



PROJECT: SUPPORT FOR GEORGIA IN THE FIELD OF PROTECTED  
AREA DEVELOPMENT

## Rapid Assessment Report: Mtirala National Park, Kolkheti National Park, Lagodekhi Protected Areas Vashlovani National Park.



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*Tbilisi 2014*



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## **1 Introduction**

The overall purpose of this study was to collect basic ecological data in order to identify and assess potential risks of the proposed new tourist products for the following protected areas: Mtirala National Park (MNP), Kolkheti National Park (KNP), Lagodekhi Protected Areas (LPA) and Vashlovani National Park (VNP).

The assessment was conducted from June through November 2013 and involved the analysis of available information as well as field surveys.

## **2 Approach and methodology**

The overall approach relied on the evaluation of any potential major impacts of the proposed tourist products (including their installation and subsequent operations) on the local species and habitats paying special attention to rare habitats and rare and endemic species. The first steps included identification of potentially sensitive species and identification and mapping of local biotopes (habitats).

After the first scoping surveys and as the tourist products sites were finalised and agreed upon by all partners and the project beneficiary, APA, NACRES experts conducted rapid assessments involving both desktop and field studies.

The rapid assessment was implemented using the *“Guiding paper on the Methodology for the Rapid Assessment of New Tourism Product Sites”* provided by the UNWTO Consulting Unit on Tourism and Biodiversity (SDT). The methodology was reviewed and agreed upon among all partners prior to the actual assessments. The agreed methodology as well as specific objectives for each of the four target PAs were then introduced to the experts.

All available literature and other materials were collected and analysed. Field surveys were conducted in order to fill some of the obvious information. Field trips were also used to identify at least one site in each of the target PAs for potential product development with clear geographical scope.

## **3 Description of activities**

A time-table of field surveys was elaborated and agreed upon with other partners and field trips were coordinated and, where appropriate, combined with other activities to ensure maximum effectiveness.

NACRES experts participated in scoping field trips to the protected areas along with the Project's international consultants and representatives of other partners. In addition to conducting field assessments they participated in meetings with local park administrations and potential guides.

Table below summarises the assessments conducted in the four PAs.

#	Protected Area	Proposed product	Assessment area	Key species and habitats for impact evaluation
1.	Mtirala National Park (MNP)	Zip-line and Canyoning	All potential sites for zip-line and canyoning.	<ul style="list-style-type: none"> <li>– Brown trout (<i>Salmo trutta</i>) and Eurasian otter (<i>Lutra lutra</i>)</li> <li>– Colchic (Kolkheti) forest and endemic plants typical of this forest.</li> </ul>
2.	Kolkheti National Park (KNP)	"Eco-paddling on flat water";	(i) lake Paliastomi with Pichori River and (ii) the Churia River adjacent wetlands	<ul style="list-style-type: none"> <li>– Migratory birds</li> <li>– Important wetland habitats e.g. Rich fens, Raised bog complexes and Estuaries.</li> </ul>
3.	Vashlovani Protected Areas (VPA)	"Geo Trail"	Vashlovani national park and surrounding areas and 3 natural monuments (also part of the VPA); (1) the Artsivi canyon, (2) Khornabuji castle and (3) Takhti-Tepa mud volcano).	<ul style="list-style-type: none"> <li>– Ground nesting birds such as Chukar and Pheasant;</li> <li>– Endemic plants e.g. Georgian iris (<i>Iris iberica</i>)</li> <li>– Large mammals</li> <li>– Rare and sensitive habitats of the semi-arid zone such as arid light woodland, semi-desert, phrygana, etc.</li> </ul>
4.	Lagodekhi Protected Areas (LPA)	3 tourist trails	The vicinities of 3 tourist trails.	<ul style="list-style-type: none"> <li>– Endemic plants e.g. <i>Primula juliae</i>, <i>Gentiana lagodechiana</i>, <i>Paeonia lagodechiana</i>, <i>Galanthus lagodechiana</i>, etc.</li> <li>– Endemic and rare large mammals</li> <li>– Rare and endemic amphibians, reptiles, birds and mammals e.g. Caucasian parsley frog (<i>Pelodytes caucasicus</i>), Caucasian black grouse (<i>Tetrao mlokosiewiczii</i>), Caucasian chiffchaff (<i>Phylloscopus lorenzii</i>), Eastcaucasian tur (<i>Capra cylindricornis</i>);</li> </ul>

#### **4 Results and conclusions**

All necessary data on local habitats and biodiversity were collected through desktop study and field assessments. Main habitats were mapped around the proposed tourist products. Detailed accounts on the rapid assessments conducted in the target PAs as well as habitat maps are provided in the annexes.

The results of the rapid assessments will be used in the site management plan for MNP and site management recommendations for KNP, VPA and LPA.

No obvious major constraints or concerns were revealed for the potential tourism products and/or their proposed sites in the target PAs as far as biodiversity conservation is concerned. With adequate management of the tourist product sites and proper operations any potential impacts may be minimised to insignificant levels.

## **ANNEX 1: Rapid assessments in the target PAs**

### **(I) Mtirala National Park**

The purpose of this study was to identify and assess potential risks of the two new tourist products proposed for Mtirala National Park (MNP): (1) a zip line and (2) canyoning.

Site assessment was carried out in September and November, 2013 and both the proposed canyoning and zip-line sites were assessed.

#### ***Brief information about MNP***

Mtirala National Park is situated in the westernmost part of the Achara-Imereti range, on the Kobuleti-Chakvi ridge and covers 15,698 ha. The park was established in 2006 with the primary purpose to protect an outstanding example of the Colchic forest, a distinct type of forest habitat found in western Georgia. This forest is distinguished by dense evergreen understory and lianas and is remarkably rich in endemic as well as relic species.

The main feature of the park's landscape is mount Mtirala (1,381 m) whose name translates as "crying mountain". Situated between the Black Sea and Achara mountains, this mountain and surrounding areas intercept the humid air coming from the Black Sea and thus become the wettest point in all Achara which is anyway very humid. The annual precipitation at m. Mtirala is over 4,000 mm. It is almost always raining at mount Mtirala, hence its name.

#### ***Ecological aspects***

##### **➤ Biodiversity**

The proposed canyoning pass is located within the Mtirala National Park while the site for a zip-line is just outside the national park boundary.

Much of the Mtirala National Park is Colchic forest composed of deciduous species such as black alder (*Alnus glutinosa*), hornbeam (*Carpinus betulus* and *C. orientalis*), oriental beech (*Fagus orientalis*), and sweet chestnut (*Castanea sativa*). At higher elevations it is also mixed with Nordmann fir (*Abies nordmanniana*), Caucasian Spruce (*Picea orientalis*) and Scots pine (*Pinus sylvestris*). Colchic forest is characterised by a well-developed evergreen undergrowth composed of rhododendron (*Rhododendron ponticum*) Cherry laurel (*Laurocerasus officinalis*), Black Sea holly (*Ilex colchica*), Colchic box tree (*Buxus colchica*) and is distinguished by the abundance of lianas. Among the rare endemics, there are Georgia's Red List species such as Mayflower (*Epigaea gaultheroides*), Primula (*Primula megasaefolia*) and Transcaucasian birch (*Betula medwedewii*).

Below is the list of species that were identified for the assessment for any potential impact by the proposed development:

#### **(A) Fauna**

#	Scientific name	Common name
<b>Mammals</b>		
1	<i>Rhinolophus euryale</i>	Mediterranean Horseshoe bat
2	<i>Barbastella barbastellus</i>	Barbastelle bat
3	<i>Sciurus anomalus</i>	Caucasian squirrel
4	<i>Lynx lynx</i>	Eurasian lynx
5	<i>Ursus arctos</i>	Brown bear
6	<i>Rupicapra rupicapra</i>	Chamois
7	<i>Lutra lutra</i>	Eurasian otter
<b>Birds</b>		
1	<i>Ciconia nigra</i>	Black stork
2	<i>Haliaeetus albicilla</i>	White-tailed eagle
3	<i>Accipiter brevipes</i>	Levant sparrow hawk
4	<i>Aquila clanga</i>	Greater spotted eagle
5	<i>Falco cherrug</i>	Saker falcon
6	<i>Falco vespertinus</i>	Red-footed falcon
<b>Amphibians</b>		
1	<i>Mertensiella caucasica</i>	Caucasian salamander
<b>Reptiles</b>		
1	<i>Vipera kaznakovi</i>	Caucasus viper
<b>Fish</b>		
1	<i>Salmo fario</i>	Brown trout
<b>Insects</b>		
1	<i>Acherontia atropos</i>	Death's-head hawk moth
2	<i>Deilephila nerii</i>	Army green moth
3	<i>Callimorpha dominula</i>	Scarlet tiger moth
4	<i>Parnassius apollo</i>	Mountain apollo
5	<i>Parnassius nordmanni</i>	Caucasian apollo
6	<i>Allancastria caucasica</i>	Caucasian festoon
7	<i>Erebia hewistonii</i>	Hewiston's mountain

## (B) Flora

#	Scientific name	Common name
1	<i>Betula medwedewii</i>	Transcaucasian birch
2	<i>Buxus colchica</i>	Georgian box
3	<i>Castanea sativa</i>	Sweet chestnut
4	<i>Corylus colchica</i>	Colchic hazel
5	<i>Epigaea gaultherioides</i>	Mayflower
6	<i>Juglans regia</i>	Persian walnut
7	<i>Quercus hartwissiana</i>	Hartwiss Oak
8	<i>Quercus pontica</i>	Pontine Oak

9	<i>Rhododendron ungerii</i>	Ungern's <i>rhododendron</i>
10	<i>Staphylea colchica</i>	Colchis bladdernut
11	<i>Taxus baccata</i>	European yew
12	<i>Ulmus glabra</i>	Wych elm

➤ **Recent trends and current threats to biodiversity**

Much of coastal Achara has been heavily transformed over the past two centuries through forest clearing for agriculture including non-native citrus and tea plantations as well as by the introduction of numerous alien subtropical plants for not only agriculture but also for decorative purposes. Clearance for agriculture, urbanization and other development have greatly reduced the range of native Colchic forest alongside with the many species that depend on this forest. Wild goat (*Capra aegagrus*) was once found in the mountains of Achara but completely disappeared at least several decades ago likely because of overhunting. Many species that are found in the natural areas of Achara have unfavourable conservation status or are threatened by illegal/excessive harvesting or habitat destruction and are believed to still show negative trends. Mass leaf-dropping and dying of the Georgian box which has taken place throughout western Georgia is also evident in Mtirala national park and adjacent areas. Some plants have apparently survived and are now recovering from the allegedly fungal disease.

Currently main threats to biodiversity of the Achara region (including marine ecosystems) include: illegal logging, illegal hunting, non-sustainable fishing, hydropower development, transport and infrastructure development, invasive alien species, and potentially also mass tourism. Both tourism and agriculture dropped sharply after the breakup of the Soviet Union. Currently agriculture is growing but still seems to be confined to the limits of the soviet time boundaries. So no major new encroachment of natural habitats is notable.

**Development zones and tourism zones**

Mtirala National Park is situated in Achara, which is the prime destination of Georgia's coastal tourism industry. The nearby port cities - the regional capital, Batumi as well as Poti are important gateways for the shipping of goods heading into Georgia, Azerbaijan and landlocked Armenia. The port of Batumi is used for the shipment of oil from Kazakhstan and Turkmenistan. Its oil refinery handles Caspian oil from Azerbaijan which arrives by a pipeline to Supsa port and is transported from there to Batumi by rail.

Investment activity has been high for the last years and some of the fast growing sectors in the region include infrastructure, tourism, construction and agriculture.

**Ecologically sensitive zones**



In the wider Achara region landslides are frequent and often devastating, especially in the high mountain areas. Within the Mtirala national park however no major ecologically sensitive zones have been identified nor are there any zones where major ecological disasters have taken place.

Heavy rains are of course a typical feature of the whole Achara coast and especially Mtirala national park.

## **Conclusions**

No obvious serious constraints or concerns were revealed for the potential tourism products and/or their proposed sites in Mtirala national park as far as biodiversity conservation is concerned.

The proposed site for a zip-line is outside the protected area and largely represents a stand of planted walnut trees.

The proposed site for canyoning represents a section of the river Chakvistiskali and three red list species were identified as potentially at risk of being impacted by the development and/or operations. These include: brown trout (*Salmo trutta*), Eurasian otter (*Lutra lutra*) and Caucasian salamander (*Mertensiella caucasica*).

The Caucasian salamander is a habitat specialist, found mainly in beech (*Fagus orientalis*), coniferous (*Abies nordmanniana* and *Picea orientalis*), box forest (*Buxus spp.*), in shrub forest, mixed forests, the subalpine belt and in alpine meadows. However it is important to note that this species tends to avoid large streams and prefers the tributaries of rivers, usually no more than 1-1.5 m in width and about 20-30 cm in depth in spring. It also breeds in small streams. In general, Caucasian salamander is very sensitive to human factors and avoids altered landscapes. According to some authors the Mtirala NP park and adjacent areas is home to a distinct subspecies *Mertensiella caucasica djanaschvilii*.

During the surveys in Mtirala, salamanders were not noted at the proposed canyoning site i.e. within the immediate section of the river that is probably too large for this species but it is likely to be present in the small tributaries.

Brown trout inhabit probably all streams and rivers on MNP and spawn in fast waters. Spawning sites usually characterised by downward movement of water into gravel. In relatively significant numbers these species was noted in the canyoning site only during the late autumn i.e. outside of the canyoning season.

The Eurasian otter lives in a wide variety of aquatic habitats including highland and lowland lakes, rivers, streams, marshes, swamp forests and coastal areas. In Georgia, among other habitats, they are found in mountain rivers in which brown trout still remain. Fresh tracks and spraints of otter were found throughout MNP all year round. However these animals apparently use the canyoning site in late autumn during which time this section of the river has more trout.

With adequate management of the canyoning site and proper operations as well as close monitoring, any potential impact may be minimized on those species.

## (II) Kolkheti National Park

The purpose of this study was to assess potential risks of the new tourist product proposed for Kolkheti National park (KNP), Eco-paddling.

Site assessment was carried out on two potential sites for eco-paddling: (1) Lake Paliastomi with Pichori River and (2) Churia River with its wetlands in August and November, 2013.

### **Brief information about Kolkheti National Park**

Kolkheti National Park (KNP) is situated at the Black Sea coast and covers an area of 28,940 hectares. It was established in 1998 and incorporated the much smaller (500 ha) Kolkheti State Nature Reserve, which was founded in 1947. KNP also includes lake Paliastomi. In 1997, Kolkheti wetlands were designated as a wetland of international importance - a Ramsar site under the Ramsar Convention on Wetlands.

The territory of KNP is networked by numerous bog-type small stagnant rivers (Pichori, Kukani, Dedabera, Tkhorina, Tsia, Tsiva, Churia, Munchia, Mukhurjina, etc.). Peat bogs are an important feature of the national park. The Anaklia, Churia, Nabada, Imnati, Maltakva, Grigoleti and Pichori peat bogs contain contemporary and fossil unbroken peat layers are located in the coastal plain and the depth of the peat layers in certain places exceeds 12 meters.

KNP is on a major migration route for water birds and it is also an important wintering site and receives millions of migrating or wintering birds.

### **Ecological aspects:**

#### ➤ **Biodiversity**

More than half the total area of the park - 15,742 ha is wetlands. There are numerous stagnant rivers and streams flowing in the coastal plain at an elevation of 0 –10 meters. A narrow strap of dunes, about 100-200-meters in width is developed along the Black Sea shore that rises 2-3 m above the coastal plain.

The warm, humid climate and the abundant hydrographical network have created perfect conditions for rich flora and diverse vegetation. The coastal peat bogs are home to the Boreal flora species - sphagnum mosses (*Sphagnum spp.*), *Drosera roxundiflora*, *Drosera rotundifolia*, *Rhinchospora aflu*, *Carex lasiocarpa*, *Menianthes trifoliata*, etc. *Rhododendron flavum* and *Rhododendron ponticum* are an important feature of the landscape. The swamped and wetland forests feature *Alnus barbata*, *Pterocarya pterocarpa*, *Quercus imeretina*, *Quercus hartwissiana*, etc. These so called Colchic forests are distinguished by the evergreen undergrowth and lianas including *Hedera colchica*. Aquatic plants, such as *Nymphaea alba*, *Trapa colchica*, etc., are common in the peat bogs, lakes, swamp rivers and along them. There is distinct vegetation on the narrow strap of sand dunes with typical salt tolerant xerophytes and ephemerals such as *Hippophae rhamnoides*, *Paliurus spinachristi*, *Imperata cylindrical*, *Cynodon dactylon*, *Pancratium maritimum*, *Glaucum corniculatum*, etc.

The flora of KNP is remarkably rich in relic and endemic species (*Alnus barbata*, *Pterocarya pterocarpa*, *Quercus imeretina*, *Quercus hartwissiana*, *Trapa colchica*, etc.).

Up to 200 bird species are found in the national park including several species listed on the IUCN and Georgian Red Lists. There are more than 40 fish species.

Below is the list of species that were identified for the assessment for any potential impact by the proposed development:

**(a) Fauna**

#	Scientific name	Common name
Mammals		
1	<i>Rhinolophus mehelyi</i>	Mehely's horseshoe bat
2	<i>Myotis bechsteinii</i>	Bechstein's bat
3	<i>Miniopterus schreibersii</i>	Common bent-wing bat
4	<i>Nyctalus leisleri</i>	Lesser noctule
5	<i>Canis aureus</i>	Golden jackal
6	<i>Canis lupus</i>	Grey wolf
7	<i>Lutra lutra</i>	Eurasian otter
8	<i>Capreolus capreolus</i>	Roe deer
9	<i>Tursiops truncatus ssp. ponticus</i>	Black Sea Bottlenose Dolphin
10	<i>Delphinus delphis ssp. ponticus</i>	Black Sea Common dolphin
11	<i>Phocoena phocoena ssp. relicta</i>	Black Sea Harbour Porpoise
Birds		
1	<i>Ciconia nigra</i>	Black Stork
2	<i>Egretta alba</i>	Great Egret
3	<i>Podiceps cristatus</i>	Great crested grebe
4	<i>Podiceps grisegena</i>	Red-necked grebe
5	<i>Podiceps nigricollis</i>	Black-necked grebe
6	<i>Phalacrocorax carbo</i>	Great cormorant
7	<i>Grus grus</i>	Crane
8	<i>Ardeola ralloides</i>	Squacco heron
9	<i>Platalea leucorodia</i>	Eurasian spoonbill
10	<i>Plegadis falcinellus</i>	Glossy ibis
11	<i>Anser erythropus</i>	Lesser white-fronted goose
12	<i>Tadorna ferruginea</i>	Ruddy shelduck
13	<i>Tringa stagnatilis</i>	Marsh sandpiper
14	<i>Gallinago media</i>	Great snipe
Amphibians		
1	<i>Triturus vulgaris</i>	Common newt
2	<i>Triturus vittatus</i>	Southern banded newt
3	<i>Hyla arborea</i>	European tree frog
4	<i>Rana ridibunda</i>	Marsh frog
Reptiles		
1	<i>Emys orbicularis</i>	European pond turtle
2	<i>Anguis fragilis</i>	Slow worm
3	<i>Natrix natrix</i>	Grass snake
4	<i>Natrix tessellata</i>	Dice snake

5	<i>Elaphe longissima</i>	Aesculapian snake
#	Fish	
1	<i>Huso huso</i>	European sturgeon
2	<i>Acipenser sturio</i>	European sea sturgeon
3	<i>Acipenser nudiventris</i>	Bastard sturgeon
4	<i>Acipenser stellatus</i>	Starry sturgeon
5	<i>Acipenser gueldenstaedtii</i>	Russian sturgeon
6	<i>Acipenser persicus</i>	Persian sturgeon

## (B) Flora

#	Scientific name	Common name
2	<i>Drosera rotundifolia</i>	Common sundew
3	<i>Rhynchospora alba</i>	White beak-sedge
4	<i>Carex lasiocarpa</i>	Slender sedge
5	<i>Menyanthes trifoliata</i>	Bogbean
6	<i>Hedera colchica</i>	Colchis ivy
7	<i>Quercus imeretina</i> ( <i>Quercus robur</i> ssp. <i>Imeretina</i> )	Imeretian oak
9	<i>Quercus hartwissiana</i>	Tanniniferous oak
10	<i>Alnus barbata</i> ( <i>Alnus glutinosa</i> subsp. <i>Barbata</i> )	Black alder
11	<i>Pterocarya pterocarpa</i>	Caucasian walnut
12	<i>Nymphaea alba</i>	European white waterlily
13	<i>Rhododendron flavum</i>	Pontic azalea
14	<i>Rhododendron ponticum</i>	Pontic rhododendron

There are the following main wetland habitats: (a) Littoral sand and muddy sand, (b) Raised bogs, (c) Rich fens, (d) Moist or wet oligotrophic grassland and (e) Estuarine coarse sediment shores.

### ➤ Recent trends and current threats to biodiversity

Since 1960s, an estimated 60% of wetland area in the wider Kolkheti lowland area has been drained for pastures, agriculture and horticulture and urbanization.

The increasing degradation of the remaining wetlands is caused by such factors as pollution, eutrophication, peat exploitation, over-exploitation of fauna (poaching), illegal logging, drainage, overgrazing, sand and gravel extraction, regulation of water flow and invasive species. Major developments are also in the pipeline, including the ambitious and controversial new city (Lazika) in the Anaklia area, oil storage and transfer facilities, etc.

Clearance for agriculture, urbanization and other development have greatly reduced the range of native Colchic forest too. The wetland shrub and forest are also the original habitat of the Colchic (Common) pheasant *Phasianus colchicus* which has been introduced as a game species into many countries worldwide. Both habitat encroachment and hunting have now reduced the pheasant population to a critical level and their reintroduction is now being considered.

### **Development zones and tourism zones**

The nearby port city of Poti is an important gateway for the shipping of goods heading into Georgia, Azerbaijan and landlocked Armenia. The Poti sea port is the largest in Georgia.

There is Supsa Oil terminal close to the Kolkheti National Park. This terminal has been in operation since 1999. It provides storage capacity for crude oil transported via the Western Route Export Pipeline (WREP) before loading to oil tankers via offshore loading facilities.

### ***Ecologically sensitive zones***

KNP is subject to strong coastal winds. Strong wind can cause storm waves on lake Paleastomi and neighbouring channels hence the treacherous reputation of this lake. Ferry movement during the storm may be very risky on the lake.

Floods are common in KNP and it is important to note that most of the park's territory used by visitors is under the sea level.

### ***Conclusions***

No obvious serious constraints or concerns were revealed for the potential tourism product and/or their proposed site in Kolkheti national park as far as biodiversity conservation is concerned.

The proposed site for eco-paddling represents a section of the river Churia and one red list species Eurasian otter (*Lutra lutra*) was identified as potentially at risk of being impacted by the development and/or operations. With adequate management of the site and proper operations as well as close monitoring, any potential impact may be minimized.

### (III) Lagodekhi Protected Areas

The purpose of this study was to collect basic ecological data in order to identify and assess potential risks of the new tourist products proposed for Lagodekhi Protected Areas (LPA): (1) Machi Castle trail, (2) Black Grouse waterfall trail and (3) Nature interpretation path.

Site assessment was carried out in October, 2013 and all proposed sites were assessed.

#### **Brief information about LPA**

LPA is situated on the Southern aspects of the far Eastern end of the Kakheta section of the Great Caucasus range. The Lagodekhi reserve was founded in 1912 and was the first protected area in Georgia. The reserve was expanded three times-in 1936, 1970 and 2003. In its current form LPA was set up in 2003 and includes the Lagodekhi Strict Nature Reserve and Lagodekhi Managed Nature Reserve.

LPA is characterized by a complicated relief and geomorphological structure, with a wide diversity of soil and climatic conditions. The elevation ranges between 400 m. and 3,500 m. above sea level. These features account for high diversity of flora and vegetation.

The main watersheds are the Ninigori, Kudigori and Kochalo. The latter is a complicated mountain system that contains a great number of fork mountain ranges and gorges. Among them, the Salevistskali and Bneli gorges are the largest.

The main rivers of the Lagodekhi reserve are the Ninostskali, the Shromistskali, the Lagodekhistskali and the Matsimistskali. There are also numerous creeks, streams and springs. The rivers frequently change their beds, particularly after flooding.

Climatic conditions vary throughout the reserve depending on the altitude (see Table below) as well as aspect. Subnival and Alpine zones are characterized by the most severe climatic conditions, whereas the Forested zone (especially in the middle and lower regions) has milder climatic conditions.

#### **Biodiversity**

##### ➤ **Flora and Vegetation**

More than 1,000 vascular plants have been recorded in the Lagodekhi reserve, at least 130 of which are endemic to the country or the Region.

Among rare endemic species, the following flora is believed to be highly threatened:

#	Scientific name	Common name
1	<i>Primula juliae</i>	Primula
2	<i>Gentiana lagodechiana</i> ( <i>Gentiana septemfida</i> var. <i>lagodechiana</i> )	Lagodekhi Crested Gentian
3	<i>Paeonia mlokosewitschii</i> ( <i>Paeonia daurica</i> subsp. <i>Mlokosewitschii</i> )	Caucasian peony

4	<i>Paeonia lagodechiana</i> ( <i>Paeonia daurica</i> subsp. <i>Lagodechiana</i> )	Lagodekhi peony
5	<i>Galanthus lagodechianus</i>	Snowdrops
6	<i>Staphylea pinnata</i>	European bladdernut
7	<i>Vitis sylvestris</i> ( <i>Vitis vinifera</i> ssp. <i>Sylvestris</i> )	wild grapevine

As mentioned above, LPA shows a distinct altitudinal character where environmental conditions change dramatically with the altitudinal gradient. Most species inhabiting the reserve also show vertical distribution patterns and some species also have seasonal vertical movement. It is logical to divide the reserve's territory into the following altitudinal segments: a) Forest (400-1,850 m.a.s.l.); b) Subalpine zones (1,850-2,200 m.a.s.l.); c) Alpine zone (2,450-3,000 m.a.s.l.); d) Subnival zone (3,000-3,500 m.a.s.l.).

The above altitudinal segments differ greatly in respect of relief, climatic conditions and vegetation cover. Using altitude and vegetation as the main criteria, the forested segment of the reserve may be divided into three zones: the lower, middle and upper forest zones. The boundaries between these zones are not always clear.

Most visitors to LPA remain within the lower forest zone during their visit.

#### ➤ Fauna

The fauna of LPA is remarkably rich and includes numerous endemic and rare species. Of hundreds of insects recorded in the reserve many are rare including: *Lucanus cervus*, *Celerio vesperilio*, *Callimorpha hera*, *Callimorpha dominula*, and *Polyommatus daphnis*. There are 600 species of *Lepidoptera*; among spiders the Caucasian tarantula is noteworthy. Among the Caucasian endemic birds, the Caucasian black grouse (*Tetrao mlokosiewiczii*), Caucasian snowcock (*Tetraogallus caucasicus*) as well as the endemic East Caucasian tur (*Capra cylindricornis*) are noteworthy vertebrates. More than 40% of all Georgian mammal species are found in the Lagodekhi reserve.

Below is the list of species that were identified for the assessment for any potential impact by the proposed development:

#### (a) Fauna

#	Scientific name	Common name
Mammals		
1	<i>Cervus elaphus</i>	Red deer
2	<i>Rupicapra rupicapra</i>	Chamois
3	<i>Capreolus capreolus</i>	Roe deer
4	<i>Sus scrofa</i>	Wild boar
5	<i>Ursus arctos</i>	Brown bear
6	<i>Canis lupus</i>	Grey wolf
7	<i>Lynx lynx</i>	Eurasian lynx
Birds		
1	<i>Tetrao mlokosiewiczii</i>	Caucasian grouse
2	<i>Tetraogallus caucasicus</i>	Caucasian snowcock

3	<i>Phylloscopus lorenzii</i>	Caucasian chiffchaff
4	<i>Gypaetus barbatus</i>	Bearded vulture
5	<i>Gyps fulvus</i>	Griffon vulture
6	<i>Falco tinnunculus</i>	Common kestrel
7	<i>Accipiter gentilis</i>	Northern goshawk
8	<i>Accipiter nisus</i>	Eurasian sparrowhawk
9	<i>Aquila chrysaetos</i>	Golden eagle
#	Amphibians	
1	<i>Bufo verrucosissimus</i>	Caucasian toad
2	<i>Pelodytes caucasicus</i>	Caucasian parsley frog
3	<i>Rana macrocnemis</i>	Long-legged wood frog
4	<i>Rana ridibunda</i>	Marsh frog
5	<i>Hyla arborea</i>	European tree frog
#	Reptiles	
1	<i>Darevskia caucasica</i>	Caucasian lizard
2	<i>Darevskia derjugini</i>	Derjugin's Lizard
3	<i>Darevskia praticola</i>	Meadow Lizard
4	<i>Vipera lotievi</i>	Lotiev's Viper
#	Fish	
1	<i>Barbus lacerta</i>	Kura barbel
2	<i>Leuciscus cephalus</i>	European chub
3	<i>Alburnoides bipunctatus</i>	Spirlin
4	<i>Salmo trutta</i>	Brown trout

## (B) Flora

#	Scientific name	Common name
1	<i>Primula juliae</i>	Primula
2	<i>Gentiana lagodechiana</i> ( <i>Gentiana septemfida</i> var. <i>lagodechiana</i> )	Lagodekhi Crested Gentian
3	<i>Paeonia mlokosewitschii</i> ( <i>Paeonia daurica</i> subsp. <i>Mlokosewitschii</i> )	Caucasian peony
4	<i>Paeonia lagodechiana</i> ( <i>Paeonia daurica</i> subsp. <i>Lagodechiana</i> )	Lagodekhi peony
5	<i>Galanthus lagodechianus</i>	Snowdrops

### **Habitats and species of the proposed tourist sites**

All 3 proposed tourist trails and infrastructure are located within the boundaries of Lagodekhi Protected Areas. More than half of the proposed Black grouse trail is within managed reserve, but about 4 km of the path crosses the Lagodekhi reserve. Also the whole trail in Matsimi gorge is within the borders of Lagodekhi reserve. The trails themselves are not part of the reserve, so visitors are allowed to use it.

All the proposed trails in Lagodekhi Protected Areas are confined to the lower forest zone. This zone has sections of relatively soft relief as well as extremely rugged terrain with deep and narrow gorges,



steep rocky slopes and waterfalls. The forest is mainly composed of beech (*Fagus orientalis*). The undergrowth is non-existent or poorly developed. Where vegetation does occur, the typical sub-forest species are *Rubus caucasicus*, *Cephalanthera lonchophyllum*, *Neottia nidus avis*, *Athyrium filix femina*, *Dryopteris filix mas*). Non-woody vegetation cover usually develops only in forest openings. South-western and South-eastern aspects are characterized by hornbeam and mixed broad-leaf stands.

The Black grouse trail begins from the LPA administration centre (560 m.), goes through the ravine of the Lagodekhis-khevi river and ends at 980 m. above sea level near the waterfall recently named as Black Grouse waterfall. As mentioned above the trail is completely within the lower forest zone. Thus, broad leaf forest is the only habitat represented along the trail. Nevertheless this habitat is not homogenous and the following forest types are distinguishable: (a) Beech forest; (b) Hornbeam forest and (c) Georgian oak forest. Along the trail the Hornbeam forest is most common forest type and Georgian oak is present only on small patches. Beech forest is found at the waterfall.

The Matchis castle trail begins from the Matsimi rangers shelter at 430 m.a.s.l. and goes along the river Matsimchai ending at 1,020 m.a.s.l. near Matchis castle. It is entirely within the lower forest zone. The habitat is broadleaf forest which is dominated by Caucasian hornbeam. Mixed deciduous forest and Oriental hornbeam (*Carpinus orientalis*) forest stands are also found in smaller patches - The trail starts in hornbeam forest, continues through mixed deciduous forest and crosses small patch of hornbeam forest.

Below is a detailed description of the forest types encountered on the two trails.

- **Beech forest (*Fageta; F. orientalis*)**

This is the most common and characteristic vegetation class of LPA. It occurs within the altitudinal range of 450-500 m. to 2,100-2,150 m. and is represented by many specific variants (plant communities), the most important of which are:

Beech forest with dead forest floor (*Fagetum rubosum*). This variant occurs very commonly at an altitudinal range of 600 to 1,350 m.a.s.l. Undergrowth and grass cover are practically non-existent.

Beech forest with blackberry (*Fagetum rubosum*) undergrowth. These communities occur throughout the reserve at the altitudinal range of 650-1,850 m.a.s.l. Typical tree species (apart from beech) include *Carpinus caucasica* and *Tilia begoniifolia*. The undergrowth is composed of *Corylus avelana* and *Sambucus nigra*. Among the herbs, there are *Galium odoratum*, *Athyrium filix femina*, *Dryopteris filix-mas*, and *Pachypragma macrophyllum*.

Beech forest with dense ivy cover (*Fagetum hederosum*). These communities are typically found along the rivers, at 500-1,000 m.a.s.l. Characteristic species include: *Carpinus caucasica*, *Tilia begoniifolia*, *Acer velutinum*, and *Fraxinus excelsior*. The ivy (*Hedera pastuchowii*) cover is developed unevenly on the ground. Among shrubs, *Rubus caucasicus* is most common. Characteristic species also include *Dryopteris filix-mas*, *Pachypragma macrophyllum*, *Galium odoratum*, *Circea lutetiana* and *Phyllitis scolopendrium*.

- **Hornbeam forest (*Carpineta; Carpinus caucasica*)**

Hornbeam forests are one of the most characteristic and widespread plant communities in LPA. They occur mainly at 450-1,500 m.a.s.l. and are well-represented on the relatively flat sections of the downstream areas of the Shromiskhevi, the Lagodekhiskevi and the Matsimchai rivers. Characteristic tree species include *Castanea sativa*, *Quercus iberica* and *Acer laetum*. Other important species are: *Rubus caucasicus*, *Corylus avelana*, *Mespilus germanica*, *Euonymus latifolia*, *Dryopteris fliix-mas*, *Salvia glutinosa*, *Pachyphragma macrophyllum*, *Geum urbanum*, *Viola odorata*, *Fragaria vesca*, etc.

- **Georgian oak forest (*Querceta*; *Quercus iberica*)**

Georgian oak forest has a limited distribution in LPA. Patches of this forest are found in the gorges of the Shromis-khevi, the Lagodekhis-khevi and the Matsimchai at the altitudes 400 to 950 m.a.s.l. Characteristic species are *Carpinus caucasica*, *Tilia begoniifolia*, and *Fraxinus excelsior*. The undergrowth is composed of *Cornus mas*, *Mespilus germanica*, *Lonicera caprifolium*, *Lonicera caucasica*, *Corylies avelana*, etc. In some places *Carpinus orientalis* dominates the under-forest. Among non-woody plants, the most important species are *Festuca Montana*, *Galium odoratum*, *Primula woronowii*, *Lathurus roseus*, *Braphypodium sylvaticum*, *Dactylis glomerata*, and *Viola odorata*.

- **Oriental hornbeam forest (*Carpineta*; *Carpinus orientalis*)**

Oriental hornbeam forest occur mainly at 400-600 m.a.s.l. namely on the planes of the lower reaches of the river Matsimchai. Characteristic tree species include *Castanea sativa*, *Quercus iberica* and *Acer laetum*.

- **Mixed deciduous forest (*Silvae mixtae frondosa*)**

Within the boundaries of LPA, mixed deciduous forests are found on slopes situated on proluvial terraces in the middle and lower sections of the rivers Ninoskhevi, Shromiskhevi, and Matsimchai within altitudes of 450-1,100 m.a.s.l. These polidominant forests are composed of: *Fagus orientalis*, *Carpinus caucasica*, *Tilia begoniifolia*, *Fraxinus excelsior*, *Acer velutinum*, *Quercus iberica*, *Castanea sativa*, *Acer laetum*.

### **Fauna and flora species**

The trails trespass the ranges of the following large mammal species: Brown bear (*Ursus arctos*), Grey wolf (*Canis lupus*), Raccoon (*Procyon lotor*), Lynx (*Lynx lynx*), Roe deer (*Capreolus capreolus*), Red deer (*Cervus elaphus maral*), Wild boar (*Sus scrofa*), Red fox (*Vulpes vulpes*), Badger (*Meles meles*); Wild cat (*Felis silvestris*); Pine marten (*Martes martes*); Stone marten (*Martes foina*); and Weasle (*Mustela nivalis*). Rarely, during the winter months East Caucasian Tur (*Capra cylindricornis*) and Chamois (*Rupicapra rupicapra*) may also be encountered in the upper parts of the trail.

In total, 51 bird species have been recorded in Lagodekhi PA, among them the following species could be observed along both trails - Raven (*Corvus corax*), Quail (*Coturnix coturnix*), Cuckoo (*Cuculus canorus*), Great spotted woodpecker (*Dendrocopos major*), Black woodpecker (*Dryocopus martius*), Shore lark (*Eremophila alpestris*), Robin (*Erythacus rubecula*), Kestrel (*Falco tinnunculus*), Honey buzzard (*Pernis apivorus*) and Black redstart (*Phoenicurus ochruros*).

LPA is home to several endemic plant species and some of them grow along the tourist trails. Rare endemic plant species found along the trails include:

1. *Galanthus lagodechianus*
2. *Paeonia lagodechiana*
3. *Primula juliae*

#### *Invasive plant species*

A number of alien plant species grow in the lower forest zone of Lagodekhi. This aspect should be taken into consideration since visitors may support their further invasion.

Invasive species found along the trails are as follows:

1. Princess tree (*Paulownia tomentosa*)
2. Honey locust (*Gleditsia triacanthos*)
3. Tree of heaven (*Ailanthus altissima*)

#### ➤ **Recent trends and current threats to biodiversity**

At the end of last century human pressure on wildlife was extremely high in Lagodekhi. The numbers as well as the spatial distribution and movement patterns of most of the key mammal species were heavily affected by human influences, primarily poaching. The status of the wildlife was extremely poor as compared to that of habitats and vegetation. Among the threats poaching was the most important human factor affecting large mammal populations. Consequently, the numbers of mammals were alarmingly below the habitats' carrying capacities.

Decades ago intense logging of fallen trees was noted throughout lower parts of the reserve in which access roads were available. Fuel wood from managed reserve zone was taken away on trucks namely in Lagodekhis-khevi and Shromis-khevi areas. Fallen trees were cut not only in the managed reserve zone but sometimes in strict nature reserve too.

Parts of the reserve are still being used for livestock grazing or for sheep migration to other areas. Grazing is most common in the Sabatkne and Kabali (the latter area was only recently included in the reserve). Sheep grazing does not occur in winter. But cattle are being grazed in lower areas of the managed reserve almost all year round. Livestock grazing in general apparently has less direct effect on the populations of key mammal species than poaching.

Presently both logging and poaching pressures have been reduced due to effective law enforcement and proper management.

Local people have always collected various forest products including chestnuts, mushrooms, medicinal plants, and berries.

Invasive plant species have been noted in lower parts of the reserve. Such invasive species as *Pavlovnia tomentosa*, *Gleditsia triacanthos* and *Ailanthus altissima* were recorded in lower parts of the Shromistskali, Lagodekhistskali and Matsimistskali river gorges. The rate of invasion of *Pavlovnia*

*tomentosa* and *Gleditsia triacanthos* seems high on riverbanks. There are small stands of these plants everywhere and numerous young plants and seedlings are noticeable. They may pose a threat to the native riparian forest and to species such as Alder (*Alnus barbata*) and other rare plants (e.g. *Pterocaria pterocarpa*). The issue of invasive plant species needs further studies to define adequate management measures.

### **Development zones and tourism zones**

No major development or tourism zones have been identified near LPA.

While understanding that the use of the reserve for tourism and recreation is a reflection of one of the important values of this unique protected area, it is also important that human presence be strictly controlled.

In 2013, a total of 24,458 tourists visited LPA, of which about 82% were Georgians and 18% were foreign nationals. The peak tourist season is from May to November. Mostly visitors do not hire a local guide and are not accompanied by a ranger. At present waste is the most obvious form of visitor impact on LPA.

### ***Ecologically sensitive zones***

Lagodekhi is characterized by a humid climate. The site abounds in water courses. All the main rivers originate in the high mountains and create numerous water cascades and waterfalls before flowing into the lower zones of LPA.

Flash floods and strong winds are common. They mainly occur in summer and autumn. Years ago tornado like wind destroyed a section of the forest which is now occupied by young forest. During the flash floods the rivers become totally unpredictable often changing course, destroying banks and riparian vegetation as well as bridges and tourist trails.

### ***Conclusions***

No obvious serious constraints or concerns were noted for the potential tourism products and/or their proposed site in Lagodekhi protected areas as far as biodiversity conservation is concerned.

All proposed sites have long been used as tourist trails and no additional impact by the development and/or operations are envisaged provided proper management can be put in place.

Along both trails endemic species and tree sprouts could be damaged by visitors if they do not obey regulations and attempt to go off trail or choose to pick flowers, leave behind waste, etc. With adequate management of the site and proper operations as well as close monitoring, any potential impact may be minimized.

#### **(IV) Vashlovani Protected Areas**

The purpose of this study was to collect basic ecological data in order to identify and assess potential risks of the new tourist trails proposed for Vashlovani Protected Areas (VPA) entitled: (1) “With vultures over mud volcanoes” (one day trip) and (2) “The Land of Hidden Water” (a 2 day- trip).

Site assessment was carried out not only in Vashlovani protected areas but also throughout the Dedoplistskaro district along the planned trails in July, August and November, 2013.

##### ***Brief information about VPA***

Vashlovani Protected Areas are situated in the extreme eastern part of Georgia, in the Dedoplistskaro district. Vashlovani reserve was established in 1928. Since then it has been expanded several times. The last reorganization took place in 2003 that resulted in the Vashlovani Protected Areas (VPA) consisting of Vashlovani Strict Nature Reserve, Vashlovani National Park and four Natural Monuments: “Eagle Gorge”, “Takhti-Tepa mud volcanoes”, “Juma Bay” and “Alazani Floodplains”. The total area of VPA is 33 594 ha.

The area features a mosaic of rugged and relatively flat terrain with planes, hills, clayey steeps and dry gullies. Light forests are mainly found on slopes of 11-20°. In the northern and southern parts there are so-called ‘alesilebi’ – precipices that can be as high as 70 m. The Vashlovani area represents typical badlands. The altitude ranges between 90 to 845 m.a.s.l.

Local climate is characterized by dry, hot summers with a maximum temperature of 39 °C. The mean annual temperature is 11.6 °C (August 23.8 °C, January 0.5 °C). The mean annual precipitation is 470 mm. The vegetative period begins in mid-April and lasts through October.

There are two major rivers Alazani and Mlashetskali in the national park. There are also numerous streams and small rivers that completely dry up in summer. During the summer, water remains only in small ponds in shaded gullies.

##### ***Biodiversity***

###### **➤ Flora and vegetation**

More than 400 vascular plants (from 81 families and 294 genera) have been recorded in Vashlovani. Two of them are Georgian and 34 are Caucasian endemics.

The vegetation of Vashlovani protected areas (Vashlovani National park and Vashlovani Nature Reserve) is characterized by remarkable diversity of plant communities some of which are represented in a number of variants and formations.

The most common plant communities include:

- Lowland and foothills deserts

- Phrygana-like vegetation
- Steppe
- Shibliak-like hemixeropilous scrub
- Arid light woodlands
- Foothills deciduous forest

There are also patches of flood plain forest, hygrophilous vegetation, humid scrub (conditional term), meadow-steppe, tragacanth and tomillar vegetation.

Of the above vegetation classes, lowland deserts, arid light woodlands, steppe and foothills forest are the zonal vegetation of the region (Kiziki district of Kakheti, East Georgia). The others are largely intrazonal and their occurrence is accounted for by local terrain and soil conditions.

The great variation in terrain and soil features results in a mosaic within the zonal vegetation. This is best expressed in the Kumuro and Bugha-Moedani areas as well as in the Lekistskali gorge in which areas desert, steppe and arid woodland communities are found in a complicated mosaic. The natural pattern of vegetation distribution has been greatly affected by human influence as a result of which secondary vegetation is also common throughout the study area.

Formerly cultivated lands feature vegetation that is drastically different from the surrounding undisturbed areas. A very distinct vegetation is also found at or near the livestock farms.

#### ➤ Fauna

A total of 16 species of fish inhabit the river Alazani, including sheat-fish, carp, pike, tusk, barbell etc. Most of the semiarid zone lies within the Iori Region IBA (Important Bird Area GE011; BirdLife International 2012). The IBA is important for breeding and wintering birds of prey (25 species recorded) and the steppe bird assemblage.

The vertebrate fauna of Vashlovani is remarkably rich in reptiles and raptors. There are 25 reptiles including Mediterranean tortoise, Caucasian agama and Caucasian sand boa and deadly poisonous Levantine's viper.

The diversity of small and large mammals is also noteworthy. A total of 46 species of mammals are found and the assemblage of large mammals is especially noteworthy : jackal, fox, lynx, brown bear, wolf, jungle cat, etc.

Various birds of prey are found in large numbers including imperial eagle, griffon vulture, Egyptian vulture, black vulture, buzzards, short-toad snake eagle, etc.

Below is the list of species that were identified for the assessment for any potential impact by the proposed development:

#### (A) Fauna

#	Scientific name	Common name
	<i>Mammals</i>	
1	<i>Canis lupus</i>	Grey wolf
2	<i>Lynx lynx</i>	Eurasian lynx
3	<i>Sus scrofa</i>	Wild boar

4	<i>Gazella subgutturosa</i>	Goitered gazelle
5	<i>Ursus arctos</i>	Brown bear
6	<i>Lutra lutra</i>	Eurasian otter
<b>Birds</b>		
1	<i>Gyps fulvus</i>	Griffon Vulture
2	<i>Aegypius monachus</i>	Black Vulture
3	<i>Neophron percnopterus</i>	Egyptian Vulture
4	<i>Aquila heliaca</i>	Imperial Eagle
5	<i>Aquila nipalensis</i>	Steppe Eagle
6	<i>Circaetus gallicus</i>	Short-Toed Snake-Eagle
7	<i>Falco peregrinus</i>	Peregrine
8	<i>Grus grus</i>	Crane
9	<i>Anthropoidesvirgo</i>	Demoiselle Crane
10	<i>Bubo Bubo</i>	Eagle Owl
11	<i>Athene noctua</i>	Little Owl
12	<i>Coracias garrulous</i>	Roller
13	<i>Meropsapiaster</i>	European Bee-eater
14	<i>Delichonurbica</i>	House Martin
15	<i>Sittaneumaier</i>	Rock Nuthatch
16	<i>Sturnus vulgaris</i>	Starling
17	<i>Tetrax tetrax</i>	Little Bustard
18	<i>Francolinusfrancolinus</i>	Black Francolin
19	<i>Alectoris chukar</i>	Chukar Partridge
20	<i>Phasianus colchicus</i>	Common Pheasant
21	<i>Falco cherrugcherrug</i>	Saker Falcon
22	<i>Ciconia nigra</i>	Black Stork
23	<i>Ciconia ciconia</i>	White Stork
24	<i>Egretta alba</i>	Great White Egret
25	<i>Tadorna ferruginea</i>	Ruddy Shelduck
<b>Reptiles</b>		
1	<i>Testudo graeca</i>	Spur-thighed tortoise
2	<i>Eumeces schneideri</i>	Schneider's skink
3	<i>Laudakia caucasia</i>	Caucasian agama
4	<i>Vipera lebetina</i>	Levantine viper

(B) Flora

#	Scientific name	Common name
1	<i>Campanula kakhetica</i>	Bellflower
2	<i>Acer ibericum</i>	Maple
3	<i>Berberis iberica</i>	Iberian barberry
6	<i>Orchis punctulata</i>	Punctate orchid
7	<i>Juniperus foetidissima</i>	Foetid juniper
8	<i>Iris iberica</i>	Iberian iris
9	<i>Tulipa eichleri</i>	Eichlerian tulip
10	<i>Pistacia mutica</i>	Wild pistachio tree

### **Habitats and species of the proposed tourist sites**

The proposed “Land of Hidden Water” geotrail goes through many sections of VPA. The second trail - “With vultures over mud volcanoes”, is largely outside VPA’s boundaries with the exception of “Takhti-Tepa mud volcanoes” natural monument. Both trails trespass almost all main habitats and vegetation types found in the semi-arid zone.

#### ▪ **Steppe**

The steppe is one of the most widespread plant communities in VPA covering a total of 8,210 ha and found throughout the study area in sections and patches of various sizes. It is represented by 3 distinct plant formations:

1. Caucasian bluestem formations
2. Needle grass formations
3. *Cleistogenes bulgarica* formations

**Caucasian bluestem (*Bothriochloeta ischaemum*) formations** are by far the most common type of steppe community in VPA. Up to 94 % of all steppe in Vashlovani is Caucasian bluestem steppe and it is in turn represented by numerous variants. More xerophilous variants are found in southern and eastern sections of Vashlovani (Kumuro, the lower and middle sections of the Lekis-Tskali gorge, the flatlands of the Alazani gorge) and relatively mezophilous variants occur in the Shavi Mta (Black Mountain) area.

**Needle grass formations** (Stipeta; *S. capillata*, *S. lessingiana*) cover about 500 ha in all and in relatively larger patches is found mainly on and around the Black mountain. The variants with the dominance of *S. Capillata* are more common than those with *S. Lessingiana*. There are a number of variants of this steppe community each represented on very small areas. Characteristic plants include: *Glycyrrhiza glabra*, *Crinitaria villosa*, *Phlomis pungens*, *Bilacunaria microcarpa*, *Cleistogenes bulgarica*, *Festuca valesiaca*, *Phleum phleoides*, *Festuca valesiaca*, *Medicago coerulea*, *Galium verum*, *Potentilla recta*, *Teucrium nuchense*, *Eryngium campestre*, *Veronica multifida*, *Coronilla varia*, *Phlomis tuberosa*, *Crocus speciosus*, *Thlaspi perfoliatum*, *Arabidopsis thaliana*, *Holesteum imbellatum*, *Phleum paniculatum*, *Medicago minima*, *Onobrychis radiata*, *Aster ibetricus*, etc.

***Cleistogenes bulgarica* formations (*Cleistogenetum bulgaricae*)** have a secondary origin and have developed to replace degraded communities of bluestem and artemisia. These formations are found in extremely small patches throughout Vashlovani. The only relatively large spot of this formation (43 ha) is found in the Mijnis Kure area.

#### ▪ **Lowland desert communities**

Lowland desert communities cover a total of up to 1,500 ha and are found in relatively flat terrain on soils with various level of salinity. There are 3 main formations as well as a number of transitional communities which develop in direct contact with steppe and arid light woodlands creating a mosaic of vegetation. Typical desert communities include artemisia formations (*Artemisieta lerchianae*) that are found in relatively flat or slightly inclined areas with various levels of salinity. They are rather diverse and include a number of specific variants for example artemisia formations with ephemerals and ephemerooids (*Artemisietum ephemerosum*) are found on low and medium salinity



soils of the lower sections of the Alazani and Likis-Tskali gorges. Typical ephemerals and ephemeroïds are: *Poa bulbosa* var. *vivipara*, *Medicago minima*, *Torularia contortuplicata*, *Allium rubellum*, *Adonis aestivalis*, *Alyssum desertorum*, *Astragalus asterias*, *Bombicilaena erecta*, *Bromus japonicus*, *Herniaria hirsuta*, *Lagoseris sancta*, *Sideritis montana*, *Veronica polita*, *Sisymbrium loeselii*, *Daucus carota*, *Erodium cicutarium*, *Filago pyramidata*, etc.

- **Phrygana-like vegetation and foothills desert**

Phrygana-like vegetation develops on hills with clay and clay-sandy soils. The main formations are *Caraganeta grandiflorae* and *Reaumurieta alternifoliae*, while *Atraphaxietum spinosae* is less common. *Reaumurieta alternifoliae* is the most xerophilous of the three and by structure it is close to foothills desert. Characteristic species include: *Stachys fruticulosa*, *Artemisia lerchiana*, *Salsola nodulosa*, *Halothamnus glaucus*, *Agropyron pectinatum*, *Zygophyllum fabago*, *Caccinia rauwolfii*, *Capparis herbacea*, *Stipa caspia*, *Centaurea ovina*, *Matthiola odoratissima*, *Astrodaucus orientalis*, *Amberboa glauca*. Characteristic species of *Caraganeta grandiflorae* include: *Atraphaxis spinosa*, *Reaumuria alternifolia*, *Stachys fruticulosa*, *Artemisia lerchiana*, *Salsola nodulosa*, *Stipa lessingiana*, *Agropyron pectinatum*, *Zygophyllum fabago*, *Centaurea ovina*, *Astrodaucus orientalis*, *Amberboa glauca*, *Bupleurum wittmannii*.

Foothills desert are found in the form of badlands in which individual plants are very scattered, while some sections completely lack vegetation cover. In fragments that *do* have more or less developed vegetation cover, there are small communities of *Salsola nodulosa* and *Artemisia lerchiana*. Certain semi-bushes and xerophilous bushes are also typical. Ephemerals grow as individual plants. Characteristic species include: *Reaumuria alternifolia*, *Stachys fruticulosa*, *Atraphaxis spinosa*, *Halothamnus glaucus*, *Agropyron pectinatum*, *Zygophyllum fabago*, *Caccinia rauwolfii*, *Capparis herbacea*, *Stipa caspia*, *Scorzonera cana*, *Centaurea ovina*, *Matthiola odoratissima*, *Suaeda dendreoides*, *Astrodaucus orientalis*, *Amberboa glauca*, *Gamanthus pilosus*, *Bupleurum wittmannii*, *Lepidium vesicarium*, *Torularia eldarica*, *Eremopyron orientale*, *E. distans*. Rarely there are also *Atriplex cana* and *Camphorosma monspeliaca*.

- **Arid light forest**

Arid light forest is one of the major vegetation types of Vashlovani protected areas. It is mostly found within the boundaries of the Vashlovani Nature Reserve. The main formations are juniper forest (*Junipereta*; *J. foetidissima*, *J. Polycarpus*) and pistachio forest (*Pistacieta muticae*). Transitional communities between the two are also quite common. Arid light forests in Vashlovani are rather diverse and exhibit several variants differing in structure and composition. For the purpose of this study only the above two main formations were differentiated and mapped.

**Pistachio forest** (*Pistacieta muticae*) is mainly found in low hills, flat spots and ravine terraces. Pistachio trees are sometimes mixed with junipers (*Juniperus foetidissima*, *J. polycarpus*). Between the pistachio trees and as undergrowth there are xerophilous bushes: *Paliurus spina-cristi*, *Cerasus microcarpa*, *Cetrasmus incana*, *Ephedra procera*, *Jasminum fruticans* *Lonicera iberica*, *Rhamnus pallasii*, *Cotinus coggygria*, etc. The floor cover is steppe or semi-desert vegetation. Among the numerous variants of the pistachio forest community, the most important are: *Pistacietum bothriochloosum*, *Pistacietum stiposum*, *Pistacietum stiposo-bothriochloosum*, *Pistacietum*

*artemisioso-bothriochloosum*, *Pistacietum artemisioso-salsolosum*, *Junipereto-Pistacietum mixtofruticosum*, *Junipereto-Pistacietum paliuroso bothriochloosum*.

**Juniper forests (Junipereta; *J. foetidissima*, *J. Polycarpus*)** mostly occur on northern aspects of medium and high inclination. The undergrowth is typically composed of the following bushes: *Jasminum fruticans*, *Paliurus spina-cristi*, *Cerasus microcarpa*, *Cerasus incana*, *Ephedra procera*, *Lonicera iberica*, *Rhamnus pallasii*, *Caragana grandiflora*, *Cotinus coggygria*. Rarely there are also *Carpinus orientalis* and *Ligustrum vulgare*. The floor cover is dominated by the non-woody species of steppe, shibliak-like vegetation, xerophilous scrub and arid light forest. Sometimes there are species typical of desert and phrygana-like communities too. The main variants of the juniper forest include: *Pistacieto-Juniperetum jasminosum-paliurosum*, *Pistacieto-Juniperetum caraganosum*, *Juniperetum caraganosum*, *Juniperetum jasminosum muscosum*, *Juniperetum mixtofruticosum*.

- **Shibliak-like hemixerophilous scrub**

Shibliak-like hemixerophilous scrub is mainly found in the Chigoelt-Khevi and Eshamikis-Khevi gorges, and in the Black mountain area. Smaller fragments are also found within the ranges of steppe and arid light forest. There are both primary and secondary shibliak-like hemixerophilous scrub. The secondary communities have developed after the clearance of arid light and foothills forests.

Shibliak-like hemixerophilous scrub occurs on slopes of various aspects and inclination and is represented by a number of formations. **Christ's thorn formations (*Paliureta spina-christi*)** are the most common type of the shibliak-like hemixerophilous scrub. Depending on aspect and elevation there are relatively xerophilous as well as more xeromezophilous variants of these formations. Specific variants include: *Paliuretum botriochloosum*, *Paliuretum gramino-mixtoherbosum* and *Paliuretum botriochlooso-stiposum*. The non-woody component is very species-rich and includes: *Bothriochloa ischaemum*, *Dactylis glomerata*, *Phleum phleoides*, *Stipa capillata*, *Phlomis pungens*, *Ph. tuberosa*, *Galium verum*, *Teucrium polium*, *T. nuchense*, *Inula germanica*, *I. britanica*, *Medicago coerulea*, *Festuca valesiaca*, *Salvia nemorosa*, *Seseli grandivittatum*, *Eryngium campestre*, *Bilacunaria microcarpa*, *Veronica multifida*, *Potentilla recta*, *Stachys atherocalys*, *Onobrychis radiata*, *O. kachetica*, *Asparagus verticillatus*, *Convolvulus cantabrica*, *Linum austriacum*.

- **Foothills deciduous forest**

Deciduous forest has very limited distribution in VPA. It is mostly found in the Black mountain and in fragments also in the ravines toward the Alazani (e.g. In Chaibulaki). Much of the deciduous forest in the Black mountain is ash (*Fraxinus excelsior*) stands. There are also some stands of oak (*Quercus iberica*). The undergrowth and forest floor vegetation are well-developed. The understory is dominated by *Carpinus orientalis*, *Euonymus verrucosa*, *Ligustrum vulgare*, *Swida australis*, *Mespilus germanica*, *coggygria*, etc. The forest floor vegetation is composed of *Brachypodium sp.*, *Viola alba*, *V. odorata*, *Serratula quinquefolia*, *Smiranium perfoliatum*, *Scilla sibirica*, *Allium paradoxum*, *Aegonychon purpurea-coeruleum*, *Ficaria ledebourii*, *Crocus speciosus*, *Torilis japonica*, *Geranium lucidum*, etc.

There are also oriental hornbeam (*Carpinus orientalis*) stands that are mainly found on the northern, shadowed slopes of the ravines toward the Alazani river. In this forest, hornbeams grow as trees or

as tall bushes while the community still retains a forest structure with understory and floor cover vegetation of herbs and mosses. The composition of the forest floor vegetation is similar to that of the ash and oak stands but is enriched with species typical of arid light forest and shibliak communities. Among tree species, there are: *Fraxinus excelsior*, *Acer ibericum*, *Acer campestre*, *Celtis caucasica*, *Juniperus foetidissima*. The understory is composed of *Ligustrum vulgare*, *Cotinus coggygria*, *Juniperus oxycedrus*, etc. The forest floor vegetation includes: *Brachypodium sp.*, *Silene italica*, *Viola alba*, etc.

- **Flood plain forest**

Within VPA, flood plain forest is found in small fragments on the Alazani river terraces. The forest is mainly composed of oak (*Quercus pedunculiflora*) and black poplar (*Populus nigra*) stands.

### ***Recent trends and current threats to biodiversity***

The Georgian part of the arid and semi-arid zone of the Caucasus has been historically used as winter pastures for livestock, mainly sheep. Every winter, large numbers of sheep are driven to the winter pastures from north-east and central parts of the country. Sheep migration into the zone begins in September and the sheep remain there until April of the next years. Sheep farming in Georgia have been solely oriented to production maximization paying little or no attention to environmental or sustainability principles.

Agricultural activities are another major factor influencing the arid and semi-arid ecosystems. Main crops include sunflower and various cereals, and to lesser extent grapes. In 1970-80's land conversion for agricultural purposes was intensified and large irrigation systems were constructed. The Dali Reservoir was built on the Iori river with the surface area of about 1700 ha. The construction as well as subsequent operation of the irrigation systems lacked environmental considerations. Incorrect irrigation in many areas has accelerated soil salinization.

In the past, arid light forest and flood plain forests were not regarded as an important timber resource and there was no commercial logging. Nevertheless tree felling was extensive for other purposes such as fuel wood, expansion of pasturelands, etc. As a result flood plain forests have been heavily fragmented and presently they remain only on protected areas.

Arid and semi-arid zone has been a popular place for sport hunting and fishing. Main game species include various Galiformes, hare, brown bear and wild boar. Also Illegal fishing with different illegal methods (electroshock, dynamites, poison) have been used.

In the 20th century roe deer (*Capreolus capreolus*), striped hyena (*Hyaena hyaena*) and goitered gazelle (*Gazella subgutturosa*) became extinct in Georgia probably due to excessive hunting and habitat encroachment.

Later, a breeding enclosure was constructed in Vashlovani and eleven gazelles were brought from Turkey in 2010 and released into the breeding enclosure. Also 10 additional specimens were brought from Azerbaijan to Vashlovani in 2013. All animals were released into the wild in 2013. More specimens are planned to be released in the coming years.

### ***Development zones and tourism zones***

Small-scale oil works began in the semi-arid zone during the Soviet times. In 1990s oil exploration was resumed by *Frontera Resources Ltd.* Now it is extracting light oil in Taribana (Iori Valley). The company plans to develop the Taribana oil field in eastern Georgia over the next 25 years and produce a total of 230 mln barrels of oil. It would develop Taribana in three stages, launching 60 wells until 2007, another 40 wells in 2007-2015, and 25 wells between 2015-2025. The volume of oil output is planned at 30,000-40,000 bpd. According to Frontera Resources, the total reserves of Taribana are estimated at about 1 bn barrels.

Before the establishment of VPA, the area was not popular among tourists. After building some infrastructure, including shelters within the Vashlovani PA and Chachuna managed reserve as well as opening "Dali game reserve", birdwatchers and later general interest visitors have begun to discover this region.

### ***Ecologically sensitive zones***

The area is characterized by a dry climate. However due to dry soil that has poor absorption ability, flash floods are common after heavy rains. Flash floods may damage the dirt roads on VPA and hence cause problems to transportation.

### ***Conclusions***

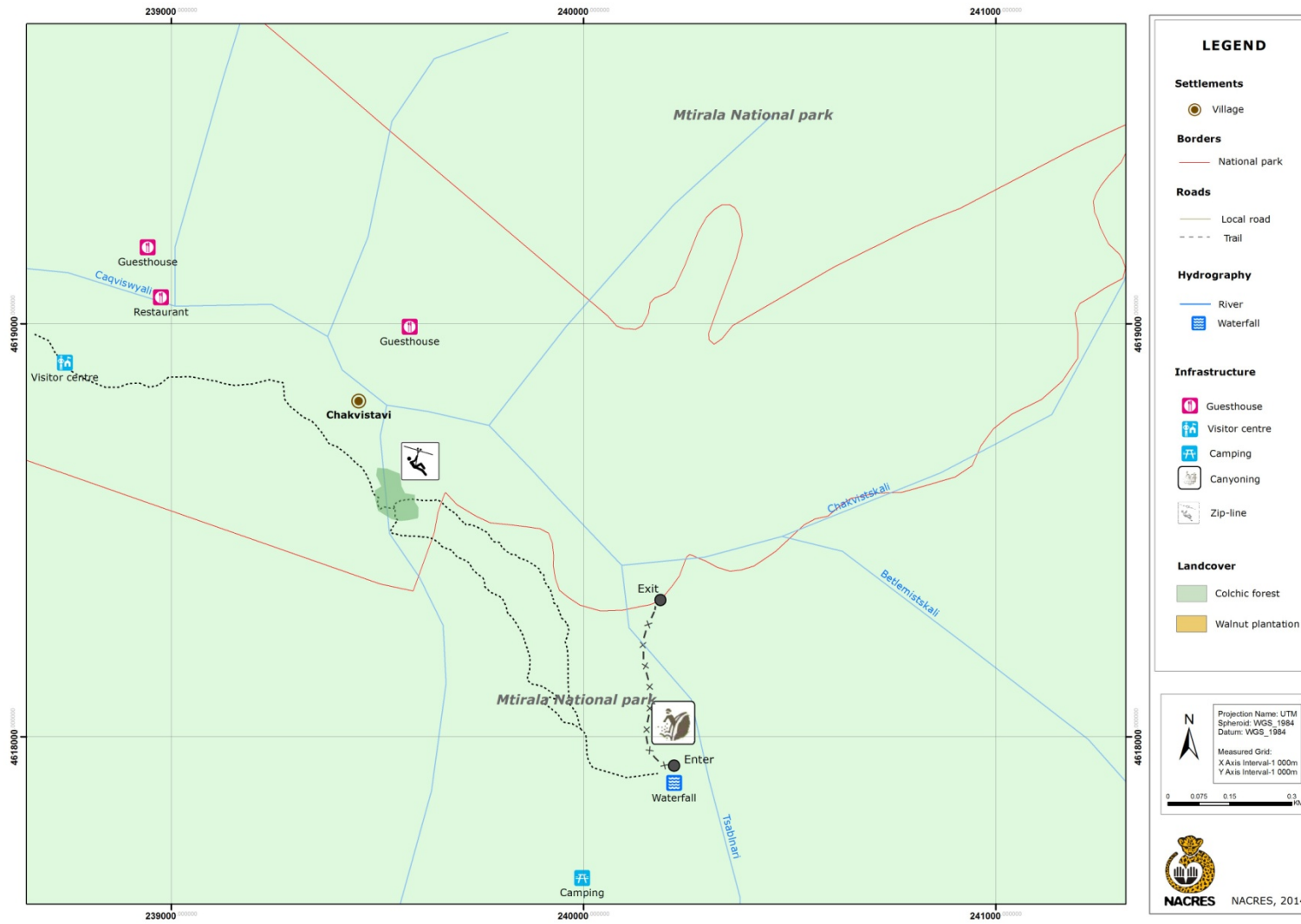
Along the two trails endemic flowers and tree sprouts could be damaged in early spring by visitors. In April and May reptiles, amphibians and ground nesting birds may be at risk of being impacted by the development and/or operations of new tourist products. Increased traffic may result in increase of road kills for mammals as well as reptiles.

Increased visitor numbers may cause additional disturbance to the newly released Goitered gazelles.

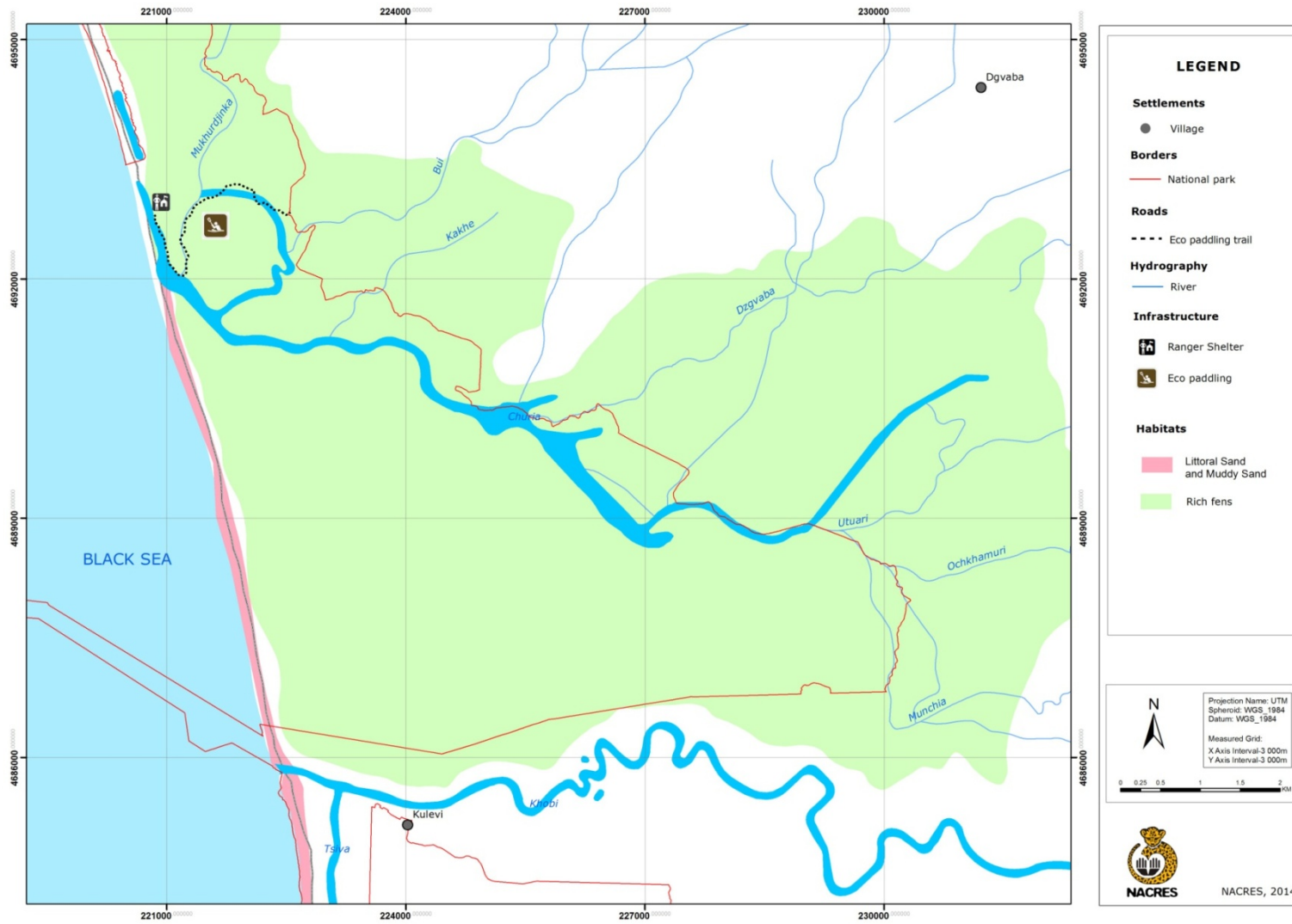
However, with adequate management of the site and proper operations as well as close monitoring, any potential impact may be minimized.

**(V) Habitat maps**

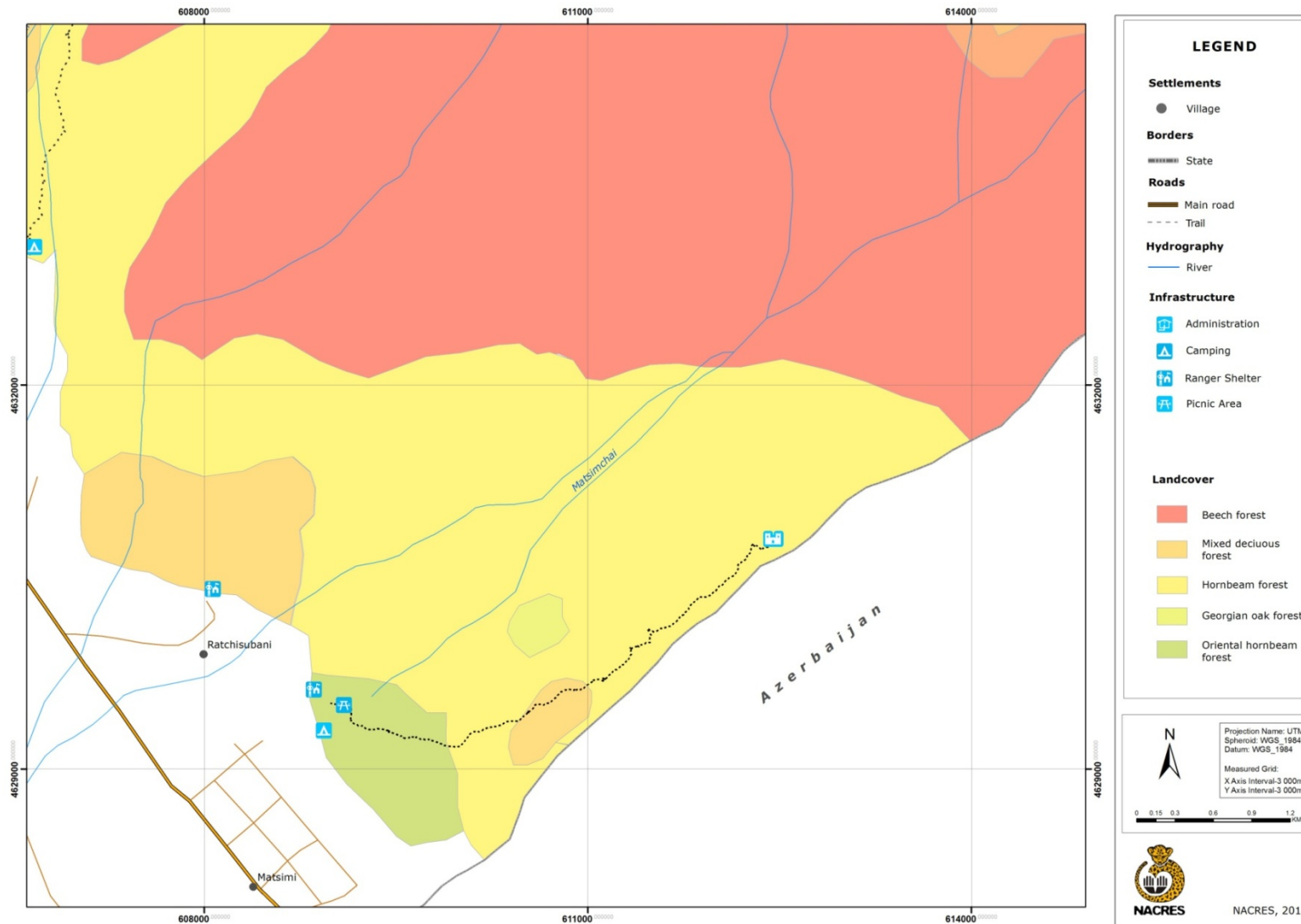
[A] Mtirala national park



[B] Kolkheti National Park

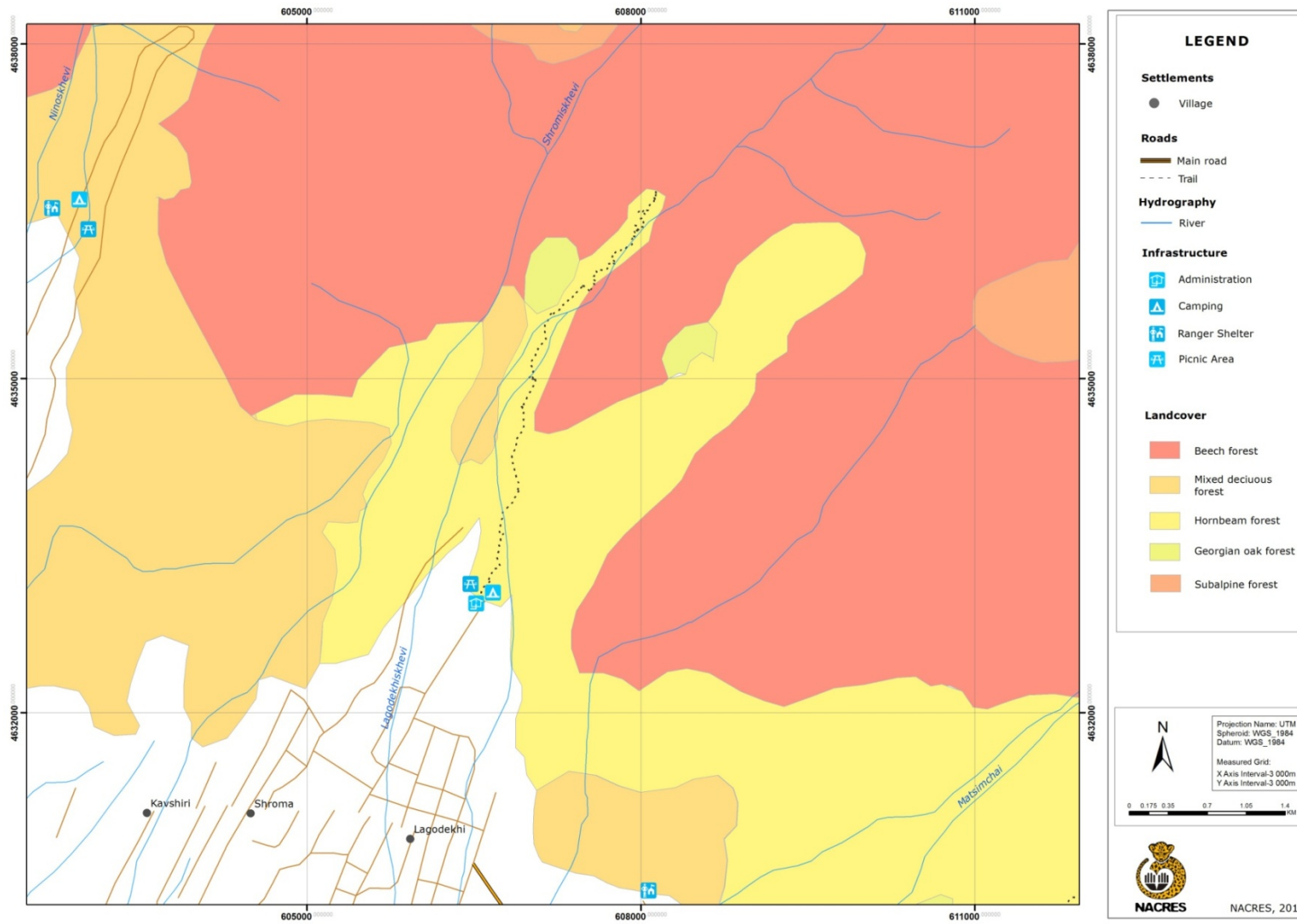


[C] Lagodekhi Protected Areas: Machis Tsikhe (Machi Castle) trail

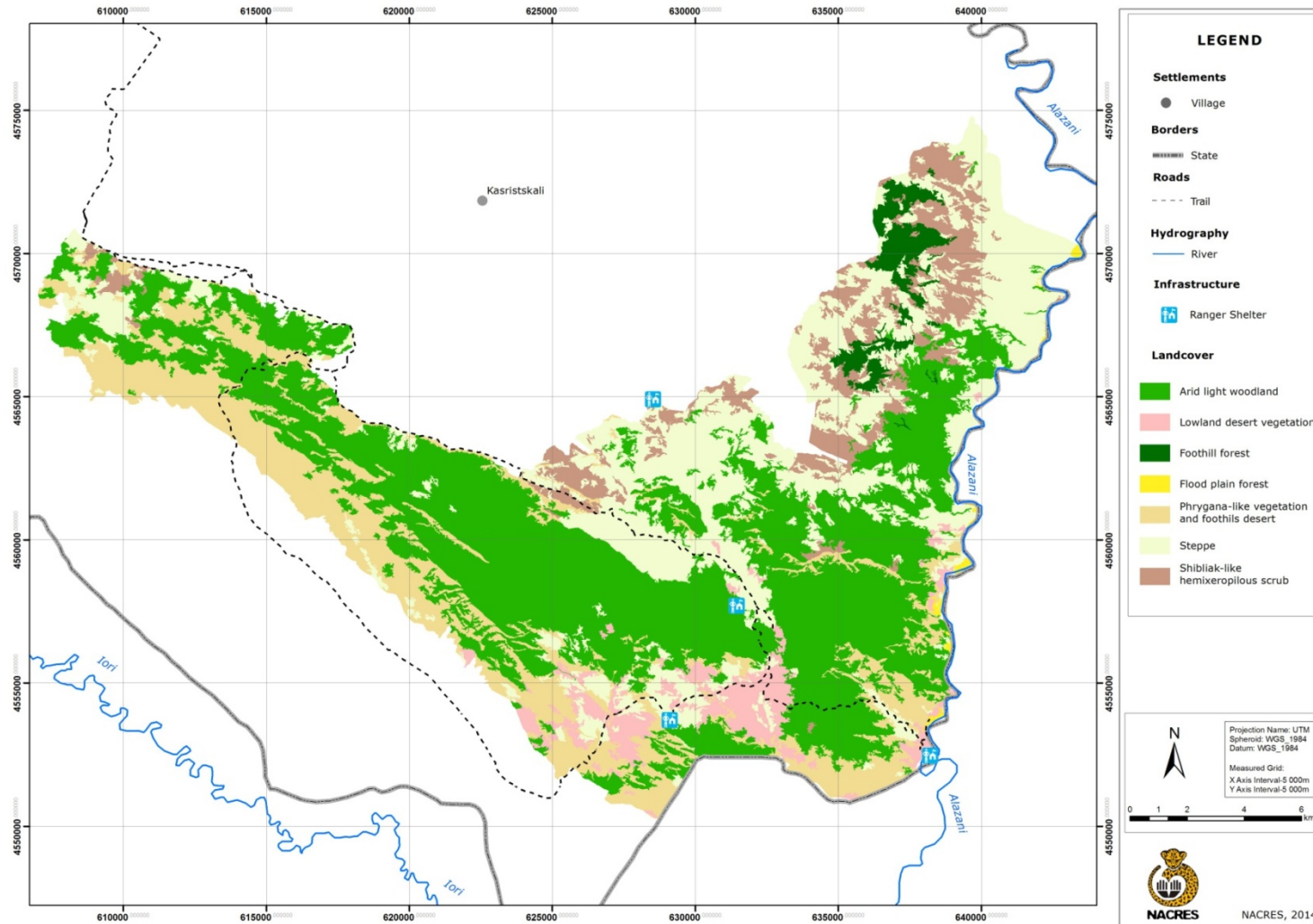




[D] Lagodekhi Protected Areas: Black Grouse trail



[E] Vashlovani Protected Areas



## ANNEX 2: Used Literature

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