs in Gorayk IBA also in 1995⁸. Numbers of pairs breeding in the area appears to have declined since, to the point where only one pair was found in this survey. The closure of the chicken farm in Gndevaz in 2011 may have removed a major source of food from the area. Levels of disturbance have also increase. The national population is now estimated at 50-55 pairs currently.

A single active nest of Egyptian Vulture was located in the vicinity of Mt. Amulsar in Spring 2013, this is in the Jermuk Gorge. Birds, thought to be from this pair, although not necessarily exclusively so, were seen on the ground on three occasions at two locations. Single birds were also seen within the area on eight dates (15th, 28th April, 12th, 13th, 17th, 19th, 25th, 26th May) mostly searching for food although the bird seen on 15th April was displaying in area B2. Two birds were searching for food over B8 and B9 on 27th April. In total, 23 "bird-days" of observations were made in the area over the survey period. In addition, a single bird believed to be a migrant was seen low over the ground in area B5 on 6th May, and single birds were seen migrating at altitude on 7th and 9th of May.

⁷ <http://www.birdlife.org/datazone/sitefactsheet.php?id=19757>

⁸ <http://www.birdlife.org/datazone/sitefactsheet.php?id=19755>

The observational data suggest that only a single pair of Egyptian Vultures was present in 2013 in the affected area and that this area makes up only a part of a much wider hunting territory. One pair represents around 2% of the national population as currently estimated. Therefore, under the tier 2 criterion:

Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species

the home range or foraging territory of any single pair needs to be considered as critical habitat for this species. Within the context of the mine, this territory for the pair nesting in the Jermuk Gorge should be considered as the discrete management unit.

However, although the birds were seen over the affected area regularly, they were in fact observed over it on only nine days during a survey lasting 49 days (i.e. 18%) suggesting that either the full range of the birds is much larger than the affected area or that other areas are much more important to it. Furthermore, birds were present in proposed mine operational areas (the heap leach pile in area B9) for only four of these 23 bird-days (i.e. 17%). Although only an estimate, area B9 would appear to comprise only around 3% of this pair's home range, and the heap leach pile less than 30% of that. Furthermore, given that the time birds needed to be present within an area for could be very small to register as a "bird-day", then the percentage of the total time they spent foraging that was actually spent over the heap leach pile or its immediate vicinity is considered to be insignificant. Hence, it is unlikely that the proposed mine operations would cause a loss of habitat that "could potentially impact the long-term survivability of [this pair, let alone] the species".

4.2 Saker Falcon

There are no previous records of Saker Falcon from the Mt. Amulsar area. A single migrant was seen passing the top of the ski-lift on 17th April, but three other birds were observed that showed behaviour more in keeping with birds that could have been local. A single bird was observed circling over a wide area (B1, B2, and B3) on 30th April and a pair were seen hunting southwards, very low over the western side of North Erato just south of the proposed waste rock dump on 3rd May. No further sightings were made nor nest site found.

However, BirdLife International⁹ notes that Saker Falcons specialise in catching medium-sized,

"diurnal terrestrial rodents (especially ground squirrels Citellus) of open grassy landscapes such as desert edge, semi-desert, steppes and arid montane areas; in some areas, particularly near water, it switches to birds as key prey. ... It uses copses or cliffs for nest sites (sometimes even the ground), occupying the old nests of other birds".

Such prey is not present around Mt. Amulsar, nor is the area arid, and both these facts militate against the likelihood of this species breeding anywhere in the vicinity of the proposed development. Furthermore, the ASPB have stated that the status of Saker Falcon within Armenia is ambiguous, with no breeding confirmed in the country since a juvenile was taken from the wild on 10th July 1948 near Aragats.

4.3 Cinereous Vulture

A single bird was recorded as migrating past the top of the ski-lift on 22nd April, although given individual birds travel great distances when hunting, a degree of uncertainty pertains to this record. Single local birds were observed on six dates (28th, 29th April; 1st, 2nd, 5th, 23rd May) over areas suggesting that they were from a pair breeding somewhere in the Jermuk IBA to the north. A total of ten "bird-days" were recorded from seven "visual areas". Clearly parts of the Amulsar massif lie within these birds foraging range, but with observations made on just six out of 49 survey days (12%) and

⁹ <http://www.birdlife.org/datazone/speciesfactsheet.php?id=3619>

with only two records from areas containing proposed mine operational areas (the waste rock dump in area A3), the impact of the proposed mine is likely to be insignificant.

4.4 Pallid Harrier

A total of ten Pallid Harriers were recorded from the watch points, all of them migrating north with none seen using the ground in any way. A single female was observed hunting over the ridge on the craggy slopes south of Arshak on 4th May. No local birds were noted.

Female and immature Pallid Harriers have very similar plumage to female and immature Montagu's Harriers and good clear views are necessary to separate them. These were not always obtained and where certain identification could not be achieved, birds were identified only as Montagu's/Pallid. A total of 110 such birds were counted, all but five migrating at altitude; the five others were recorded as using the ground. Even allowing for 50% of these to have been Pallid Harriers (an unlikely ratio given 141 Montagu's Harriers were seen of which 26 were recoding as using the ground), this means that at most perhaps three or four Pallid Harriers were using the massif during migration. No impact is expected to be made on this species.

4.5 Red Kite

A single bird was seen migrating north-west of Watch Point A on 29th April without interacting with the ground. No local birds were observed.

5 MITIGATION, SET-ASIDE, OFFSET

5.1 Avoidance

The proposed mining and associated operational areas have been through a number of iterations with areas such as the heap leach pile being moved from more sensitive areas in the Vorotan Valley. As such, the current placement of the proposed components represent the sites of least impact and no further avoidance measures can be taken.

With a development proposal of this scale, the concept of no net loss of biodiversity is effectively impossible to achieve since common species which breed across the massif such as Skylark and Whinchat will lose breeding habitat, and disturbance from noise, dust and lights will inevitably permeate beyond the footprint of the site and reduce breeding opportunities of success over a wider area.



Whinchat

5.2 Mitigation

With one exception, there would appear to be little need for mitigation measures specifically for birds beyond those being applied as environmental good practice. Minimisation of the footprint is most important to minimise habitat loss, degradation, and disturbance. While company management suggests that this will happen, present evidence is contrary, with a plethora of tracks being formed over a very wide area of delicate montane grassland; no indication of vehicle drivers being educated on the need to keep to existing tracks; and no basic steps taken towards restoration (such as separation of turf, top soil, and sub-soil) of excavations. This needs to change quickly if the footprint of the site is not to grow excessively. Furthermore, the proliferation of tracks is being exploited by local people to gain access for the collection of mushrooms and other sources of wild food, with concomitant increases in the levels of disturbance to bird-breeding habitat. Standard mitigation measures to minimise dust and noise, prevent erosion and prevent siltation of small mountain lakes and watercourses will be important, as will good traffic management to ensure disturbance is kept to agreed routes.

The singular exception would be the south-facing slope that forms the northern part of the waste rock dump and which transpired to be of some importance as an early-season feeding ground for up to eight Lesser Kestrels. Under current proposals, much of this hillside will be covered by the waste rock dump and the remainder rendered useless as a feeding area by the associated noise, disturbance, and dust. Since there appear to be no alternative sites to locate the waste rock dump, this impact cannot be mitigated.

5.3 Set-aside

Certain key areas for birds have emerged from the ornithological survey. These are:

- The craggy corrie surrounding the mountain lake south of the unnamed peak about 1km south of Arshak. This area holds an assemblage of montane species not observed anywhere else in the Amulsar area including Golden Eagle, Lammergeier, Ruddy Shelduck, Caspian Snowcock, Asian Crimson-winged Finch, White-winged Snowfinch, Alpine and Radde's Accentors, Red-billed Chough, Eurasian Crag Martin, Common Rock Thrush, Horned Lark, and Ring Ouzel. Many of these species are still found across the montane area where rocky outcrops are present, but large areas of rocky habitat have already been heavily



Alpine Accentor



Common Rock Thrush

disturbed, e.g. especially on the eastern slope of the massif where tracks have become extensive in an otherwise wild area, and it is likely that the less common members of this assemblage were once present there. While none are particularly rare (but the first three are listed as Vulnerable in the Armenian Red Data Book), the southern part of the massif described here now remains the only place on the massif that all are represented together within a limited area.

- The lower slopes of the western side of the massif, below an altitude of about 2,300m. In particular, the wooded valleys and associated shrublands and flower-rich meadows support a high diversity of birds including Booted, Lesser Spotted, and Short-toed Snake Eagles, White-throated Robin, Chukar, Corncrake, Fire-fronted Serin, Mountain Chiffchaff, Western Rock Nuthatch, Rock Sparrow, Common Quail, Radde's Accentor, Rose-coloured Starling, and Green and Barred Warblers. While not all of these species breed, the area was important for some during the period of the spring snow thaw when birds were making local (often altitudinal) movements to their breeding habitats.



Rose-coloured Starling

- The area around the current municipal waste tip supported the highest avian total diversity and breeding diversity of any area within the survey boundary. The abutment of wetlands, river, and wooded hillside in the valley to the south-west of the tip, along with herb-rich meadows and shrublands provides a high diversity of habitats in a small area. Interesting bird species included the only location where European Honey-buzzard may have been breeding; white-throated Dipper; Common Sandpiper; Purple Heron; Cetti's, Marsh, Eurasian Reed, and Green Warblers; Mountain Chiffchaff; Lesser Grey, Red-backed and Woodchat Shrikes; and Rock Sparrow plus common species rarely encountered elsewhere in the survey area such as Spotted Flycatcher, Common Redstart, European Goldfinch and Common Wood-pigeon. A single Bonelli's Warbler of the eastern race *orientalis*¹⁰ was also observed in this area – the first record of the species in Armenia.



Red-backed Shrike

These areas should generally be set-aside from the operations and traffic associated with the proposed mine. It is understood that the lower western slopes of the massif are outside of the current proposals for operations, therefore the area roughly coinciding with B1, B6, and B7 should remain undisturbed. The area around the municipal waste tip is similarly outside of mine operations although it is understood that the company intends to remove the tip to improve the local environment. This should be done outside of the breeding season to minimise disturbance, so August-September would be preferable. It is also noted that the quarries close to the waste tip have been re-opened to provide material for improving the main access road. These operations should not be allowed to extend further west. Finally, the intentions for the area around Arshak and the unnamed peak to the south are unclear. On paper, the proposals for mining appear to be limited to the north slope of Arshak peak, but on the ground it is clear that new tracks have been driven further south. This should cease and traffic should not be allowed south of Arshak peak – not only for birds but it is understood that the area is also important botanically, and Brown Bear *Ursus arctos* was observed by the bird surveyors in the corrie described above.

5.4 Offset

At a general level, the proposals for development of a gold mine on Mt. Amulsar have few specific impacts on the birds using the area – certainly none that are quantifiable. A large number of species use the area and a number of these are recognised as being globally- and/or nationally-threatened. It is inevitable that low-level extensive environmental degradation will result from the operations and that parts of the area will become unusable for breeding and for feeding. While the body of the report above suggests that in most cases impacts on individual species are likely to be small or insignificant, there remains a degree of uncertainty, e.g. just how important will disturbance be to part of an Egyptian Vulture's feeding territory that it uses for around 20% of its time?

Offset measures could be taken that could help to compensate for these unquantifiable impacts and which would provide good practice in line with Lydian International's Environmental Policy. The first of these would be to improve the conservation status of the Jermuk IBA by helping to establish it as a protected area – either a National Park or a Protected Landscape – and then to assist with the sustainable financing of its operational management. Similarly, measures could be taken to improve the conservation management of Gorayk IBA. Further details of these actions are provided by reports from Ramaz Gokhelashvili .

¹⁰ Recognised as a full species Eastern Bonelli's Warbler *Phylloscopus orientalis* by many authorities but not by BirdLife International.

Measures could also be taken specifically for vultures and other scavenging birds through the provision of a “vulture restaurant” – a well-established concept undertaken with great success in many countries around the world, e.g. Nepal and Cambodia. BirdLife International carry a case study of an example already carried out successfully in Armenia at Noravank ¹¹. From observations made during this ornithological survey, this would best be located somewhere on the western slope of the massif, on open ground, close enough to a road to allow easy access for delivering animal carcasses but far enough away to minimise casual disturbance. It should be fenced to prevent mammalian scavengers from robbing the carcasses, but the fenced enclosure needs to be large enough to ensure that the birds do not feel confined and thereby avoid it.

In one specific instance, that of the Lesser Kestrels feeding over the hill that will form part of the waste rock dump, no meaningful mitigation measures are available. Discussions with ASPB suggest that while provision of artificial nest sites has increased the breeding population of the area substantively, further provision may not lead to further increases nor necessarily be an adequate offset for loss of early-season feeding grounds. It is proposed that Lydian engage with the ASPB to develop an increased research capacity specifically directed at learning more about the detailed ecology of Lesser Kestrels in the area so that targeted conservation measures can be undertaken to ensure that this population continues to flourish.

¹¹ <http://www.birdlife.org/datazone/sowb/casestudy/424>

Annex I: Distribution of bird species recorded during atlas survey work by tetrad.

	B5	C4	C5	C6	D3	D4	D5	D6	D7	E2	E3	E4	E5	E6	E7	E8	F2	F3	F4	F5	F6	F7	F8	G3	G4	G5	G6	G7	G8	H5	H6	H7	H8	I6	I7	I8	Total	
Alpine Accentor																						1						1										2
Alpine Swift			1	1			1	1				1			1																	1						7
Asian Crimson-winged Finch		1			1																							1										3
Barn Swallow	1	1	1	1		1		1	1	1	1			1		1	1	1			1					1					1	1			1			18
Barred Warbler		1		1		1		1	1	1	1					1	1								1													10
Black Kite			1		1	1				1							1	1																				6
Black Redstart			1					1							1						1	1					1				1							7
Black-billed Magpie			1		1			1	1	1	1				1	1	1																					9
Black-headed Bunting	1	1	1	1			1		1	1						1																						8
Black-winged Pratincole		1																																				1
Black-winged Stilt			1																																			1
Blue Tit								1	1	1						1						1																5
Blue-cheeked Bee-eater										1																							1					2
Bluethroat					1																				1	1		1	1	1		1	1					9
Bonelli's Warbler										1																												1
Booted Eagle	1		1		1	1		1		1								1																				7
Caspian Snowcock																												1										1
Cetti's Warbler								1		1																												2
Chaffinch										1																												1
Chukar								1																														1
Common Buzzard		1	1		1	1	1	1	1	1	1		1		1		1	1			1			1				1				1						17
Common Chiffchaff					1			1	1	1						1						1									1							7
Common Cuckoo	1	1	1	1	1		1	1	1	1	1	1	1		1	1		1				1	1	1		1		1		1	1	1		1	1	1		26
Common Kestrel		1			1	1					1		1						1			1						1				1			1			10
Common Quail		1					1	1			1																			1					1	1		7
Common Raven		1		1	1	1	1	1		1	1						1		1		1				1			1	1	1	1	1	1					17
Common Redshank			1																						1													2

	B5	C4	C5	C6	D3	D4	D5	D6	D7	E2	E3	E4	E5	E6	E7	E8	F2	F3	F4	F5	F6	F7	F8	G3	G4	G5	G6	G7	G8	H5	H6	H7	H8	I6	I7	I8	Total
Common Redstart	1			1				1		1					1		1													1							7
Common Rock Thrush	1		1	1	1	1	1	1	1		1		1	1	1		1	1	1		1	1		1	1			1	1							1	22
Common Rosefinch	1			1	1			1		1	1	1	1		1	1	1		1		1	1		1	1	1		1		1	1		1	1			22
Common Sandpiper										1															1	1										1	4
Common Starling		1			1				1	1							1	1						1	1						1						9
Common Stonechat	1								1																												2
Common Swift			1	1						1	1	1					1	1							1			1				1					10
Common Teal																													1							1	2
Common Whitethroat		1	1	1	1	1		1	1	1	1			1	1	1	1	1						1	1	1				1	1	1	1	1	1		23
Common Wood-pigeon			1	1				1		1																											4
Corn Bunting	1	1	1	1	1	1	1		1	1	1			1	1	1	1	1																			15
Corncrake								1			1					1		1																			4
Eastern Olivaceous Warbler																															1						1
Eurasian Blackbird	1	1	1	1	1		1	1	1	1				1	1	1						1		1								1				1	16
Eurasian Crag Martin						1		1	1	1										1					1			1		1							8
Eurasian Golden Oriole				1		1										1																					3
Eurasian Griffon Vulture								1																													1
Eurasian Hoopoe	1		1	1	1		1			1	1			1																1						1	10
Eurasian Jackdaw					1																																1
Eurasian Jay	1			1				1		1						1							1														6
Eurasian Linnet	1	1	1	2	1	1	1	1	1	1	1	1		1	1	1	1	1						1				1		1		1	1	1	1		25
Eurasian Siskin																											1										1
Eurasian Skylark		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	35
Eurasian Sparrowhawk						1		1																													2
Eurasian Wryneck					1				1																												2
European Bee-eater		1		1	1	1	1	1		1	1		1	1	1							1										1				1	14
European Goldfinch	1				1					1				1				1																			5
European Honey Buzzard										1	1		1													1											4
European Roller			1						1		1															1											4

	B5	C4	C5	C6	D3	D4	D5	D6	D7	E2	E3	E4	E5	E6	E7	E8	F2	F3	F4	F5	F6	F7	F8	G3	G4	G5	G6	G7	G8	H5	H6	H7	H8	I6	I7	I8	Total	
European Turtle Dove Dove											1																											1
Fire-fronted Serin								1																														1
Garden Warbler										1															1					1								3
Golden Eagle																											1											1
Great Snipe					1																									1								2
Great Spotted Woodpecker										1																												1
Great Tit					1			1	1	1					1	1							1															7
Greater Short-toed Lark			1																																			1
Green Sandpiper																											1											1
Green Warbler								1		1					1																							3
Grey Partridge			1															1				1					1	1		1		1	1					8
Grey Wagtail					1			1		1																							1					4
Hooded Crow		1	1	1	1	1				1						1																						7
Horned Lark						1						1								1	1	1			1	1		1	1			1	1					11
Lammergeier		1			1						1							1											1			1	1					7
Lesser Grey Shrike		1	1	1	1					1	1						1	1														1						9
Lesser Kestrel			1			1							1								1														1			5
Lesser Spotted Eagle	1		1	1			1	1		1	1				1		1	1					1		1	1					1					1		15
Lesser Whitethroat			1	1				1		1				1	1	1																	1					8
Lesser-spotted Eagle					1																																	1
Levant Sparrowhawk											1																											1
Long-legged Buzzard	1		1		1	1		1	1	1	1	1	1				1	1	1	1			1		1	1			1	1	1	1	1		1	1		24
Mallard										1																1	1	1				1			1			6
Marsh Harrier																						1																1
Marsh Warbler								1		1	1														1					1	1				1			7
Menetries Warbler			1																																			1
Merlin																																				1		1
Mistle Thrush				1			1	1							1																							4
Montagu's Harrier			1																																	1		2

	B5	C4	C5	C6	D3	D4	D5	D6	D7	E2	E3	E4	E5	E6	E7	E8	F2	F3	F4	F5	F6	F7	F8	G3	G4	G5	G6	G7	G8	H5	H6	H7	H8	I6	I7	I8	Total	
Mountain Chiffchaff								1	1	1					1	1																					5	
Northern House Martin	1					1			1	1											1				1			1			1	1					9	
Northern Wheatear		1	1		1	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1		1			1	1	1				26	
Orphean Warbler								1																													1	
Ortolan Bunting	1	1	1	1	1	1	1	1	1	1		1			1	1	1																				13	
Pallid Harrier																													1								1	
Purple Heron					1					1	1																										3	
Radde's Accentor			1		1		1							1	1						1	1						1			1						9	
Red Kite																		1																			1	
Red-backed Shrike	1	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1					1	1	1				1		1	1			1	23	
Red-billed Chough	1	1	1					1					1															1	1								7	
Red-throated Pipit					1		1																		1												3	
Reed Warbler										1																											1	
Ring Ouzel	1	1	1	1	1		1	1						1	1		1	1				1		1				1				1			1	16		
Rock Bunting	1	1	1	1			1	1	1				1		1	1					1															11		
Rock Dove		1																																			1	
Rock Sparrow					1	1			1	1																											4	
Rose-coloured Starling								1										1																			2	
Ruddy Shelduck		1	1			1						1	1									1			1			1									8	
Saker																										1											1	
Sand Martin		1		1				1		1	1							1														1	1				8	
Sedge Warbler											1																										1	
Short-toed Snake Eagle			1			1		1						1											1												5	
Spotted Flycatcher									1	1	1																										3	
Tawny Pipit	1	1	1	1	1	1	1	1	1	1	1				1																					12		
Thrush Nightingale																										1											1	
Tree Pipit		1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1					1	1	1				1	1	1	1	1	1	1	25	
Twite			1		1	1	1				1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	29	
Water Pipit		1	1		1	1	1	1		1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	32

	B5	C4	C5	C6	D3	D4	D5	D6	D7	E2	E3	E4	E5	E6	E7	E8	F2	F3	F4	F5	F6	F7	F8	G3	G4	G5	G6	G7	G8	H5	H6	H7	H8	I6	I7	I8	Total	
Western Rock Nuthatch		1						1																														2
Whinchat		1	1		1	1	1		1	1	1	1	1				1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	28
White Wagtail			1		1			1	1	1							1	1							1	1	1			1								11
White-throated Dipper										1															1	1	1			1								5
White-throated Robin	1		1	1			1																															4
White-winged Black Tern											1																											1
White-winged Snowfinch																						1						1										2
Willow Warbler			1	1	1			1		1	1						1	1	1			1				1			1						1			13
Winter Wren								1		1					1							1										1						5
Wood Sandpiper			1																						1													2
Woodchat Shrike	1				1					1	1																										1	5
Woodlark	1	1	1	1	1		1	1	1	1					1	1																						11
Yellow Wagtail		1		1							1														1	2					1						1	8
Total	26	36	50	37	48	32	29	56	34	63	43	14	17	20	32	25	26	31	11	7	15	28	6	18	33	23	10	30	11	25	25	29	13	12	17	18		

Annex II: Distribution of bird species recorded as breeding during atlas survey work by tetrad.

	B5	C4	C5	C6	D3	D4	D5	D6	D7	E2	E3	E4	E5	E6	E7	E8	F2	F3	F4	F5	F6	F7	F8	G3	G4	G5	G6	G7	G8	H5	H6	H7	H8	I6	I7	I8	Total
Alpine Accentor																						1						1									2
Asian Crimson-winged Finch		1			1																							1									3
Barred Warbler		1		1		1			1	1	1					1	1							1													9
Black Redstart								1							1						1	1					1				1						6
Black-billed Magpie			1		1			1			1				1																						5
Black-headed Bunting	1	1	1	1					1	1						1																					7
Blue Tit								1	1	1						1																					4
Bluethroat					1																				1	1		1		1	1	1			1		8
Bonelli's Warbler										1																											1
Cetti's Warbler								1		1																											2
Chaffinch										1																											1
Chukar								1																													1
Common Buzzard			1							1																											2
Common Chiffchaff								1	1	1						1						1															5
Common Cuckoo	1	1	1	1	1		1	1	1	1	1	1	1		1	1		1				1	1	1		1		1		1	1	1			1	1	25
Common Kestrel		1																										1									2
Common Quail		1					1	1			1																			1					1	1	7
Common Raven		1		1		1	1	1		1									1									1	1	1		1					11
Common Redshank																									1												1
Common Redstart															1																						1
Common Rock Thrush			1	1			1	1	1		1			1	1		1				1	1		1	1			1	1								15
Common Rosefinch				1	1			1		1	1		1		1	1	1		1					1	1					1	1			1			15
Common Sandpiper										1															1	1											3
Common Starling					1				1	1															1						1						5
Common Stonechat									1																												1
Common Swift										1																											1
Common Teal																													1								1

	B5	C4	C5	C6	D3	D4	D5	D6	D7	E2	E3	E4	E5	E6	E7	E8	F2	F3	F4	F5	F6	F7	F8	G3	G4	G5	G6	G7	G8	H5	H6	H7	H8	I6	I7	I8	Total	
Common Whitethroat		1			1	1		1	1	1				1	1	1	1	1						1	1	1				1	1	1		1	1		19	
Common Wood-pigeon				1						1																											2	
Corn Bunting	1	1	1	1	1	1	1		1	1	1			1	1	1	1	1	1																		15	
Corncrake								1			1					1		1																			4	
Eurasian Blackbird	1	1	1	1	1		1	1	1	1					1	1						1										1					13	
Eurasian Crag Martin								1																				1										2
Eurasian Golden Oriole																1																						1
Eurasian Hoopoe	1			1	1	1		1			1	1																									7	
Eurasian Jackdaw					1																																	1
Eurasian Linnet			1	1	1	1	1	1			1	1				1	1	1							1						1			1	1			16
Eurasian Skylark			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	35
European Honey Buzzard										1																												1
Fire-fronted Serin								1																														1
Great Tit					1			1		1					1	1						1																6
Green Warbler								1		1					1																							3
Grey Partridge				1														1				1						1	1		1		1					7
Grey Wagtail					1																																	1
Hooded Crow			1	1												1																						3
Horned Lark						1														1		1						1	1									5
Lesser Grey Shrike				1																																		1
Lesser Spotted Eagle								1		1							1					1																4
Lesser Whitethroat				1	1			1		1				1	1	1																1						8
Lesser-spotted Eagle					1																																	1
Long-legged Buzzard				1				1	1				1				1		1		1							1							1	1		10
Mallard																																1			1			2
Marsh Warbler								1		1															1					1	1				1			6
Mistle Thrush				1			1	1							1																							4
Mountain Chiffchaff										1					1																							2
Northern House Martin																					1				1													2

	B5	C4	C5	C6	D3	D4	D5	D6	D7	E2	E3	E4	E5	E6	E7	E8	F2	F3	F4	F5	F6	F7	F8	G3	G4	G5	G6	G7	G8	H5	H6	H7	H8	I6	I7	I8	Total
Northern Wheatear		1	1		1	1	1				1		1	1	1			1	1	1	1	1			1	1		1			1	1	1				20
Orphean Warbler								1																		1											1
Ortolan Bunting	1	1	1	1	1	1	1	1			1			1	1	1																					12
Radde's Accentor			1		1		1							1	1						1	1						1			1						9
Red-backed Shrike	1	1	1	1	1		1		1	1	1			1	1	1	1	1						1	1					1							17
Red-billed Chough		1						1					1															1	1								5
Ring Ouzel	1	1	1	1	1		1	1						1			1					1		1				1				1				13	
Rock Bunting	1	1	1	1			1	1							1	1																				8	
Rock Sparrow					1	1			1	1																										4	
Ruddy Shelduck		1	1			1						1										1			1			1									7
Saker																										1											1
Sedge Warbler											1																										1
Tawny Pipit	1	1								1	1																										4
Tree Pipit		1			1	1	1	1	1	1	1	1		1	1	1	1	1						1	1	1				1	1	1	1		1	1	23
Twite					1												1		1	1		1		1	1	1		1		1	1		1			12	
Water Pipit										1		1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		23
Western Rock Nuthatch								1																													1
Whinchat						1	1		1	1		1	1				1	1	1				1	1		1	1	1	1	1	1	1	1	1	1	1	22
White Wagtail					1				1																1												3
White-throated Dipper										1															1		1										3
White-throated Robin	1			1			1																														3
White-winged Snowfinch																												1									1
Willow Warbler								1		1																											2
Winter Wren								1		1					1							1										1				5	
Woodlark	1	1	1	1	1		1	1	1	1					1	1																				11	
Yellow Wagtail																									1												1
Total	12	23	22	21	26	13	20	35	19	38	17	6	8	12	25	21	14	11	7	6	7	19	4	13	19	11	5	22	8	15	15	14	7	8	10	5	