MICHAEL SUCCOW FOUNDATION
for the Protection of Nature

Potential for strengthening the coverage of the core - zone of Biosphere Reserve Issyk-Kul -

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front page picture: Prof. Michael Succow
desert south-west of Issyk-Kul – summer 2013

Abbreviations and explanation of terms -

Aiyl	Kyrgyz for village
Akim	Province governor
BMZ	Federal Ministry for Economic Cooperation and Development of Germany
BMU	Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety of Germany
BR	Biosphere Reserve
Court of Ak-sakal	traditional way to solve conflicts. Court of Ak-sakal is elected among respected persons. It deals with small household disputes and conflicts, leading parties to agreement.
ESPOO	Convention on Environmental Impact Assessment in a Transboundary Context
GTZ	German Technical Cooperation (today GIZ)
Local kenesh	The local council, consists of 10-16 people and functions as local legislative court, approves the budget, adopts plans for social and economic development of the local territory.
Jaiyt committee	Pasture council committee
NABU	Naturschutzbund Deutschland (German environmental NGO)
SCENP	State Committee of Environment and Nature Protection of the Kyrgyz Republic
SAEF	State Agency of Environment and Forestry
Women's council	form of social organization, which has its roots in the Soviet Union and aims at the mobilization of women and consideration of their interests in various matters. In villages, they often deal with social issues as kindergartens, schools and so on
Zakaznik	wildlife sanctuary or game management reserve
Zapovednik	state reserve – strictest nature protection regime in Kyrgyzstan (IUCN Ia)

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1. SUMMARY

Kyrgyzstans' unique natural landscapes, its history as an extraordinary tourism destination and its rich cultural traditions predestine the country for the establishment of UNESCO Biosphere Reserves.

The Biosphere Reserve Issyk Kul is one out of 23 biosphere reserves worldwide and the only one at the whole Eurasian continent whose establishment was supported by the German Federal Ministry for Economic Cooperation and Development (BMZ) (BMZ, 2011). Thus the German government cares a relevant responsibility to make the Biosphere Reserve Issyk Kul a success story.

As model regions for sustainable development, biosphere reserves are regions where human interactions go along with the preservation of the cultural and ecological heritage. With 20 % of the state territory, the Kyrgyz UNESCO Biosphere Reserve Issyk-Kul covers an area, which reaches from the cost of the "hot lake", along arid steppes and high mountain pastures up to the glaciers and the 7,000 m peaks of the Tian Shan.

The broad diversity of landscapes makes sustainable development of the Biosphere Reserve a challenge. Therefore the administration cooperates with the provincial administration (Akim) on equal level. At national level the State Agency of Environment and Forests of the Republic of Kyrgyzstan has the responsibility for the biosphere reserves of the country.

Recipients of the desk-study are the Biosphere Reserve administration, the State Agency for Environment and Forests, as well as the partner-NGO in Kyrgyzstan *BIOM*. The latter one has contributed fundamentally to the study.

The study provides a technical basis with recommendations for further development of the Biosphere Reserve Issyk-Kul according to the Seville Strategy.

A focus has been put on recommendations for a better protection of the arid coast area and badland back country of the south-western Issyk-Kul lake (near Kara-Koo village).

For the preparation of the study, amongst others, the authors conducted interviews with the Biosphere Reserve administration, collected data during fieldwork and analyzed available literature. Discussions with experts have been showing the current state of affairs and built the basis for further recommendations.

The most crucial one is, to apply a type of protected area, which secures the natural succession of devastated ecosystems, without principally eliminating the (partly touristic) anthropogenic use.

In this way the study introduces the concept of the "wildlife matrix zone", resp. "mini zapovedniks".

1.1. Objectives of the project

Current core zones are inadequate and do not represent all of the ecosystems of the Biosphere Reserve Issyk-Kul in the opinion of the applicants. The area of Kara-Koo (see map. 1) (often referred to as *area of investigation* in that study), in South-West of Issyk-Kul lake, is a small territory of desert habitat with semi-desert patches, adjacent to Issyk-Kul shore. Since it is unique and of outstanding ecological value for the whole Biosphere Reserve it is worth to be investigated in more detail in order to turn these areas into a stronger nature protection regime. It is important to protect it from growing infrastructure construction in the region in particular increasing mass tourism.

The desk-study is planned to give answers to the following topics

- Ecological characterization of an area around Kara Koo city mainly by literature review and consideration of current state of research
- Identification of threats for the ecosystems
- Literature review about protected area status
- Analysis of tourism development potential of the area
- Potential impact and recommendations of a possible future protection

1.2. Expected results according to the project proposal

The result of the desk-study is to be a policy document that:

- Could be used as basis to define future priorities in the field of environmental and nature conservation cooperation at governmental talks between Kyrgyzstan and Germany;
- Provides approaches of nature conservation and tourism development concerns in the Seville strategy sense;
- Serves potential for discussions to incorporate nature conservation concerns into regional development goals;
- Serves for future lobby work of the Kyrgyz NGO BIOM to extend protected area activities in the Issyk-Kul province.

2. STATUS QUO

2.1. History of Biosphere Reserve establishment and Germanys contribution

Already in the Soviet Union a series of state reserves (Zapovedniks) around Lake Issyk-Kul were established (see chapter 2.2). In 1993 for the first time the idea for the development of a Biosphere Reserve at the territory of Issyk-Kul province has been born jointly with the State Committee of Environment and Nature Protection of the Kyrgyz Republic, Naturschutzbund Deutschland (NABU, Nature Protection Association of Germany) and representatives of University of Greifswald. According to KUSTARYEVA & ANAZOVA (2002) in 1994 the "Issyk-Kul conference" took place where the idea has been settled. Beginning in 1995 the German Ministry of Economic Cooperation and Development (BMZ) started to support the establishment of a Biosphere Reserve Issyk-Kul (in these times "*Tengir-Too*") (BMZ 2011). German Technical Cooperation (GTZ) has been assigned for implementation. 150 representatives from Kyrgyzstan, Kazakhstan, Uzbekistan, Germany and Switzerland took part at the kick-off conference in 1996. That formed the basis for a joint resolution to establish a Biosphere Reserve complying with the UNESCO standards for Biosphere Reserves. To lay out the scientific basis for the Biosphere Reserve a series of investigations and research campaigns were initiated and regularly presented at the "Issyk-Kul symposium". The first one took place in 2001. Others where following annually 2002 until 2005.

In 1997 the GTZ project "Leitlinien für eine umweltgerechte Entwicklungsplanung im Gebiet des vorgesehenen Biosphärenterritoriums ‚Tengir Too'" started. The project was implemented under the Ministry of Environment, Crisis Prevention and Civil Defense of the Republic of Kyrgyzstan. Together with the German company "Planungsgruppe Ökologie + Umwelt" (Hannover) planning criteria and legislative basis were prepared and published. After preparation and enacting the law "On biosphere reserves in the Kyrgyz Republic" a corresponding resolution on the Biosphere Reserve Issyk-Kul has been established in October 1998 on the basis of a presidential decree (Gottschling 2002). In September 2001 the official recognition as international UNESCO Biosphere Reserve occurred. The Biosphere Reserve administration started to work in 2000, in Balykchy town at the western most part of Lake Issyk-Kul. In autumn 2001 the GTZ project started into its 3rd phase (2001-2004) with the milestones of building up a functioning administration, support of monitoring programs, public relations and implementation of sustainable land use approaches. Already in 1999 NABU started the snow leopard monitoring and protection programme at the territory of Issyk-Kul province. In 2002 the first periodic review has been transmitted to the UNESCO ICC MAB and only recently in 2013 the 2nd periodic review was delivered. Thanks to Mrs. Elnura Korchueva, representative of UNESCO office in Bishkek, it has been made available for that study.

In its final report of the 25th session of the international coordinating MAB council in Paris, May 27th – 30th 2013 the secretariat welcomed the delivery by the Biosphere Reserve Issyk Kul administration. In its response the secretariat motivated the biosphere reserves administration at page 27 to develop a management structure und management plan that includes proposals on how participatory decision making processes can be further encouraged in particular on

resource management. As the UNESCO representative in Bishkek, Kyrgyzstan, stated “they” did not receive answer on the report delivered and thus where not knowing about the mentioned request. Consequently there were no activities so far. Those issues can get sorted out pretty easily and should not become a serious threat for the international designation of the biosphere reserve. Ideally some international flanking support for the task could contribute to its short termed implementation.

Besides the sources of information mentioned above already, the GTZ project finished in 2005 and has commissed three proceedings on scientific investigations by KUSTARYEVA & ANAZOVA 2002, KUSTARYEVA & ANAZOVA 2003 and KUSTARYEVA 2005. In the frame of a comprehensive landscape ecological research campaign a bunch of theses were published in the late 90ies and early 2000th (BEUTELL 1997, ENGELKE 1997, ZEMMRICH 1997, HEINICKE 1999, KOCKSCH 1999 and GOTTSCHLING 2003). Additional literature sources originated to that investigation campaign were published by NEUNHÄUSER et al. 1996, ASYKULOV 2002 and GOTTSCHLING 2002. Relevant older literature from soviet period should be mentioned as well (ABRAMOV 1949, SOBOLEV 1972, AZYKOVA 1973, GOLOVKOVA 1979 and GOLOVKOVA 1990). More up-to-date literature from Kyrgyz sources were published by MAMYTOVA 1992 and SHUKUROV (1989, 1990, 1991, 2009) for instance.

2.2. Status and prospects for nature conservation in Issyk-Kul province

2.2.1. National and international level of protection of the territory

The conservation of biological diversity in Kyrgyzstan is under the administration of the State Agency of Environment and Forestry and regulated by environmental laws that have mainstreamed the relevant international conventions and duties.

Red Data Book of Kyrgyzstan is prepared on the basis of the national list of threatened and endangered species, approved by the Government of the Kyrgyz Republic as of April 28, 2005 № 170 (as amended and supplemented on July 25, 2009 № 471). The list includes 57 species of birds, 23 species of mammals, 2 amphibians, 8 reptiles, 7 species of fish, 18 species of arthropods, as well as 87 species of higher plants and fungi threatened.

Conservation of biological diversity is provided by a system of special protected areas in Kyrgyzstan that deliver a set of different protection regimes dedicated to meet different nature conservation targets. The research area, Kara-Koo, is partially covered by Issyk-Kul State Reserve (zapovednik). It is one of the core zones (see map 1) of Issyk-Kul Biosphere Reserve. Besides there are several game management reserves (zakaznik) as well as nature monuments within the biosphere reserve. The protection regime there is much less then in state reserves, access is allowed, there is no staffed guarding regime in zakazniks.

2.2.2. Issyk-Kul State Reserve

In 1948 the Council of Ministers of the Kyrgyz SSR from December 10, 1948 № 1205 established one of the first reserves of the Kyrgyz SSR - Issyk-Kul State Reserve. The initial area of the reserve consisted of a two-kilometer shore stripe of approximately 730.000 ha all in all. Currently the total area of the reserve is about 19.100 ha and is represented by 14 separated

sites, 2.300 ha of which are covered by shore and 16.700 ha are water surface at sites with huge wintering waterfowl occurrence, and 22 ha compose islands.

Within the reserve 24 species of mammals, 232 species of birds, 12 species of fish and 297 species of plants are under protection. In 1975, upon the signing of the RAMSAR Convention by the former USSR, Lake Issyk-Kul has received the nomination as a wetland of international importance. It came into force in 2002 with the ratification of the law "On the accession of the Kyrgyz Republic to the Convention on Wetlands of International Importance especially as Waterfowl Habitat" (RAMSAR Convention). In March 2003, the Kyrgyz Republic became a full party to the RAMSAR Convention.

The main objective of Issyk-Kul State Reserve is the protection and monitoring of wintering waterfowl. Annually there winter from 30 to 50.000 individuals of different species of birds on the lake. In addition, in spring and autumn the lake serves as a resting and feeding area of waterfowl migrating flocks of birds. The state reserve protects 11 species of birds and 13 species of insects listed in the Red Data Book of Kyrgyzstan.

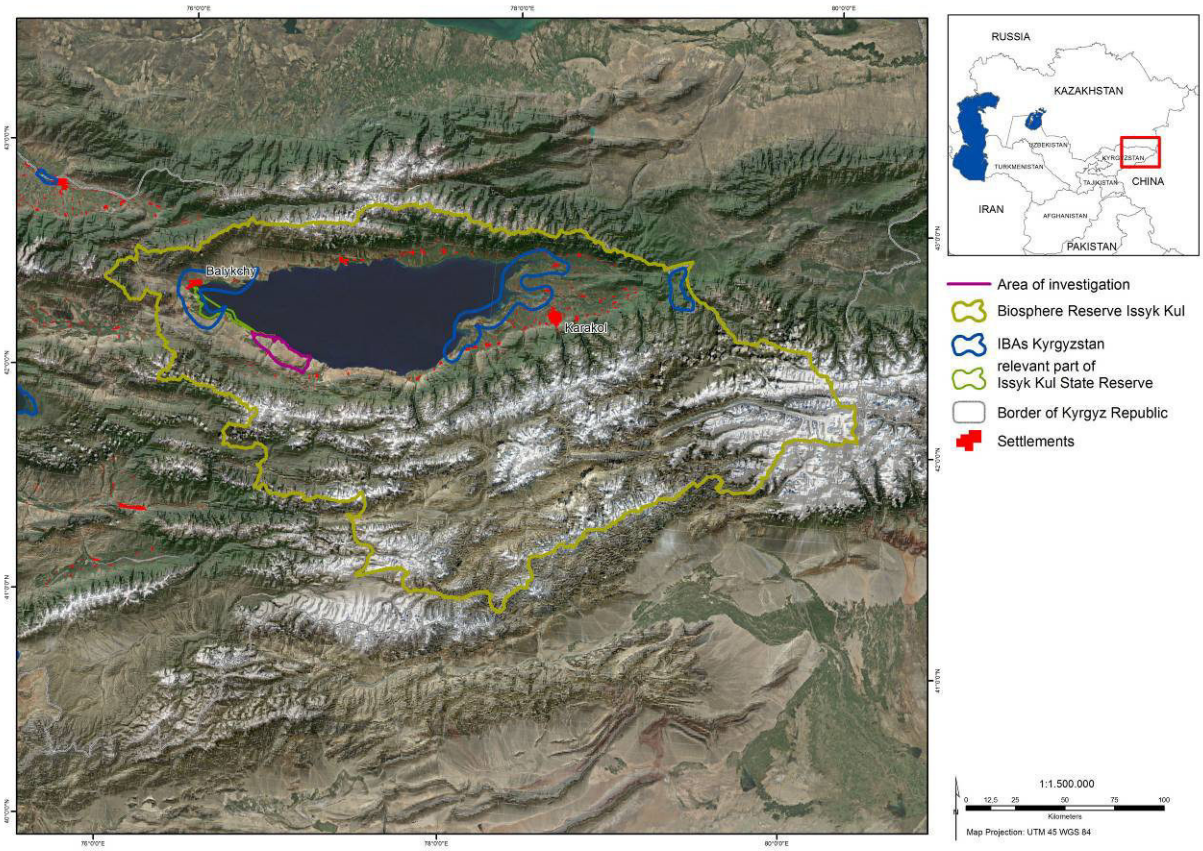
With the collapse of the USSR, the coordination for comprehensive wetlands research at Lake Issyk-Kul has dropped. Everything that has remained is the protection and monitoring of wintering waterfowl at Lake Issyk-Kul (Kulagin: available at internet: www.welcome.kg/ru/reserve/iss/279.html).

2.2.3. Sarychat-Ertash State Reserve

Sarychat-Ertash State Reserve has been established in 1995 with the aim to protect flora and fauna of the region, first of all the habitats of snow leopards and argali that live under comparably pristine conditions. The total area makes up 134.140 ha where 72.080 ha are under strict protection and the remaining under limitations. There are 25 species of mammals. Out of them Snow Leopard, Brown Bear, Manul and Argali are listed in the red data book of Kyrgyzstan. 84 species of birds are recorded including four listed in the Red Data Book: Saker Falcon, Golden Eagle, Bearded Vulture and Himalayan Griffon. Two fishes (*Diptychus gymnogaster* and *Nemchilus stoliczkai*) and one amphibian (*Bufo viridis*) are confirmed. Invertebrates are not investigated comprehensively so far.

2.2.4. Issyk-Kul Biosphere Reserve

By the decision of the Government of the Kyrgyz Republic with the aim of preserving the rich natural and cultural heritage, a resolution on the establishment of Issyk-Kul Biosphere Reserve within the administrative boundaries of the Issyk-Kul province of Kyrgyzstan was adopted in 1998. In 2001 Issyk-Kul Biosphere Reserve has been designated under the UNESCO programme Man and Biosphere (MAB) and thus entered into the worldwide network of biosphere reserves. In terms of visibility of the outstanding natural and cultural properties of Issyk-Kul district this has been one of the most significant achievements. Issyk-Kul Biosphere Reserve thus has become a specially protected natural area of national importance in Kyrgyzstan.



Map 1 overview map of Biosphere Reserve Issyk Kul

2.3. Biosphere Reserve Issyk-Kul at a glance

The territory of Issyk-Kul Biosphere Reserve is home of approximately 630.000 inhabitants. The SAEF of the Kyrgyz Republic is in charge for the biosphere reserves of the Kyrgyz Republic, whereas the head office and administration of Issyk-Kul Biosphere Reserve is located in Balykshy at the outer most western place of Lake Issyk-Kul. The administration is directly under the akim of Issyk-Kul province and negotiates its issues from a comparably strong position.

By chance it became possible to have an appointment with the biosphere reserve administration at 18th of December 2013. The meeting took place with the director of the biosphere reserve, the head of the scientific and monitoring department and the head of the education department. These sources of information enabled us to gain additional information for that study apart from literature.

The directorate of the Issyk-Kul Biosphere Reserve has changed in summer 2013 to Mr. Mirslav Alkalovich Amankulov, who is an ecologist and forester by profession.

The biosphere reserve has currently 23 paid employees of which two are senior management, six nature protection department, four monitoring department, four scientific employees, three rangers and five technical employees. Additionally the biosphere reserves' visitors' center in Cholpon-Ata has three employees which are currently not paid. That happened when the entrance fee to the biosphere reserve that had to be paid by every car driver accessing the biosphere reserve heading from Bishkek (Tshu province), had been disposed in 2013. The so

called “ecologic post” gained a relevant income that run into the biosphere reserves’ budget. The parliament of the Kyrgyz Republic has stopped to charge that source of income since it could not have been made transparent where exactly the income is spent for. According to the biosphere reserve director this had a considerable impact on all activities related to nature conservation and sustainable development activities of the biosphere reserve. Expenses for monitoring, sciences, environmental education (including visitor’s facility), law enforcement has cut to 6.88 % of the overall budget. Most of the budget goes into the salary of employees currently. The income from “ecological post” made in 2012 59% of the total annual budget of the biosphere reserve according to the 2nd periodic review (2013).

The state reserves have their own staff including at least one administration employee plus rangers of each of the fourteen separate parts of Issyk-Kul State Reserve as well as Sarychat-Ertash State Reserve.

2.3.1. Zonation

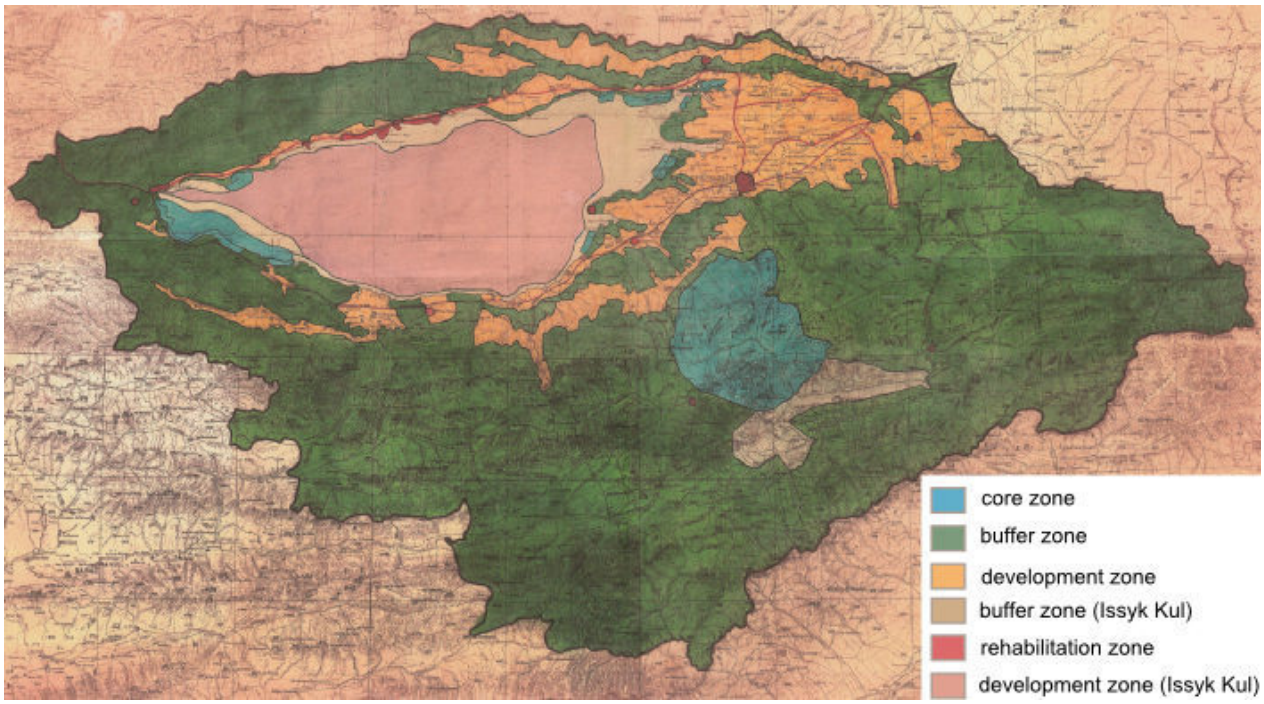
According to the 2nd periodic review the whole Issyk-Kul Biosphere Reserve has a total size of 4.311.588 ha. Core zones make up a size of 145.072 ha (of which freshwater: 16.678 ha), buffer zones 3.501.516 ha (of which freshwater: 457.145 ha) and development zones 665.000 ha. In percentages the share is 3.3 % core zone, 81.2 % buffer zone and 10.6 % development zone. Impreciseness might be caused in unclear boundary definition.

Despite the fact that there have been extensive research and publications along the establishment of the biosphere reserve in none of these publications a precise map or delineation nor a zonation could be found. The same is true for searching the internet. The only map that could give an indication about a zonation could get gained from the 2nd periodic review of the BR which is that low in resolution and detailness that it is impossible to clearly distinguish between separate zones or even identify clear boundaries.

The reason for that became quite obvious at the meeting with biosphere reserves’ administration. At the moment there is no clear zonation of the Biosphere Reserve. The less there are indications or coordinated management needs in practice. According to the biosphere reserves’ director many of the core zones are not identified in the field.

The map below was received at the meeting in December 2013 in analog DIN A3 format and was reworked as in map 2. However it is the most precise map currently available. The director of Issyk-Kul Biosphere Reserve confirmed that zonation is currently under revision and precise mapping in planning. There is no definite deadline yet.

At a later stage sign posting is envisaged as well but requires financing which is currently not budgeted. The revision of zonation is planned to take place at district level in a participatory manner. An updated map including precise GIS data is expected.



Map 2 map of latest Biosphere Reserve Issyk-Kul zonation (revised by MSF 2013)

In theory there are two core zones in the Biosphere Reserve Issyk-Kul which are both almost identical to both state reserves mentioned in chapter 2.2. The first one is Sarychat-Ertash State Reserve; the other one Issyk-Kul State Reserve. Sarychat-Ertash State Reserve is situated south of the city of Karakol in the high mountains of Central Tian Shan. Issyk-Kul State Reserve consists of 14 separated subunits which are all located around the lake itself along the shore.

A Buffer zone has been reported at the meeting with the Biosphere Reserve administration consisting of National Park Karakol which is located west of Sarychat-Ertash State Reserve (not depicted in map 2). Karakol National Park has been established in 1997 and makes up a size of 38.256 ha. The development zone is to a large extent not clearly defined especially taking the lake surface itself into consideration and the constantly changing sea level of Lake Issyk-Kul. Since these statements do not really fit to the map (see map 2) the situation must be understood as unclear. As map 2 shows the majority of the biosphere reserves' territory is made up by the buffer zone, where the development zone consists of a large area of Lake Issyk-Kul which is under economic use (fishery) and the big cities.

2.3.2. Monitoring

According to the 2nd periodic review there is a broad range of monitoring activities about the biotic and abiotic features of the biosphere reserve (pages 18 – 19) including staffing. A long list of cooperating local, regional and national institutions that conduct or support research and monitoring activities are given at pages 19 and 20.

In fact, beyond the comprehensive scientific research in soviet times, regular monitoring has only remained in concise project frameworks and mostly species oriented; to a far extend financed through international donor originations or NGOs. NABU international conducts waterfowl surveys three times a year, as well as a patchy mammal monitoring. WWF and NGO

"Panthera" jointly do snow leopard monitoring in Sarychat-Ertash State Reserve. Recently a camera trap shot of a snow leopard was published (www.panthera.org/node/4525). In September 2013 an international snow leopard symposium in Bishkek took place under participation of parties from all over the world including many of the relevant organizations working on snow leopard monitoring and conservation. Knowledge on distribution and behavior of snow leopard has increased already since remote sensing, camera trapping and telemetry is being applied. These methods were introduced to Kyrgyzstan and Issyk-Kul Biosphere Reserve. The advantage of snow leopard conservation is the better understanding and protection of that mega flag ship species and its pray, that results in better habitat conservation and gains benefits for the whole ecosystem. The downside is that other habitats get into disadvantage in the contest about attention and protection efforts. As already mentioned in chapter 2.3 the cancelation of the "ecologic post" fee in 2013 omitted the biosphere reserves' budget to proceed at least with a minimum of budget for monitoring and research activities apart from flag ship species monitoring. Most of the still ongoing monitoring in the biosphere reserve takes place thanks to private initiatives of local nature conservation activists. Usually they are well connected with the already mentioned international organizations.

2.3.3. Rangers and law enforcement

It has been stated by biosphere reserves' administration that the protection regime of both state reserves in Issyk-Kul Biosphere Reserve shows comparably good performance. But it must be noted that in consideration of the missing indication of the core zones as well as little public awareness at the whole biosphere reserve territory concerning socio-economic constraints and shortcomings for livelihood of local population, this statement needs to be considered carefully. At least the biosphere reserve administration raised honest concerns about professionally organized poaching activities in Sarychat-Ertash State Reserve. Several authors confirm weak law enforcement, corruption and intensive land use (hay making, livestock breeding, agricultural production) within the state reserves. Of course a lot of impact is caused by unregulated tourism especially in the shore area of Lake Issyk-Kul even within the state reserves. Payment of biosphere reserve staff, among others rangers, is extremely low. It is pretty likely that chances to gain additional income are taken. It is also known that rangers themselves keep livestock within the state reserves. The fodder supply of desert, semi-desert and dry-steppe ecosystem close to the Issyk-Kul shore is marginal. For Issyk-Kul State Reserve there is no nature conservation management plan yet.

2.3.4. Education

The head of the Biosphere Reserve education department did present running education approaches. There are regular seminars for pupils as well as for teachers (ToTs) in schools, several issues on sustainable development, nature conservation and biosphere reserve are part of the curricular and an annual ecological calendar has been established in order to get pupils regularly connected to their environment.

2.3.5. Tourism

Lake Issyk-Kul is a priority tourism destination in Central Asia. Nowhere else in the region exists a lake that could compete with Lake Issyk Kul and the very peculiar climate. In Soviet times a comprehensive tourism infrastructure has been developed around the lake, mostly at the northern shore. Already in these times some of the tourist housings were closed because of destructive impact to the environment, first of all because of problems with the sewage system. The number of tourists has declined seriously after the collapse of Soviet Union but started to increase again since a decade. Concepts for the development of ecotourism with staying in yurts overnight and other offers became rampant but their share is marginal in comparison with conventional tourism offers. However it should not be underestimated that many families do earn the major share of their annual income with ecotourists. GTZ prepared recommendations for interested companies who are willing to invest into sustainable tourism offers in the Issyk-Kul Biosphere Reserve (GTZ, 2001). One out of many recommendations the study gives is to focus on some selected hot spots for tourism development to facilitate centers of growth for income and employment generation and to relieve pristine and natural habitats from the majority of anthropogenic impact.

The whole province depends on the tourism industry which in turn is very vulnerable against political stability in Kyrgyzstan but also against an intact environment – which became serious in 1998 when the mining company “Kumtor” caused a huge disaster by discharging loads of cyanide into river Barskoon that flows into the lake. Tourism numbers dropped immediately by 50%.

According to Issyk-Kul Biosphere Reserve administration, tourism development needs to be oriented to the new regulations on the sustainable development strategy of Kyrgyzstan as confirmed by the government of the Republic of Kyrgyzstan in June 2013 for the period 2013 until 2017. Tourism development is coordinated with the akim of Issyk-Kul province.

In general tourism development has been much uncoordinated in Issyk-Kul province within the last decade. The northern shore was subject of heavy house building and tourism infrastructure construction work. Paradigms of sustainable development benefit sharing, participatory approaches or consideration of the environment has been largely neglected. At the same time the southern shore has hardly been developed and tourism infrastructure is still minor so far (more in detail see chapter 3.3). In general tourism infrastructure and traffic is to be considered as one of the most serious threats for the ecosystem.

2.3.6. Cooperation

In regard to current ongoing cooperations with the biosphere reserve administration the following has been mentioned at the meeting of 18th of December 2013: Academy of Science Bishkek, independent experts (for instance with the reputable Prof. Shukurov), ADB (Issyk Kul sustainable development project), monitoring activities run by French and Japanese organizations as well as the Kyrgyz dependence of the German NABU International.

At national level there are professional links with the only remaining other biosphere reserve in Kyrgyzstan “Sary Chelek Biosphere Reserve”. At international level some networking activities existed with Biosphere Reserve Schorfheide-Chorin in Germany and currently opportunities with Altai Transboundary Biosphere Reserve are being explored.

2.3.7. International recognition of biodiversity in Issyk-Kul province

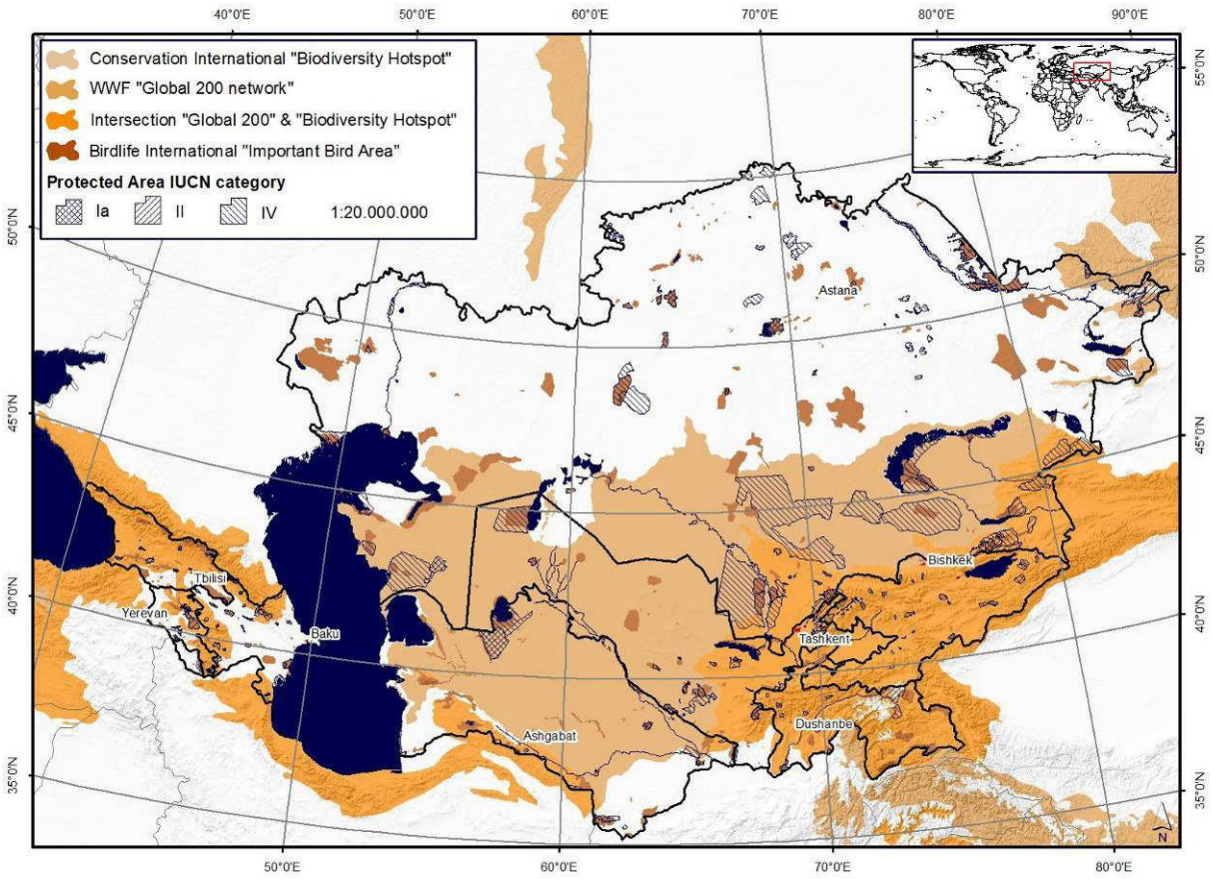
Kyrgyzstan is incorporated in Conservation Internationals´ Biodiversity Hotspots with “Mountains of Central Asia”. The biodiversity hotspots are defined as follows: “The world's most remarkable places are also the most threatened. These are the Hotspots: the richest and most threatened reservoirs of plant and animal life on Earth.” (http://www.conservation.org/where/priority_areas/hotspots/Pages/hotspots_main.aspx).
Biodiversity Hotspot “Mountains of Central Asia” entails approx. 1.500 endemic plant species, three endemic threatened mammal species and one endemic amphibian species (see annex III pp. IV).

The Issyk-Kul basin forms also part of the WWF global 200 ecoregion “Tian Shan montane steppe and meadows” and thus is defined as priority area for conservation worldwide (Olson & Dinerstein 2002) (see annex III p. VI).

The research area is included in Fish Ecoregion of World: 627 - Lake Issyk Kul - Upper Chu. (see annex: III pp. VII)

There are three RAMSAR sites in Kyrgyzstan. One of these areas is “Issyk-Kul State Reserve with the Lake Issyk-Kul” (see annex: III p. IX)

There are two IBA sites within Issyk-Kul Biosphere Reserve. Eastern Issyk Kul lake (criteria: A4i, A4iii) and Western Issyk-Kul lake (criteria: A1, A4i, A4iii). (see annex: III pp. X).



Map 3 Relevant nature conservation areas (IUCN Ia, II and IV) in Central Asia and some biodiversity indicators of international organizations, initiatives or conventions (RAMSAR and IBA not depicted)

2.3.8. Particular threats or shortcomings of Biosphere Reserve Issyk-Kul performance

As expressed by the periodic review

- Missing laboratory facilities and equipment to analyze water quality of the lake and the rivers flowing into the lake;

- Poor waste water treatment and sewage facilities all over the territory. Infrastructural investments and technological improvements are of high priority for the maintenance of ecosystems;

- The work on inventory (land cadastre, mapping, inclusion of legal relations into a database) has not been finished. Especially the definition of boundaries of sanitation zones and their degradation status through anthropogenic impact has not been done but is of highest importance for protection of water quality.

As expressed by the biosphere reserves' administration

At the meeting with Biosphere Reserves' administration the following threats have been notably expressed in regard to future prospects for biosphere reserves' development in the idea of the Seville strategy:

- Poaching in particular mammals, large herbivores and snow leopards, is another serious threat for biodiversity conservation. Hot spots are sites around Kumtor and within the Sarychat-Ertash State Reserve. There are hunting companies that organize hunting tours and

destinations. Currently annually 20 Argali are licensed for hunting – but there is no scientific basis for these licensing numbers in fact; Anti-poaching means are at the most top of the list;

- More monitoring support also as scientific basis for hunting licenses and long term population development data;

- Delegation journeys would be appreciated to receive lessons learned and to get in exchange with employees of biosphere reserves in other countries;

- International biosphere reserve cooperation (with German biosphere reserves, for instance Schorfheide-Chorin which is existing already according to the 2nd periodic review but must be understood as not to be a close contact at the moment according to biosphere reserves administration) on the ground of international cooperation and information exchange (guideline principles on biosphere reserves as of MAB international council at its 17th session March 2012) would be appreciated.

- The gold mining company "Kumtor" is percepted as serious threat for the environment, polluting ecosystems including Lake Issyk-Kul. From biosphere reserve administration there is reported lack of interest in negotiations about possible compensation mechanisms. Instead full stop of ecologic pollutions needs to be realized;

- Glacier melting between 1960 and today - The area covered by glaciers has decreased from 80.000 km² to 60.000 km² country wide. There is evidence that pollution from Kumtor mining company and Aral Sea basin salt fractions are main driving factors for the accelerating glacier melt. Thus abat more uncertain water availability in future;

- Missing law enforcement is one of the main shortcomings for contraventions. This is closely linked with the decreased budget for biosphere reserve tasks.

As expressed by nature conservationist in Kyrgyzstan

- The whole shore of Lake Issyk-Kul is under intensive use due to limited pastures, in particular winter pastures, and limited arable land. Its entire territory has been shared among villages. Today sealing and land consumption have become most serious threats for human-nature interaction in balance. In particular the tourism zones at the northern shore of Lake Issyk-Kul around the city of Cholpon-Ata are especially concerned. Economic activities have to be seriously regulated and monitored in the shore zones. The less harmed and the more pristine the areas have remained the more urgent their strong protection is. This to avoid further loss of ecosystem functions and depletion of biodiversity in these areas;

- The sea-buckthorn bushes and the narrow strip of wetlands along the northern, eastern and south-eastern shore of the Lake Issyk-Kul play an important role for natural soil formation, filtering surface and groundwater supplies and cleaning of impurities from the entire basin (Shukurov, 1990). In certain places the width of the sea-buckthorn belt reached more than 2 km. At Lake Issyk-Kul these habitats form a unique microclimate that increases humidity by reducing evaporation, in winter it creates snow accumulation and provides for slower melting procedures than in open areas. It creates favorable conditions for the emergence of meadow grasses and a large variety of animals. Currently there are only very few intact sea-buckthorn communities at the shore of Lake Issyk-Kul. Anthropogenic impact, namely development of infrastructure along the shore and scrub

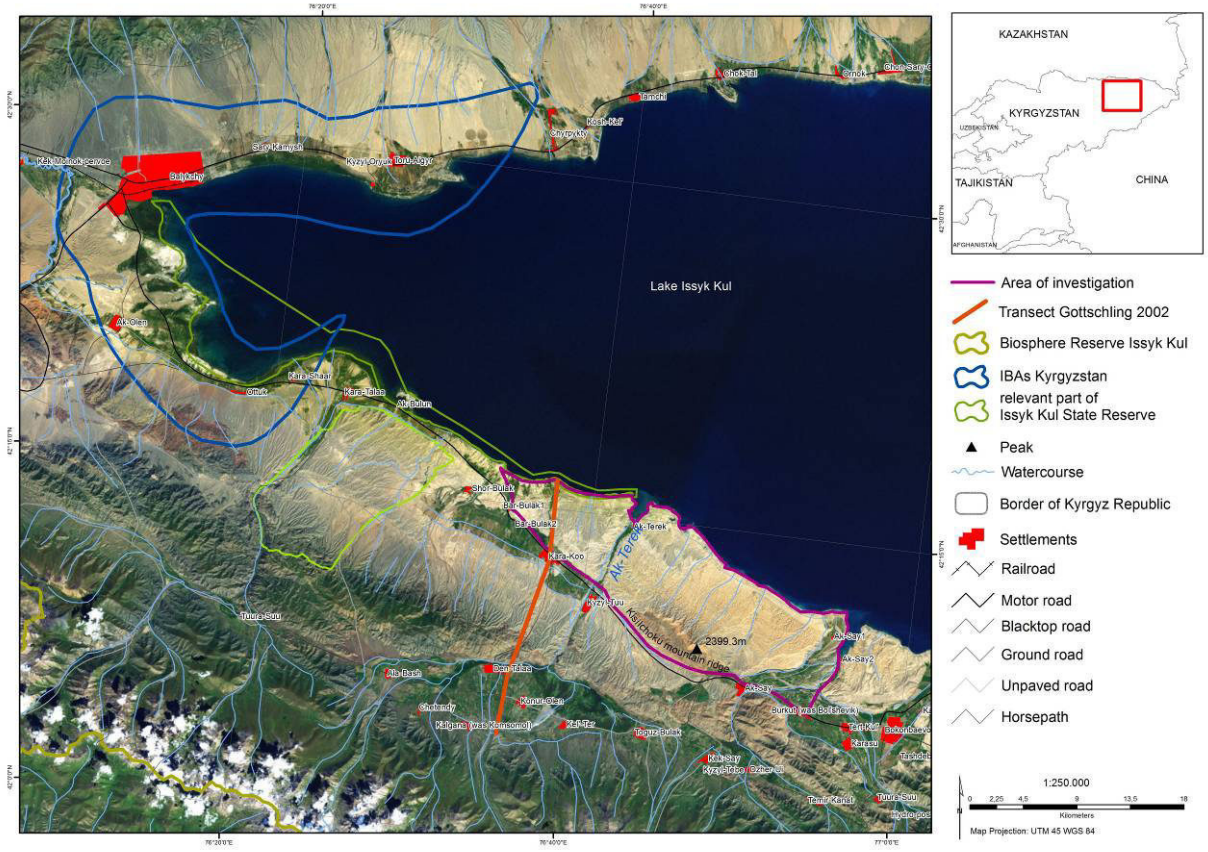
cutting, has caused massive damage to the Issyk-Kul natural complexes and negatively impacts recreational resource quality as well.

- Harvest of fruits of sea-buckthorn is usually taking place in the way that collectors uproot the entire bushes in order to be not harmed by the thorny branches while picking the berries. These results in thinning and finally die off of the sea-buckthorn bushes. There is an urgent need to put the sea-buckthorn-water zone under protection or limited use, respectively. In recent decades, on the areas with sea-buckthorn large areas of forest plantations were established, mainly elm and apricot. Unlike sea-buckthorn bushes - they poorly stop or slowing deflation exposed soil. They form much humidity in the surface layer. Therefore, when creating reforestation measures in Issyk-Kul region, species must be taken that have been tested by nature itself, which is sea-buckthorn.

3. INTRODUCTION TO THE KARA-KOO AREA

3.1. Location

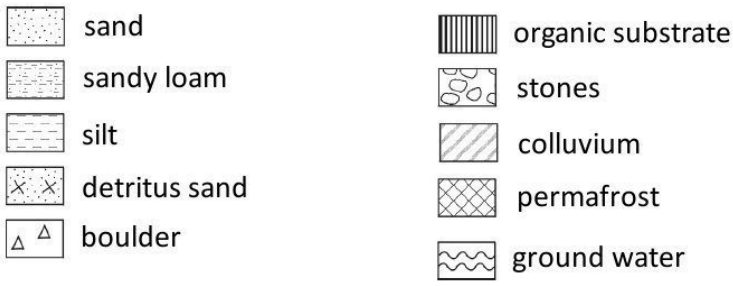
The area of investigation is confined by the south-western shore of Lake Issyk-Kul and its hinterland (see map 4 and the violet indication of the area of investigation). Its eastern limit is Bokombaev town and the western Kara-Koo town. The altitude expansion is starting at Issyk-Kul sea level of 1.609 m a.s.l. in average to the montane peak of Kisilchoku mountain ridge with 2.399 m a.s.l., from colline zone to lower limits of high-montane zone. The area is part of northern slopes of Terskey-Alatau of the Northern Tian Shan. Annual precipitation is less than 200 mm in the colline zone and increases with altitude to montane zone to up to 400 mm. Mean temperature in July is between 16-18°C and in January -2 - -4°C (Atlas Kirgizskoy SSR, 1987). In winter the area is almost free of snow cover. Its geographic location causes an arid climate that determines its biotic and abiotic natural inventory. The area is characterized by comparably little anthropogenic pressure and sparsely distributed tiny settlements yet, relatively remote from traffic infrastructure and thus in comparison with other shore near areas of Issyk-Kul Biosphere Reserve pristine. To a far extent an explanation is its composition of so called badlands, which are too unproductive for agriculture and pasturing .



Map 4 location of area of investigation

3.2. Description of a transect along altitudinal zonation

To describe the area of investigation an altitudinal zonation along a transect from North (lake side) to South (mountain ridge) was chosen (compare orange line at map 4). It has been elaborated by Gottschling in 2003 in a very sophisticated way and is drafted in below. For proper understanding note the legend:



Legend 1 in terms of use the following abbreviations are used:

W – winter pasture, **SP** – spring pasture, **S** – summer pasture, **A** – autumn pasture

Colline semi-desert zone (1.600 – 1.800 m a.s.l.)

The colline semi-desert is bordering to Lake Issyk-Kul shore. Characteristic *vegetation form* (more details on the *Vegetationsformenkonzept* see Succow & Joosten 2001) of the zone is a *Kalidium–Reamuria kaschgarica* – dwarf shrub semi-desert with coverage of 10-15 % at ordinary burozem soil. Distribution of vegetation is diffuse. Dwarf shrub semi-desert is poor of species. At a site of 100 m² five to ten species are represented among those *Kalidium cuspidatum*, *Kalidium schrenkianum*, *Sympegma regelii*, *Zygophyllum rosovii*, *Limonium hoeltzeri* and others. Productivity with one to two decitons per hectare.

Picture 1 Lake Issyk Kul shore from point of investigation area

There are almost no differences of northern and southern aspects in the natural landscape because of the arid climatic conditions. At sheltered slopes (eventually with rare water inflow) occasionally *Stipa caucasica* and *Kraschenninnikovia ceratoides* occur. Ordinary burozems are gypseous but not remarkable saline. Soils of silt content develop silt crusts at the top layer that protect to a certain extent from aeolic erosion. Cattle passage and car traffic on the other hand, destroy the crust and stimulates wind erosion. Sandy and skeletal semi-desert soils are less prone to erosion. In terms of relief and substrate the *badlands* form outstanding sites. They consist of seriously saline tertiary silty sediments and rise above the flat surrounding areas, sometimes interstratified by layers of rock. At slope sites only some centimeters below soil surface substrate became very hard (syrozem with silicium hardening). Moreover at slope sites no semi-desert vegetation survives. Vegetation remains only at favorable depression sites and lower slopes. Thus the site is to characterize as a desert due to substrate and relief

Picture 2 Lake Issyk Kul shore from point of investigation area

constitutions. Younger lake sediments, especially those consisting of sandy substrate and saturated by ground water in different proportions, are seriously salt affected because of capillar ground water streams that occure under these colline semi-desert climate.

Under medium or high ground water table, capillar streams occur and accumulate salt in the soil (gley-solonchak, gley-calcium salt raw soil). Different shrub communities and wet meadows or wet pastures are to be found here. Solely close to shore of Lake Issyk-Kul sandy soils are free of salt where high ground water table and sea-buckthorn shrub communities (Hippophae rhamnoides) occur. A lateral soil water stream most likely prevents soil salinisation. A typical *ephedra* intermedia–dwarf-shrub usually occurs at free / poor of salt, well drained sandy substrates with only little ground water interference. Ground water table that would cause capillar streams obviously is too low.

In more eastern areas (where the transect went through) it was found that slightly declining areas are to a very large extend under use (irrigation and furrow irrigation). Skeletal or not irrigated areas are under pasture. Not salinized sites are even under intensive pasture use throughout the year. *All these land use aspects are omitted in the area of investigation where land use is to the largest extend absent and natural landscapes still remain.*

Picture 3 ephedra communities

The peculiarities of the areas in proximity to the shore of Lake Issyk-Kul within the area of investigation are described in detail by Romanovsky (1991) in the dimension of its geomorphological genesis. Weed vegetation is intensively growing in the shore areas plus different species of aquatic vegetation but most dominant are reed communities, especially in Ak-Terek and Ton river inflows. In both inflows perfoliate mixed tangle and fennel pondweed species (*Potamogeton perfoliatus, P. pectinatus*), Eurasian water milfoil (*Myriophyllum spicatum*), *Vaucheria ssp*. and others.

At shallow water grounds *Chara altaica, Ch. connivens Salzmann, Ch. Cantraria, Ch. aspera* and other occur. In deeper water *Tolypella nidifica (Mill) Leonh, Ch. intremediata, Ch. tomemtosa (ceratofylla Wallz.) are represented.* The belt of stonewort communities decreases along the whole shore zone of the lake until 40m in depth (Romanovsky, 1991). The endemic seaweed *Ch. crinitoides Hollerb* is becoming more dominant (Mambetalieva et al., 1960).

According to Pavlova (after Romanovsky, 1991), the vastest biodiversity of benthic organisms is registered in stonewort habitats. They are represented by chironomid larvae, mollusks, gammarids, mysids, oligochaetes and others.

Side note on water filtration system and peculiar vulnerability of the sea buckthorn - bog complexes of the Issyk-Kul shore (1.609 m)

The Issyk-Kul basin, in parallel to the geomorphological uplift processes of Tian Shan Mountains, has been formed to a large extent by groundwater and surface runoff. Because of this geomorphologic peculiarity a large amount of pollutants infiltrate the endorheic basin. These are accumulated and cause eutrophication. Having no effluent rivers, Lake Issyk-Kul is under very slow water-logging processes and functions as natural filter.

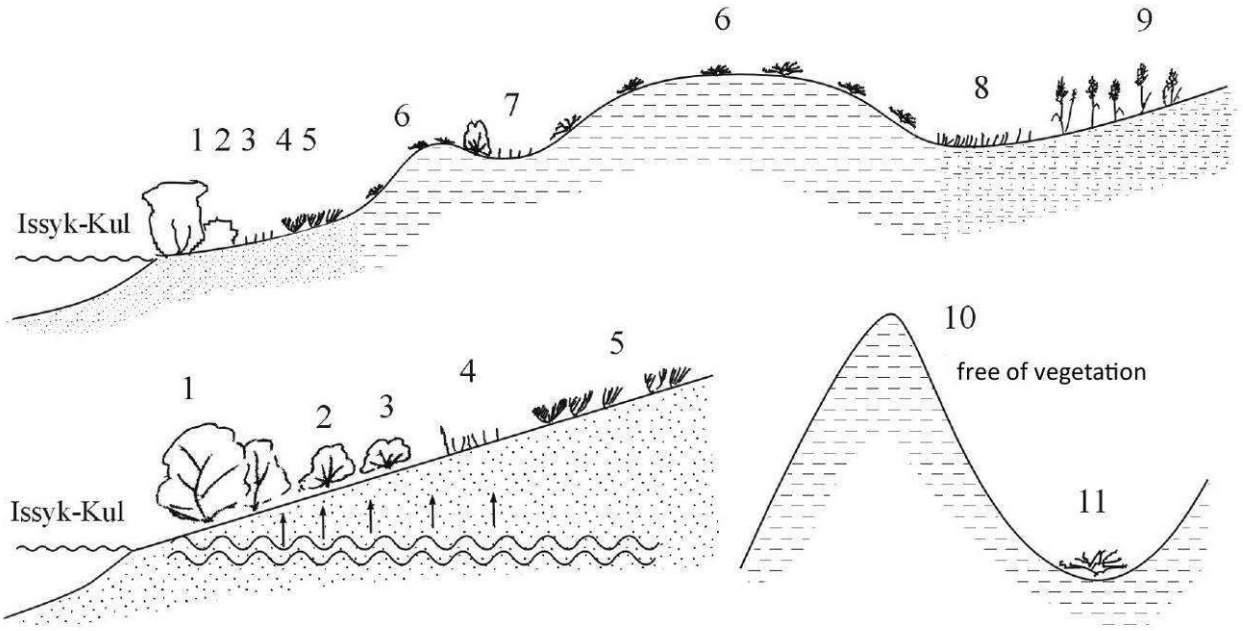
These natural filters are “recreational” sands, bogs and wild shrublands near the shore. These ecosystems are dominated by sea- buckthorn communities. The shallow wetlands are inhabited by many microorganisms forming a vivid filter. Main parts of these natural filters consist of bog microorganisms, grasses and shrubs. Sea-buckthorn is the most dominant plant, but not the only relevant element of the filter; others, usually associated with sea-buckthorn are reed, barbery, cherry-barbery and blackberry-currants vegetation communities.

“Recreational” sands serve as shore stabilizer and have sanitary, epidemiological functions, thus they also have recreational functions. Issyk-Kul shore in general is comparably poor of organic processes and thus of special vulnerability to anthropogenic impacts. Organic substrates are hardly processed, accumulate in the sand and degrade its aeration and permeability. At pristine shores sands smells like the lake itself. Biotic degradation processes are self-perpetuating and cause depletion of species composition and abundance of psammophiles. It results in a decreasing ability to assimilate and process organics. Extinct littoral communities are not able to process even small amounts of organic contamination anymore.

Exceeding the limits of contamination causes anaerobic processes. As a result the level of sulphurous layer increases. Finally it covers the entire thickness of the soil moisture of the recreational sands. A characteristic black and smelling layer of hydrogen sulfide rise to the surface.

In order to combat the accelerating degradation processes large areas of former sea-buckthorn communities were reforested, mainly with elm and apricot within the last decades. Currently, the areas covered by sea buckthorn communities amounts only to a few thousand hectares hardly any that are not harmed (see chapter 2.3.8.)

colline semi-desert zone
altitude: 1.600 - 1.800 m
precipitation: < 200 mm
meso climatic contrast: low



Scheme 1 colline-desert zone of transect (after Gottschling, 2003)

	1	2	3	4
Vegetation	*Hippophae rhamnoides*-shrubs with *Rosa beggeriana* and *Epilobium hirsutum*	*Nitraria sibirica-Hippophae rhamnoides*-shrubs	*Nitraria sibirica-Halimodendronhalodendron* - shrubs with *Phragmites australis,Salsola australis, Thermopsisturkestanica*	*Calamagrostisepigeios–Phragmite saustralis–Glycyrrhizs Glabra* - wet meadow
Soil	gley-raw soil (not saline)	gley-calcium salt raw soil	gley-calcium salt raw soil	gley - solonchak
Substrate	calcareous sand, lake sediment	skeletal calcareous sand (lake sediment)	skeletal calcareous sand (lake sediment)	calcareous sand (lake sediment)
Relief	flat, gentle slope, Issyk-Kul-shore	flat, gentle slope	flat, gentle slope	flat, gentle slope
Substrate water	soil wetness	ground water effected	ground water effected	soil wetness, capillary ground water pressure
Meso climate	hyper arid (eventually lake effected)	hyper arid (eventually lake effected)	hyper arid (eventually lake effected)	hyper arid (eventually lake effected)
use	no use	no use, occasional minor pasturing (W)	no use, occasional minor pasturing (W)	occasional pasturing (W)

	5	6	7	8
Vegetation	*Ephedra intermedia*-semi-desert	*Kalidium (cuspidatum)–Reamuria kaschgarica–* Dwarf-shrub semi-desert; at slope sites higher share of an *Stipa caucasica*; and former agricultural sites with *Artemisia subgen. seriphidium*	moist pasture of *Elytrigia repens,Phragmites australis* with *Nitraria sibirica–* shrubs	moist pasture of B*lysmus compressus, Juncus bufonius, Juncus articulatus, Juncus heptapotamicus, Triglochin palustris, Halerpestes sarmentosa, Potentilla anserina*, and others
Soil	gley-calcium salt raw soil, gley-pararendzina	ordinary burozem	gley-solonchak	grey-gley
Substrate	skeletal calcareous sand (lake sediment)	calcareous silt, skeletal calcareous	low calcareous silt layer on to of calcareous sand (lake sediment)	calcareous silt
Relief	flat, gentle slope	undulating, flat, gentle slope, aspects to all directions	depression site	Gentle slope, in front of ground water impounding small mountain ridge
Substrate water	little ground water affected	formerly short termed irrigation	soil wetness, capillar ground water pressure	soil wetness

Meso climate	hyper arid (eventually lake affected)	hyper arid	hyper arid	hyper arid
Use	Moderate pasturing (W)	Occasional pasturing (W)	Regular pasturing, (W,SP, S, A)	Very heavy pasturing (W,SP, S, A)

	9	10	11
Vegetation	agricultural use of *Artemisia annua, Elytrigia repens, Medicago lupulina, Cirsium incanum, Avena fatua, Lathyrus tuberosus*, and others	Free of vegetation	*Nitraria sibirica* – *Kalidium*-shrub semi-desert
Soil	Irrigated agricultural-burozem	syrozem, serious salinization, silicium hardening	colluvial-burozem, serious salinization
Substrate	calcareous sand clay, calcareous silt	calcareous silt from very salinized tertiary sediments	calcareous silt from very salinized tertiary sediments
Relief	gently slope	cliffs to all aspects, badlands	depression in badlands
Substrate water	furrow irrigation	course regime	rare episodic inflow from adjacent slope sites
Meso climate	hyper arid	hyper arid	hyper arid
Use	irrigation	no use	occassional pasturing

Table 1 site description of colline semi-desert zone (after Gottschling, 2003)

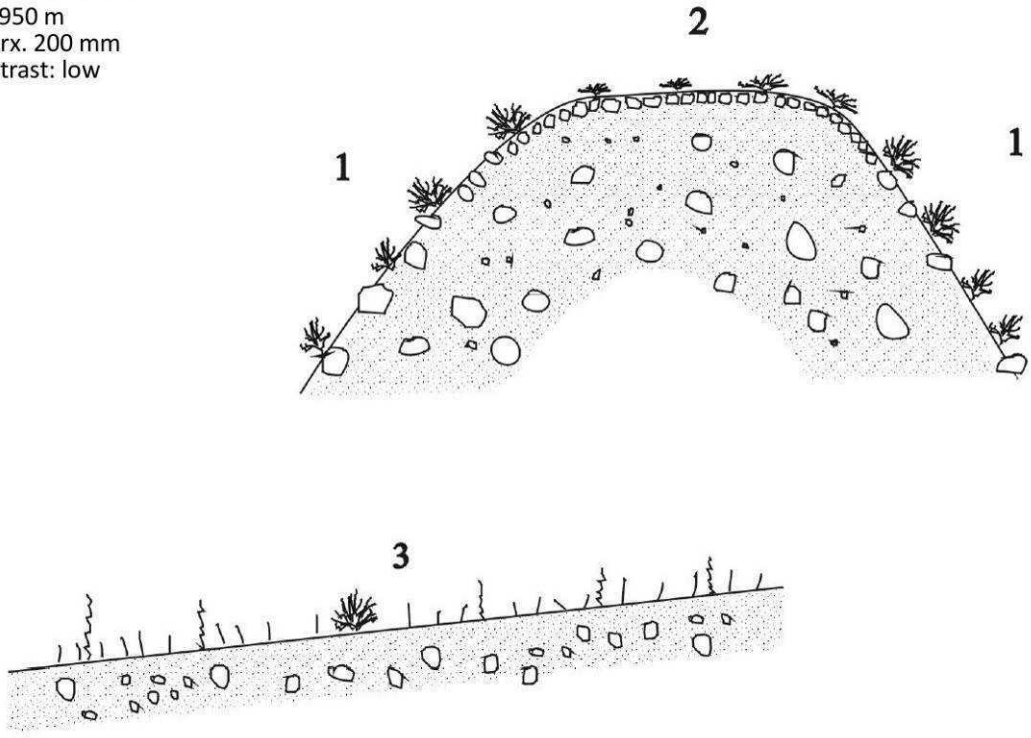
Submontane semi-desert zone (1.800 – 1.950 m a.s.l.) -

That zone is already composed of a higher species diversity of semi-deserts and higher vegetation cover of up to 40%: thorn cushion - dwarf shrub semi-desert with *Allium oreoprasum*, *Convolvulus tragocanthoides* and *Helianthemum songoricum* at dark burozems (substrate skeletal calcareous sand, gypseous). Besides species of lower altitudes of the semi-desert areas like *Reamuria kaschgarica*, *Zygophyllum rosovii*, *Limonium hoeltzeri*, *Kalidium cuspidatum*, K. *schrenkianum* and others the following species occur: *Brachanthemum titovii*, *Kraschenninnikovia ceratoides*, *Lagochilius platyacanthus*, *Convolvulus tragocanthoides*, *Acantholimon alatavicum* and *Caragana aurantiaca*. Sometimes in seperate *Stipa caucasica*, *Agropyron christatum* and *Stipa lessingiana*. At the skeletal calcareous sandy and gypseous sediments deflation pattern at the layer prevent or at least decrease erosion processes.

Picture 5 badlands

Picture 4 badlands

submontane semi-desert zone
altitude: 1.800- 1.950 m
precipitation: apprx. 200 mm
meso climatic contrast: low



Scheme 2 submontane semi-desert zone of transect (after Gottschling, 2003)

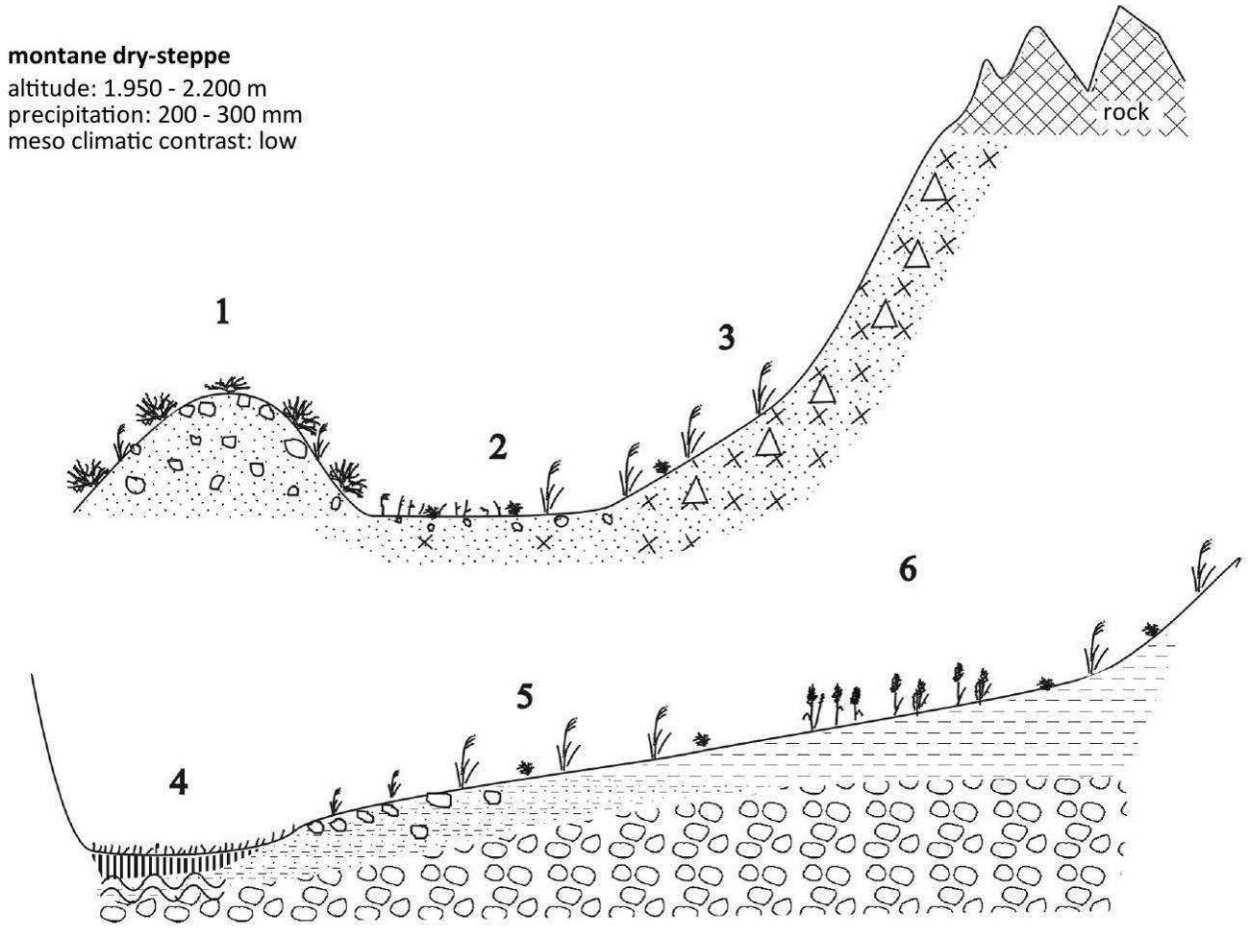
	1	2	3
Vegetation	*Allium oreoprasum–Convolvulus tragocanthoides–Helianthemum songoricum*–(thorn cushion-) dwarf shrub semi-desert	*Reamuria kaschgarica-Helianthemum songoricum*) dwarf shrub semi-desert	Degraded dry steppe of *Salsola collina, Neopalassia pectinata, Botrichloa ischaemum, Artemisia tianschanica*
Soil	dark burozem	normal burozem	dark burozem
Substrate	skeletal calcareous sand. Bouldered skelet, gypseous	skeletal calcareous sand, gypseous, deflation pattern	skeletal calcareous sand, gypseous
Relief	Cliffs but moderate sloped, different aspects	aeolic exposure	large depression
Substrate water	-	-	-
Meso climate	arid	hyper arid	arid
Use	moderate pasturing (W)	moderate pasturing (W)	Serious pasturing (formerly very heavy pasturing) secondary vegetation (W) (possibly SP, A)

Table 1 site description of submontane semi-desert zone (after Gottschling, 2003)

Montane dry-steppe zone (1.950 – 2.200 m a.s.l)

Dominant *vegetation form* is *Salsola collina*, *Artemisia tianschanica*, *Stipa capillata* dry steppe with a cover of 35–55%. It is of moderate gypsiousness at pale kastanozem. In opposite to semi-desert the share of grasses is considerably higher. Additionally to the already mentioned *Stipa capillata* and *Festuca valesiaca*, there also occur *Artemisia tianschanica* and legumes as *Oxytropis globiflora* and *Astragalus chomutovii*. Other species are: *Orostachys thyrsiflora*, *Allium weschnjakovii*, *Lagochilius platyacanthus*, *Achnatherum splendens*, *Lappula microcarpa*, *Meniucus linifolius*, *Botrichloa ischaemum*, *Ajania fastigiata* and others. At that altitude there is a large depression with a gently sloped surface exposing to the north on a -glacial boulder of mostly little cover of silt layer.
At some places there are alluvial fans and river gravel. At soils with siltcontaining substrate irrigation farming is done. The short growing season decreases the choice of arable crops. To grow spring wheat is risky but for hay making and fodder production the land is suited.

All the agricultural soils contain carbonate up to the surface layer. Irrigation still does not lead to decalcification. *But again land use practices do not take place within the area of investigation and thus the habitats are comparably pristine.*



Scheme 3 montane dry-steppe zone of transect (after Gottschling, 2003)

	1	2	3
Vegetation	dry steppe of *Stipa capillata, Salsola collina, Artemisia tianschanica, Oxytropis globiflora*	Intensively pastured dry steppe of *Neopalassia pectinata, Artemisia tianschanica, Salsola collina, Stipa capillata, Chenopodium album*	*Salsola collina A rtemisia tianschanica-Stipa capillata*- dry steppe (partially of xeromorph *Caragana aurantiaca*-shrubs especially in gullies)
Soil	dark burozem, pale kastanozem (transition)	pale kastanozem, little saline	pale kastanozem
Substrate	skeletal calcareous sand	calcareous sand, skeletal calcareous sand	skeletal calcareous sand (granite erosion)
Relief	slope site	flat, large depression	lower site of slote
Substrate water	-	-	Little water intrusion from slope in gully sites
Meso climate	semi-arid	semi-arid	semi-arid
Use	moderate to serious pasturing (W, SP, A)	serious pasturing, secondary vegetation (W, SP, A)	Moderate to serious pasturing (W, SP, A)

	4	5	6
Vegetation	peat complex, among others occure: *Carex orbicularis, Parnassia palustris, Triglochin maritima, Ligularia heterophylla, Geranium collinum, Eleocharis mitracarp*	*Salsola collina–Artemisia tianschanica–Stipa capillata–* dry steppe	*Elsholtzia densa, Pleconax connoidea, Elytrigia repens, Medicago lupulina, Cirsium incanum, Avena fatua, Lathyrus tuberosus* and others (partially irrigated fallow land)
Soil	fen-gley	pale kastanozem	irrigated pale agricultural kastanozem
Substrate	calcareous peat, calcareous sand, calcareous silt	silt; sandy clay / sand; boulder	silt; sandy clay / sand;
Relief	gentle slope, ground water stow because of mountain ridge	flat, gentle slope	flat, gentle slope
Substrate water	soil wetness	-	furrow irrigation
Meso climate	semi-arid	semi-arid	semi-arid
Use	hey making	serious pasturing (W, SP, A)	Irrigation

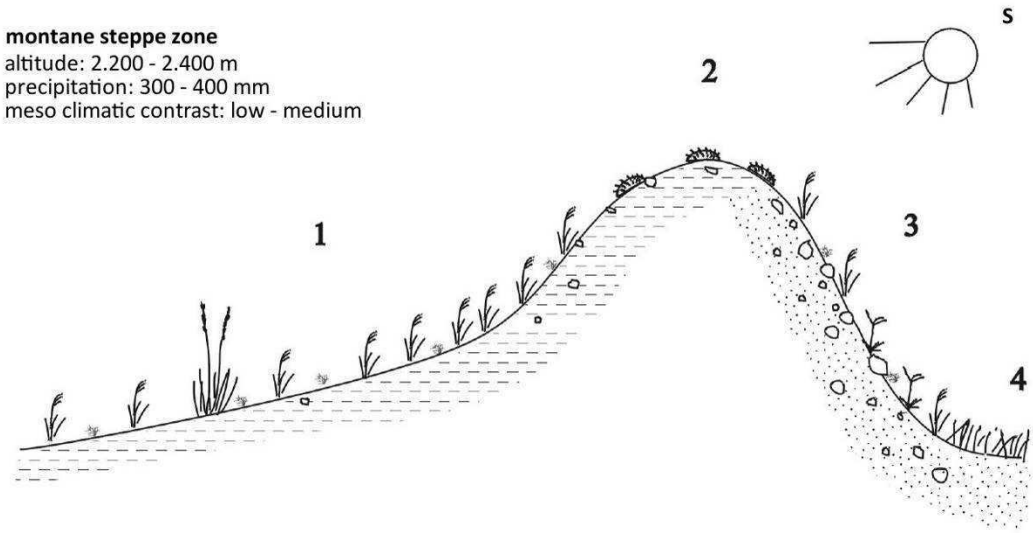
Table 2 site description montane dry-steppe zone of transect (after Gottschling, 2003)

Montane steppe zone (2.200 – 2,400 m a.s.l.)

Dominating *vegetation form* is *Teloxys aristata*, *Salsola collina*, *Stipa capillata* steppe with cover of 45–65% at dark kastanozem (in parts gypseous in the bottom profile). Characteristic is a high share of nitrogen sequestering legume as *Oxytropis globiflora*, *Hedysarum songoricum* and *Astragalus borodinii*.

Teloxys aristata (*Chenopodiaceae*) as a therophyte grows in one year, and did almost not appear another year. *Artemisia tianschanica* grows in a lower density then in the dry steppe zone. Where pasturing is taking place, large hummocks of *Achnatherum splendens* are physiognomically peculiar. If very intensive pasturing takes place, the steppe species are substituted by thorn cushion communities from *Acantholimon alatavicum*, *Convolvulus tragocanthoides* and *Lagochilius platyacanthus*.

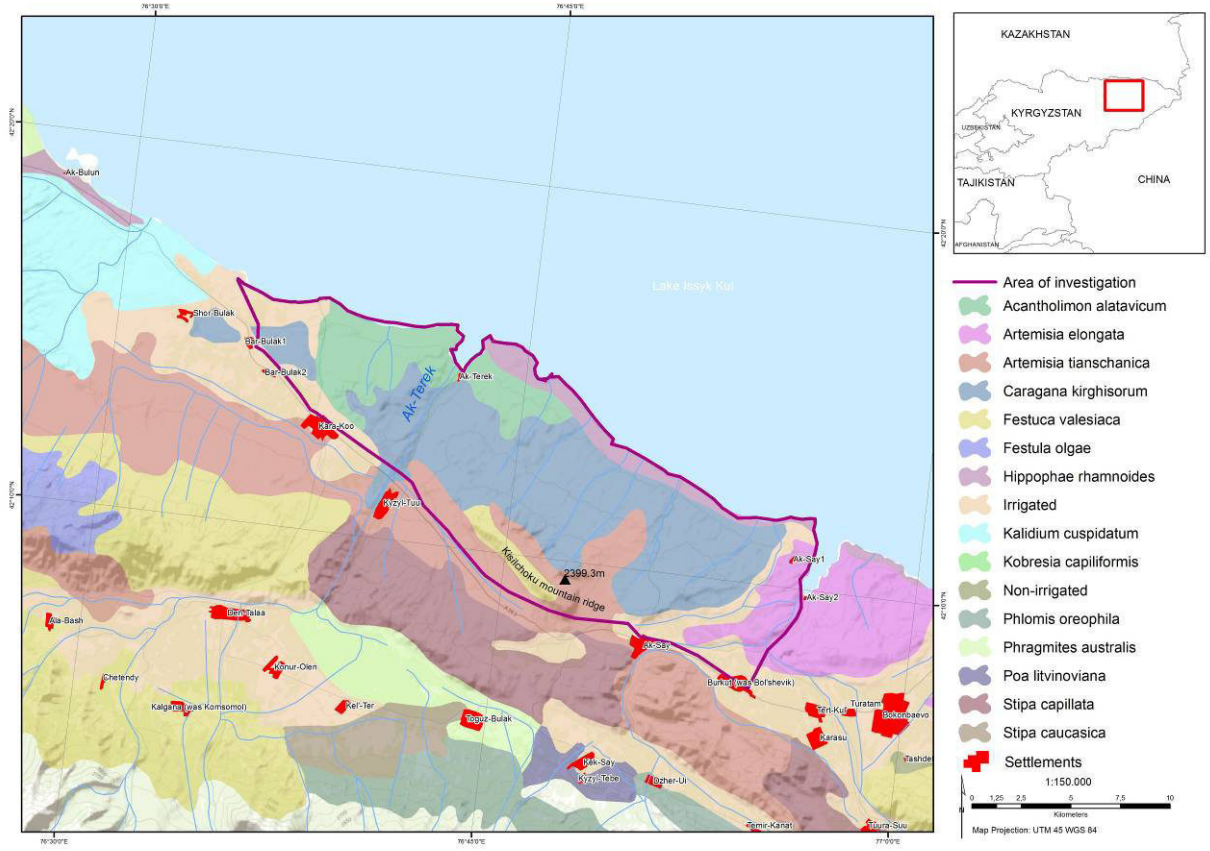
Differences in northern and southern aspects are little to medium. The dry climatic conditions are even at shadowed northern aspect sites determining vegetation and soils, with some minor differences in species composition. Soils at both aspects are dark kastanozems. But there are some aspect related differences in composition of substrates and gypseous horizons in the soil profiles.



Scheme 4 montane steppe zone of transect (after Gottschling, 2003)

	1	2	3	4
Vegetation	*(Teloxys aristata) - Salsola collina - Stipa capillata* – steppe of *Achnatherum splendens*	thorn cushion formations of *Acantholimon alatavicum, Convolvulus tragocanthoides, Lagochiliusplatyacanthus* (serious degraded *Salsola collina-Stipa capillata*-steppe)	*(Teloxys aristata) - Salsola collina-Stipa Capillata*	Modified *Salsola collina - Stipa capillata* - steppe of *Elytrigia repens* and *Chenopodium album*
Soil	dark kastanozem (not saline because of northern slope)	Seriously degraded (erosion) kastanozem	dark kastanozem (little salinized because of southern slope)	colluvial kastanozem, eutrophic
Substrate	calcareous sand loam, calcareous silt,	skeletal calcareous silt	skeletal calcareous sand, skeletal calcareous silt)	
Relief	gentle slope, northern aspect	Upper slope, slope (eastern)	gentle slope, southern aspect	depression
Substrate water		Intensive discharge regime		Slope inflow water / irrigation of steppe
Meso climate	semi-arid	semi-arid	semi-arid	semi-arid
use	Serious pasturing, moderate degraded (SP, A)	Very serious pasturing, serious degradation, secondary vegetation, thorn cushion (SP, A)	Serious pasturing, (SP, A)	Serious pasturing, Eutrophic (SP,A,W)

Table 3 site description montane steppe zone of transect (after Gottschling, 2003)



Map 5 Distribution of vegetation in the area of investigation. source: Atlas of Kyrgyz SSR. V.1. M.: GUGK, 1987.

Within the area of investigation the following terrestrial vertebrates are represented along the described altitudinal zonation above (not complete):

Class	Species of colline semi-desert zone	Species of sub-montane semi-desert zone	Species of secondary steppe habitats in the different montane zones
reptiles	*Ablepharus deserti*	*Eremias arguta*	*Ablepharus deserti*
	Eremias multiocellata	*Natrix tessellata*	
	Eremias velox	*Eremias multiocellata saturata*	
	Eremias nikolskii		
	Eremias arguta		
	Psammophis lineolatus		
	Gloydius halys		
birds	*Neophron percnopterus*	*Motacilla personata*	*Passer domesticus*
	Calandrella cinerea	*Motacilla citreola*	*Passer indicus*
	Bubo bubo	*Emberiza bruniceps*	*P. montanus*
	Otus brucei	*Emberiza calandra*	*Riparia riparia*
	Athene noctua	*Saxicola torquata*	*Acridotheres tristis*
	Charadrius mongolus	*Coturnix coturnix*	*Sturnus vulgaris*
	Syrrhaptes paradoxus	*Alauda arvensis*	*Merops apiaster*
	Pterocles orientalis	*Passer*	*Coracias garrulus*
	Calandrella cinerea		*Alcedo atthis*
	Anthus campestris		*Upupa epops*
	Oenanthe oenanthe		*Columba livia*
	Oenanthe isabellina		*Columba eversmanni*
	Sitta tephronota		*Athene noctua*
	Bucanetes mongolicus		
	Rhodospiza obsoleta		
mammals	*Lepus tolai*	*Mus musculus*	*Cricetulus migratorius*
	Allactaga saltator	*Cricetulus migratorius*	*Mus musculus*
	Meriones tamariscinus	*Spermophilus citellus*	*Meles meles*
	Meriones erythrourus	*Lepus tolai*	
	Mustela eversmanni	*Hemiechinus auritus*	
		Canis lupus	
		Vulpes vulpes	
		Felis manul	
amphibians	*Bufo viridis* (indicator species)	*Bufo viridis*	

Table 4 vertebrates are represented by three types within the area of investigation

The entire Issyk-Kul basin is most important for migratory birds. In spring and autumn seasons large numbers of birds especially waterfowl but others as well use Lake Issyk-Kul as stop over or even wintering habitat, among others demoiselle crane (*Anthropoides virgo*), bar-headed goose (*Anser indicus*), black stork (*Ciconia nigra*), ibisbill (*Ibidorhyncha struthersii*) as well as for wintering birds like *Fulica ssp.*, *Anas ssp*., graylag goose (*Anser anser*) and about 850 mute swans (*Cygnus olor*) and whooper swans (*Cygnus Cygnus)* (WWF ECONET, 2013). Thus also the area of investigation is a most important destination for migratory birds, especially because of its comparable remoteness to human interactions. In average, there are up to 1.000 birds per day observed. The species composition of migrants differs over the migration period. The more distant to Lake Issyk-Kul the less wintering species are observed. In the far hinterland only 100 wintering bird species remain.
Lake Issyk-Kul hosts 28 species of fish of which 8 are endemic (Birdlife International (2014) Important Bird Areas factsheet: Western Issyk Kul Lake. Viewed at www.birdlife.org on 07/04/2014). Some of these fishes are marinka (Schizothorax issykkuli), ich (*Ichthyophthirius multifiliis*), Issyk-Kul dace (*Leuciscus bergi*), minnow and gudgeon.
Also the montane steppe zone inhabits nesting sites for the majority of raptors among others but most of all saker falcon (*Falco cherug*), lammergeyer (*Gypaetus barbatus*), cinereous vulture (*Aegypius monachus*) and eastern imperial eagle (*Aquila heliacal*).

3.3. Socio-economic situation

There are a couple of villages around and near the area of investigation (see map 6). All of them impact on ecosystems and landscapes, most of them by agricultural practices. It is a matter of course that strict nature protection areas and priorities in nature conservation targets contradict with human settlements in between. That is why certain needs of local population must be considered and harmonized. Obviously the settlements do not fit to the establishment of a strict nature reserve. Another approach must be taken and is outlined in chapter 4.3. From a broad perspective there are only very limited settlements in the area of investigation itself and as already mentioned only very limited anthropogenic pressure so far. That's one of the reasons for choosing the area for closer investigation in the study. Nevertheless human cause impact on nature, even at this place, either direct by accessing or land use or indirect by resource use of adjacent landscapes and ecosystems. The villages in and around the area of investigation are economically left behind. After collapse of Soviet Union almost no cultural institutions have survived, schools are poorly equipped, medical treatment facilities are marginal, people do not have the resources even to visit neighboring district. The less exchange with innovations and knowledge takes place. Birth rates are high, mortality as well. Livestock breeding and horticulture are almost the only means to survive. Some of the major socio-economic facts are given in table 5(compare villages with map 6).
To begin to overcome the mentioned shortcomings it is on the one hand side essential to receive external earnings but a waste to mention that this is not the solution for the socio-economic situation. People need advice on how to help themselves. To found farmer associations could function as a local-farmer-inherent mechanism on agricultural advice, technical assistance (machinery and equipment sharing) and manpower support. Agricultural products are to a large extent organic because farmers do not have the resources for chemical treatments (a positive aspect of economic break down). Organic, local food is a preferred offer for western tourists. Marketing chains need to get developed, a task that is only to achieve with extern support and know-how. Farmers should diversify their products and use native species that are adapted to the local site characteristics. Use of agricultural small-scale technique, in opposite to the soviet large scale machinery, is to be preferred. The latter one is not maintained anymore and therefore useless nowadays. For allocation of necessary equipment micro-loan

approaches are a tested and sometimes well performing mechanism to enable people's self-help. Introduction of adapted pasture management and breeding of locally adapted, traditional species, is another important mean. Livestock manure belongs to soil development. To compensate the lack of fuel and firewood, fast growing plantations could be an approach, but extern support for fuel import and support with energy-efficient house building and house restoration is indispensible. The biosphere reserve administration needs to involve people into participatory land use planning to initiate ownership and distribute innovative and cheap to implement land use practices.

		Aiyl Aimak	village Aiyl Aimak Kara-Koo	village Aiyl Aimak Barbulak	village Aiyl Aimak Kyzyl-Tuu	Eshperov	Ak-Sai	Bokom-baevo
general information	area in ha	24.096						327
	residents	8.675	4.168	928	1.866	2.060	2.025	12.504
	households		1.204	274	491			
education	pupils		636	162	314	447	322	1.141
	availability of school books		78%	76%	74%			62%
husbandry	sheeps		10.000	2.510	3.200	3.722	4.107	*
	cattle		1.450	394	550	614	848	6.990
	horses		582	420	428	422	482	3.718
	goats		779	292	466	297	390	*
	poultry						1.657	14.022
agriculture	pastures in ha	39.587				5.028	22.006	74.004
	area under crops in ha	4.489				329	5.000	2.763
	area under grain in ha	1.630					12	1.385
	hay area(fodder) in ha	1.670				140	232	685
	area under potato in ha	876				111	120	312
	area under fruits and vegetable in ha	130				274	289	21

Table 5 conditions of villages in the area of investigation

3.4. Tourism perspectives

As several times already stated the area of investigation is comparably pristine. This is to a large extent due to a poor transportation infrastructure. Where other areas of Lake Issyk-Kul shore are easily accessible because of roads that go pretty close along the lake site, the area of investigation has remained a remote destination. The areas of easy accessibility suffer from unmanaged anthropogenic impact which becomes immediately obvious by evidence of degraded vegetation cover, timber cutting, rubbish, water pollution, nutrification and so on.

Thus on the one hand side the area of investigation has a considerable potential to become a destination for visitors which are looking for more pristine places and act more cautious. On the other hand it contradicts with typical nature conservation targets to conserve biodiversity, natural processes and gene pool.

In general there are almost no large resorts or hotel complexes in the nearest surroundings of the area of investigation. That is why the water is cleaner, beaches are rarely crowded, and

existing tourism offers are aimed at people with interests in calmness and countryside. However there exist a few offers for tourists. The most relevant ones are drafted in the following:

A unique destination within the research area is a salt lake. The *salt lake* on Issyk-Kul: (Tuzkel, Tuz-Kul) — is the most salty mountain lake in whole Kyrgyzstan. It is located at the outer most western part of Lake Issyk-Kul, 73 km south of Balykchi, just 1 km from the shore line in its hinterland, of the Terskei Ala-Too Mountain at 1.609 m above sea level. It is in the eastern part of the area of investigation (see map 6). The lake has an extent of 1.500 m and a depth of 11 m. The surface area amounts 86 ha. Water salinity reaches 65 g/l (according to other sources - 132 g/l).

The road to the lake is unpaved. After raining the passage is hampered. Along the road there are agricultural acreages - hay-makings, pastures, orchards and some construction sites like sheep yards, buildings of temporary and permanent housing. Cattle grazes along the road and in summer horse-rides are offered to passing tourists. Near that lake there are three permanent buildings, that offer rooms for the price of 25 € per night (in summer), and a yurt camp. In summer there are about 48 yurts there. One yurt costs about 16 € and in guest houses the prices per bed ranges between 2 and 4 €. The yurt can be of different size. The average size yurt may consist of 5-6 sections. Before entering the territory there is a barrier, because the territory is leased by a private entrepreneur for 49 years. Entrance is charged with 0.8 € per adult person, 1,5 € per car; children enter for free. At the northern shore of Lake Issyk-Kul, resorts offer a tour to the Salt Lake, organize transport and one-day trips. Infrastructure around the lake is hardly developed; nevertheless anthropogenic impact is apparent at many places.

Bar-Bulak Spring is a mineral water spring, located in Ton District, 300 m away from Lake Issyk Kul, 45 km east of Balykchi and 2,5 km to north-east of Bar-Bulak village. In 1979 a 1.100 m deep hole was drilled to gain access to mineral water. The water is uncoloured, odorless and has a temperature of approx. 44 °C. 2.5 l/s release from the drilled hole. Mineralization is in the range of 4.0 – 4.7 g/l. The chemical composition is sulphate-sodium-chloride-calcium. In the dissolved form predominate: nitrogen (88 - 90%), carbon dioxide (4.2%) and helium (1.5%). Furthermore copper, lead, zinc, fluorine, arsenic, molybdenum, nickel and brome are contained. These waters are used for baths; they are bottled under the name “Bar-Bulak”. It is used as a treatment for gastrointestinal, gynecological and other diseases. “Bar-Bulak” recreation house is operating near the water spring (www.kyrgyzstantravel.info/resorts/mineral-ru.htm). The spring is famous among tourists and local residents.

Cultural events: On the initiative of local people and with the support of the gold-mining company “Kumtor” and other sponsors, in 2013 in Kyzyl Tuu village / Ton district, the second international festival “Kiyiz Duino” was held (www.youtube.com/watch?v=dZA7cFZm3oE). The program includes a variety of workshops, plays, exhibitions, films, theater and concert shows with the participation of Kyrgyz stars of pop and theatre. During the festival, the entire territory of the village was designed in the style of the 19th century, and all villagers were dressed in traditional Kyrgyz clothing. The festival administration sales "patronage tickets" The ticket included accommodation in a hotel of Kyzyl-Tuu village and entrance fee for the festival. All earnings were used to produce the documentary “Kiyiz Duino”, which has been sent to the “Golden Fund” of Kyrgyzstan. A two-day ticket took 63 € per person. The first international festival “Kiyiz Duino” took place in august 2012.

It is necessary to note, that according to local administration, the Kyzyl-Tuu village has the largest share in the Kyrgyzstan yurts production.

Apricot festival: Moreover in august 2013 the apricot festival took place in Ton District. The festival aims to attract tourist's attention to apricots growing at the southern shore of Lake Issyk-Kul. Local apricots are famous for their taste quality and for their organic way of production. During the festival, a concert of Kyrgyz folklore, as well as games, contests and cooking classes were organized.

In summer at Ton District shore yurt camps for tourists are organized by local population, which also sell kumyz (fermented horse milk) and honey.

In Bokombaevo village the NGO "Bokombaevo-Manjily" has been founded to promote sustainable eco-tourism in Ton District. The initiative promotes fairs of traditional handicraft and sustainable community based hunting management. At the holy place "Manjyly-Ata" festivals are arranged, containing eagle shows, demonstrations of how ala-kiyiz is produced, trade fairs of souvenirs and folk concerts. Reception and services for tourists up to 50 people are offered.

From what has been mentioned here the spontaneity of events is the most obvious peculiarity of tourism offers at the moment near the region of investigation. There are events interesting for tourists from time to time but nothing that could attract tourists and gain income from tourism at a regular and more or less predictable basis.

However since the area of investigation is still pristine and of outstanding uniqueness, tourism development should not be the first choice recommendation for the area anyway. Nature conservation must be in the first place. At second it is imaginable that guided tours at properly signed paths through the territory with clearly defined "to-do's" and "not to-do's" could be an additional and regular offer for tourists who visit the region and the villages of Bokombaevo, Kara-Koo, Barbulak and so on.

Parts of the area of investigation that this study proposes to manage under nature protection targets can be kept accessible for well managed and sustainable tourism offers. The area must not function as *a* tourist destination but as an additional offer for tourists among the others mentioned above to attract the whole *region* as a destination.

Thus it is imaginable that a recreational beach zone could be offered but it must be taken care that all activities which are incompatible with the task of protection of shore communities (colline semi-desert zone) are avoided. Paved paths or roads decrease the ability of the ecosystem of self-purification of the shore for instance. A provision to avoid such negative impact can be formulated by the local aiyl aimak kenesh for the area of investigation.

The above mentioned existing nature tourism destinations should be developed adequately in its sanitary and environmental dimensions to decrease the harm to nature as much as possible while gaining additional income from tourism at district and village level.

To combine strict nature protection efforts through establishment or extension of a state reserve with the opportunity to involve local population and tourists in regional development goals and participation in nature conservation an innovative approach needs to be tested and is proposed below.

4. CONCLUSIONS & RECOMMENDATIONS

4.1. Objects of nature conservation value

The area of investigation is bordering with two sites (out of 14) of Issyk Kul State Reserve, namely "*Ottukskim*" and "*Kara-Koo*" (see map 4). *Kara-Koo* and adjacent areas provide habitat conditions that may facilitate the rehabilitation of the following species listed in the Red Data Book of Kyrgyz Republic (1985, 2005), Shukurov (1989), Birdlife International (2014) and IUCN Red List of Threatened Species (2014):

Kingdom	Class	species	status
plants	**flowering plant**	*Tulipa kolpakowskiana*	
animals	**insects**	*Parnassius apollo merzbacheri*	IUCN Red List ***vulnerable***
		Satanas gigas	
	fishes	*Schizothorax issykkuli*	
		Diptychus dubowskii lansdelli	
	amphibians	*Bufo viridis*	IUCN Red List *least concern*
	birds	*Ibidorhyncha struthersii*	IUCN Red List *least concern*
		Crex crex	IUCN Red List *least concern*
		Bubo bubo	IUCN Red List *least concern*
		Cygnus cygnus	IUCN Red List *least concern*, **IBA A4i**
		Netta rufina	IUCN Red List *least concern*, **IBA A4i**
		Podiceps nigricollis	IUCN Red List *least concern*, **IBA A4i**
		Anthropoides virgo	IUCN Red List *least concern*
		Burhinus oedicnemus	IUCN Red List *least concern*
		Syrrhaptes paradoxus	IUCN Red List *least concern*
		Pterocles orientalis	IUCN Red List *least concern*
		Gypaetus barbatus	IUCN Red List *least concern*
		Aegypius monachus	IUCN Red List ***near threatened***
		Falco cherrug	IUCN Red List ***endangered,*** **IBA A1**
		Otis tarda L.	IUCN Red List ***vulnerable,*** **No observations anymore after Red Data Book, 2005**
		Aquila heliaca	IUCN Red List ***vulnerable,*** **No observations anymore after Red Data Book, 2005**
	mammals	*Gazella subgutturosa*	IUCN Red List ***vulnerable,*** **No observations anymore after Red Data Book, 2005**
		Lutra lutra	IUCN Red List ***near threatened,*** **No observations anymore after Red Data Book, 2005**

Table 6 species of nature conservation value in the area of investigation

The status of those species with outstanding nature conservation value is written in bold. The mentioned criteria of Birdlife International (adapted for Middle East) are described as follows:

A1 - Species of global conservation concern. The site regularly holds significant numbers of a globally threatened species, or other species of global conservation concern.
A4i - The site is known or thought to hold, on a regular basis, ≥ 1% of a biogeographic population of a congregatory water bird species.
A4iii - Species group – water birds. The site is known or thought to be a 'bottleneck' site where at least 20,000 storks (Ciconiidae), raptors (Accipitriformes and Falconiformes) or cranes (Gruidae) regularly pass during spring or autumn migration.
Compare to: Birdlife International (2014) dated: 07/04/2014

The A4iii criteria is justified by 25.000 – 80.000 individual water birds migrating (Birdlife International (2014) Important Bird Areas factsheet: Western Issyk Kul Lake. Viewed at www.birdlife.org on 07/04/2014).

Saker Falcon (*Falco cherrug*), Great Bustard (*Otis tarda*) and Eastern Imperial Eagle (*Aquila heliaca*) are of special conservation relevance to mention here. *Otis tarda L.* and *Aquila heliaca* have not been observed anymore according to Red Data Book of Kyrgyz Republic (2005). To protect their habitats is of regional and international outstanding importance. The already existing state reserves and a new protected area in the area of investigation aim to facilitate the maintenance of their habitats. The up to 80.000 migrating water birds is another argument to protect the area especially considering that currently only 50% of the IBA "Western Issyk-Kul" is under protection (Birdlife International (2014) Important Bird Areas factsheet: Western Issyk Kul Lake. Viewed at www.birdlife.org on 07/04/2014). The 20% under game reserve management (*ibidem*) need to be managed sustainably supporting rehabilitation of near threatened, vulnerable and endangered species populations.

According to the Red Data Book of Kyrgyz Republic (2005) some of the mammals have not been observed anymore, such as: *Lutra lutra* and *Gazella subgutturosa.* The main reason for the local extinction of these species is serious degradation (Shukurov, 1989) and segmentation of their habitats.

The 2nd periodic review 2013 to ICC of MAB states at page 15 the threat of regional extinction of sea-buckthorn, barberry and ephedra. If this is the case for the Issyk-Kul Biosphere Reserve, which this study is not able to assess, then the colline montane zone of the area of investigation is represented by these plants and its protection would facility conservation of these species.

Another strong protected area supplement supports connectivity efforts for mammals, amphibians and reptiles.

A protected area at the proposed site recognizes international conventions, agreements and designations that apply for the region, as RAMSAR site Issyk Kul, Freshwater Ecoregions of the world (FEOW) - Lake Issyk Kul - Upper Chu, WWF GLOBAL 200 Ecoregion Tian Shan montane steppe and meadows and Conservation International – Mountains of Central Asia Biodiversity Hotspot (compare chapter 2.3.7. and Annexes).

4.2. Discussion of nature protection measures for the area of investigation

Second periodic review (2013) to ICC of MAB states at page 27 that all of the main ecosystems of Issyk-Kul Biosphere Reserve are covered within the core zone network of the biosphere reserve. In opposite Gottschling (2002) found that some important ecosystems are not covered under strict nature conservation targets, yet. With Sarychat-Ertash State Reserve the stunning syrt landscapes, the high mountain ranges and glaciers of central Tian Shan are under, in several aspects, comparably well performing protection. Also with the serial protected areas of Issyk Kul State Reserve some of the limnic formed areas of the lake are under protected designation.

In particular not covered by core zones within the Issyk-Kul Biosphere Reserve are spruce forests (*Picea schrenkiana*), several mountain steppe ecosystems as well as semi-desert ecosystems (Gottschling, 2002). Thus the major gap with the comparatively pristine remained south-western part of desert and semi-desert ecosystems including the mountain steppe ecosystem and semi-desert ecosystem as described in chapter 3 could get covered by another core zone in the area of investigation.

Along Lake Issyk-Kul shore there are individual construction sites and house building activities even within the strong protected water protection zones, which is a completely unacceptable situation. It is an indicator of bad governance and poor law enforcement. The shore stripe plays a key role as fresh water filter with its wet meadows and moist soils functioning as a biological filter before inflows enter into the lake. It provides ecosystem services for the whole lake affected region. Unorganized dump sites and the almost complete absence of a sewage system is an honest threat to Lake Issyk-Kul and the shore (Shukurov E.J., 1990, information newsletter "Ak-Kuu" http://issykul.kg/index.php?option=com_content&view=article&id=34&Itemid=52 dated: 07/04/2014).

A priority has to be the participative development of smart management plans for the buffer zone combined with management plans for the core zones. The pressure on the shore near areas, also within the state reserves boundaries needs to get neglected or at least considerably decreased. That could happen through assigning pasturing grounds in the moister and more vital mountain sides with functioning pasture rotation and so on. Thus minimizing the pressure within the most sensible and rare ecosystems of the biosphere reserve.

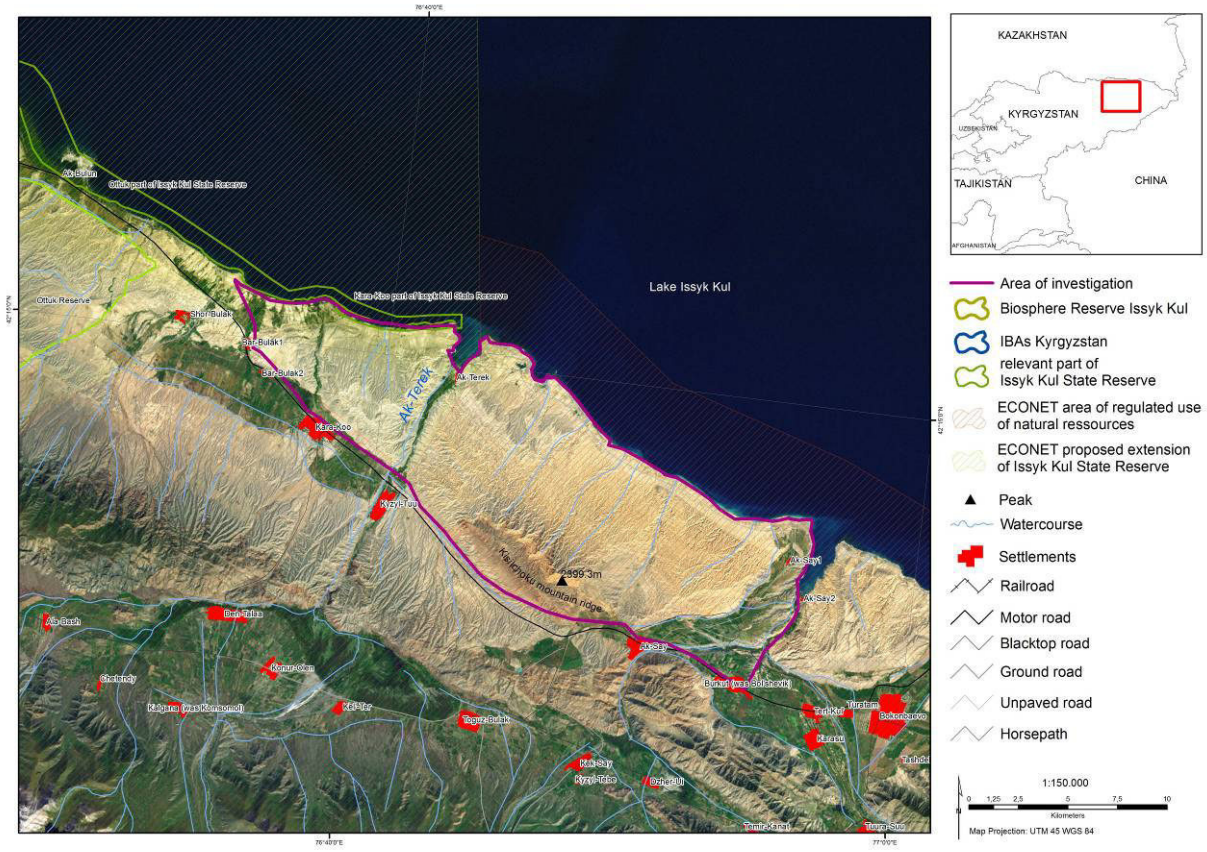
The comparably pristineness of the shore in the area of investigation is an additional strong argument for its protection. Choosing a proper management approach it could perform as a model for other shore areas of Lake Issyk-Kul and thus function in the sense of Seville Strategy – testing of innovative approaches for ecologic, economic and social balance.

The ECONET project of WWF that run between 2003 until 2006 prepared an inventory and a nature conservation strategy for the Central Asian countries. For the area around Kara-Koo the proposal for stronger nature protection measures has been made already (compare map 6). In that way two suggestions were made on how to proceed, namely:

1. - Extension of the existing Issyk-Kul State Reserve to the area of investigation

2. - To develop a so called micro reserve (or wildlife matrix zone) that combines nature conservation targets with the needs of local communities. (As a method it is also proposed within the 2nd periodic review to ICC of MAB 2013 page 18)

A 3rd approach is conceivable, namely the establishment of a new state reserve.



Map 6 protected areas and strengthening efforts in Kara-koo area

The proposed extension (1st variant) deals with the idea to include new areas under the already existing Issyk-Kul State Reserves' two sub-sites (*Kara Koo* and/or *Ottukskogo*). That approach has the advantage to build up at an already existing administrative and legal infrastructure but has the same disadvantage as the 3rd variant: It keeps local communities completely out of land use and land use planning. The participatory aspect of both variants is inexistent. Taking into consideration that already the whole western shore of Lake Issyk-Kul is under state reserve management an additional state reserve / state reserve extension is difficult to communicate and the less implementable – ethically as well as practically. Experiences from Issyk-Kul State Reserve show that it is impossible to avoid illegal land use. Not because local population is ignorant but because there is no other choice to survive. For tourists it is evenly not attractive just to watch beaches but not to enter.

A much more participatory approach is necessary and that is why we propose to try the remaining 2nd variant for a nature conservation strategy in the area of investigation – the wildlife matrix zone.

4.3. Wildlife matrix zones (micro reserves) – new principles for the protection of ecosystems

Wildlife matrix zones, also micro reserves or micro zapovedniks, are innovative approaches to support natural succession processes and to rehabilitate local hotspots of biodiversity. The approach combines these prior targets with the maintenance of local population needs. The latter ones are always the bottleneck of a successful nature conservation strategy. There is always the need to include affected people into land use planning and to respect their basic needs to cover expenses of living and to offer perspectives of individual development. Figure 1 shows the sketch and general idea of wildlife matrix zones. In the centre of interest is the unaffected development of a natural habitat that still represents the typical features as for

instance soil condition, species, vegetation community, genetic varieties of a species, micro climate and so on. The size and location of the wildlife matrix zones need to be sufficiently large to comply with the environmental objectives. In an ideal world these areas may get located around / along areas that are historically under restricted use by law anyway, such as water protection zones. Water protection zones are defined in Kyrgyz legislation as 50m left and 50m right of a river. In practice this should also apply for part of the shore of the area of investigation of that study. The wildlife matrix zone functions then as genetic pool and source for distribution of seeds, pollen, pollinators, and rhizomes into neighboring human affected territories which is the restoration zone in figure 1. Forest plantations with natural species facilitate the rehabilitation of habitats and function as additional migration corridor at the same time – ecologic corridor. Sustainable use is fostered in these areas and village inhabitants are involved in land use planning taking traditional Kyrgyz local kenesh (village council) decision making and law enforcement mechanisms into account. That approach is meant to take place also to protect the village surroundings by involving village inhabitants into maintenance works. The protection of the wildlife matrix zone and the restoration zone as well as the forest plantations or re-vegetation areas (where eligible) should be provided by local population in their own interest (functioning of ecosystem services and access and benefit sharing). Environmental and cultural functions can also serve the nature conservation target especially in the area of investigation. For instance holy places can serve as a very strong incentive to protect a site.

There are several principles that must be followed while implementing wildlife matrix zones:

- Exclusive use of resources that are locally available (avoid of exterior resources, in particular no fertilizers, no pesticides, no herbicides);

- Absolute avoidance of influencing natural processes. A self-sustaining process needs to develop

- As an exception the cut of biomass is supported as long as natural herbivores do not reduce biomass growth themselves. In practice it can be easily arranged by grass canopy cutting. Hay needs to remain at the site.

But the ecologic well-being of the lake is not only depending on functioning water protective zone, but also on the basin ecosystems. It is to a large extent degraded by overgrazing and grazing in shore zones and floodplain ecosystems. Therefore efficient measures need to be taken that regulate grazing, veterinary treatment of livestock, introduce a pasture rotation, which bases on traditional practices and revive indigenous species of livestock and crops. These measures should be implemented in the areas under sustainable economic use.

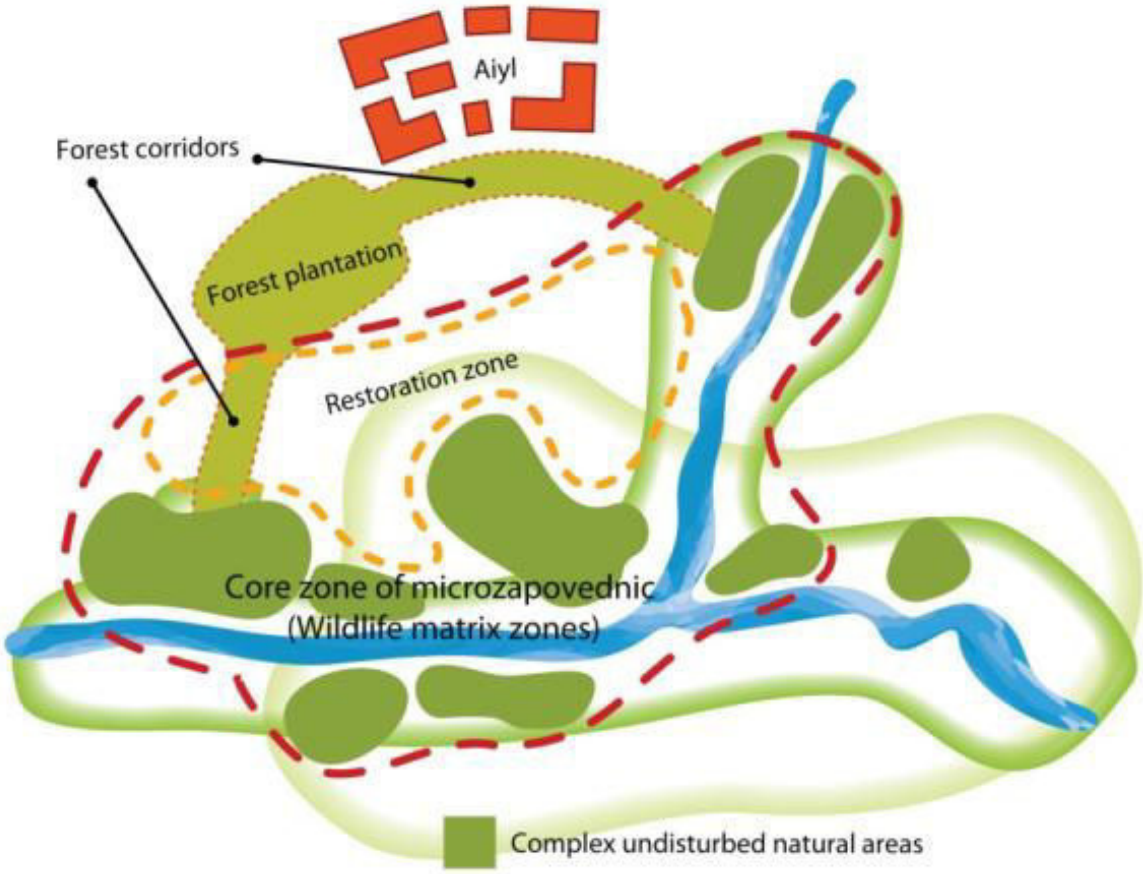


Figure 1 Wildlife matrix zone

Moreover, together with students and nature conservationists it is possible to practice and conduct scientific investigations and monitoring of the rehabilitation of degraded land. The legal status of the area can be provided at the village council level, which will provide its legal registration and additional legal protection.

The approach includes the general and broad idea of the Seville strategy and can be understood as a mini biosphere reserve in the biosphere reserve itself. It is also a testing site that is innovative and could be upscaled within the biosphere reserve or even into other areas worldwide if successful. The long term strategy of biosphere reserves to convert degraded areas into natural and locally adequate habitats as well as the introduction of sustainable resource management in the long term could get well supported by the concept of wildlife matrix zones, eventually. It's worth to give it a try – in the model region for sustainable development.

4.4. Agenda setting

Title

Recommendations to continue German – Kyrgyz dialogue in the field of Biosphere Reserve cooperation

Context

Worldwide there are 23 biosphere reserves that have been established with support of the German BMZ. One of them is Issyk-Kul Biosphere Reserve. Huge efforts were made in the past in the fields of scientific research, establishment of functioning administration, monitoring, education and testing sites for sustainable land use practices. In the context of elevated coordination between the German ministries (in particular the BMU and BMZ) to improve the contribution to biodiversity conservation, measures against climate change, combat land degradation and sustainable development in partner countries important fields for further support are to be identified.

Purpose

To appoint fields for support in bilateral cooperation in strengthening testing sites for sustainable regional development in order to further backstop the implementation of the Seville strategy in Issyk Kul Biosphere Reserve.

Scope

Target group of the policy are German negotiators for bilateral cooperation in the field of nature conservation.

Agenda

The agenda setting topics have been chosen according to the originate starting point of this particular study as well as in accordance with the identified specific needs expressed by the biosphere reserves' administration at a working meeting in December 2013 and along with the 2nd periodic review 2013 to ICC of MAB.

It is difficult to assign precise priorities or a detailed schedule for implementation since most of the issues depend on windows of opportunity or they need to be taken by chance. Means to address issues are (a) bilateral negotiations between Kyrgyz and German governments, (b) assign organizations facilitating defined tasks or (c) provide constant medium-/long term advise.

level	Issue / Problem statement	Task(s)	Target group	Respon-sibility
international	Response and request of ICC MAB secretariat in May 2013. Stated need for a participatory management plan on decision making processes in resource management	Support by experts on management plan and management structure preparation	BR administration	(b)
	Networking events of BR staff employees /	Offer opportunities and funding for regular meetings with partner BRs (lessons learned, motivation, new approaches) regionally and internationally	BR staff (administration, scientists and rangers) (Potential) partner BRs are Sary-Chelek, Altai and Schorfheide-Chorin.	(c)
	Networking of protected area coordination in the region	Facilitation of better coordination of nature conservation efforts. To improve migration corridors, exchange of genetic resources and habitat connectivity as well as transboundary eco tourism offers (hiking) with community involvement.	NABU (currently implementing a BMZ financed project on transboundary protected areas northern Tien Shan in Kazakhstan and Kyrgyzstan), BR administration, National Park administrations (Kazakhstan and Kyrgyzstan)	(a) and (c)
	Plans to construct a ski-resort in Ili-Alatau National Park in Kazakhstan conflicts with PA aims of Chon-Kemin National Park and BR Issyk-Kul in Kyzgyzstan. The destruction and degradation of (protected) habitats in Kazakhstan impacts the migration range, hunting grounds and quality of habitats of species under Red List of IUCN as well national Red List species.	The ESPOO convention and CMS (relevant species as argali and snow leopard are concerned) are a relevant basis and pull for bilateral agreements. Kyrgyz authorities need to appeal at Kazakh authorities for sustainable tourism developments in the border regions and to ban the development of ski resorts in areas of nature conservation value.	BMUB needs to address that at bilateral meeting against the State agency of environment and forests / government of Kyrgyzstan.	(a)
	International funding of the BR Issyk Kul to steer development priorities and actions to overcome funding gaps	Funding streams needs to be set up as co-funding approach to gain ownership and proper priority setting of the government of Kyrgyzstan and the BR administration	BR administration, Government of Kyrgyzstan (State agency of environment and forests), BMUB	(a)

Biosphere Reserve Issyk Kul	Loss of income from "Ecologic post" (see chapter 2.3) / Missing transparency in appropriate use of budget	Agree transparent accounting procedures that ensure the committed purpose of income	BR administration, Government of Kyrgyzstan (State agency of environment and forests), BMUB	(a) and (b)
	Facilitate designation of core zones of all ecosystems of the BR through proper core zone extension (desert habitat in south-western part of Issyk-Kul near village Kara-Koo is not represented in core zone coverage of the BR (see chapter 4)	Develop roadmap to turn parts of the buffer zone around Kara-Koo as described in the study into another core zone with appropriate strong protection	Depending on approach chosen: a) State Reserve establishment – national level through mainstreaming regulation through parliament. Lobby group as **e.g. NGO BIOM**. b) establishment of micro reserve. The legal status of a micro reserve can be secured at the **local council**, which will provide its legal registration and additional legal protection.	(a) and (c)
	Construction work within the protected water protection zone / There takes construction work place within the water protection zones and causes harm to water quality, sanitation and natural purification abilities of the inflows and shore of Issyk-Kul (see chapter 4.2)	Comply with existing law and push authorities for law enforcement. Advise regular meetings with authorities to sort out these issues	Governor of Issyk-Kul province, director of BR Issyk-Kul	(a)
	Cadastre, zoning and signing / The work on cadastre zoning and signing has not been finished yet. Of special importance are sanitation zones as well as zones for rehabilitation and sanitation of lakes and rivers and their effective separation from recreational and construction zones	Support that work with funds and expertise and especially care for signing areas to gain visible evidence in nature about zoning. Accompanied by participatory involvement of local population by workshops and decision – making procedures	BR administration, local council, local communities, externals	(b)
	nature conservation management plan / for Issyk Kul State Reserve there is no nature conservation management plan yet.	develop nature conservation management plan	BR administration together with local communities and externals	(a) and (b)

Local level – Kara-Koo area	Testing micro-reserve as approach for nature conservation and testing approach for biosphere reserves according to Seville Strategy Goal III "Use Biosphere Reserves for research, monitoring, education and training". / The approach is possibly suited to mitigate land use - nature conservation conflicts (see chapter 4.3)	Promote the approach at province and district level and develop legislative basis to implement a testing site. Refer to 2nd periodic review 2013 that proposes the approach as well (page 18).	Governor of Issyk-Kul province, director BR Issyk-Kul, head of Ton district as testing site (south-west of Issyk-Kul) and akims of surrounding villages, jointly with local NGOs (e.g. BIOM)	(a), (c)

Table 7 some of the priorities for political consulting on Issyk Kul Biosphere Reserve that has been raising during the elaboration of the desk-study

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6. ANNEXES -

Annex I 2nd periodic review 2013 on Issyk-Kul Biosphere Reserve to the UNESCO ICC MAB

Please note that the front page of the document implies to be the first periodic review (2002). The document itself gives evidence about updated content. The representative of UNESCO office in Bishkek, Mrs. Elnura Korchueva, commented consequently not to be sure that this version is the finally delivered one.

PERIODIC REVIEW

FOR BIOSPHERE RESERVES

(January 2002)

Periodic report must include the following information:

map with clear zoning reserves;
legal texts for different zones.

The completed form is sent to:

UNESCO
Division of Ecological and Earth Sciences
1, rue Miollis
F-75732 Paris Cedex 15, France
Tel: +33.1.45.68.40.67
Fax: +33.1.45.68.58.04
E-mail: mab@unesco.org **with a copy to the National Commission for UNESCO**

I. NAME OF THE BIOSPHERE RESERVE

"Issyk-Kel" Biosphere Territory

II. COUNTRY

The Kyrgyz Republic

III. PHYSICAL CHARACTERISTICS OF THE BIOSPHERE RESERVE

Latitude and longitude

"Issyk-Kel" Biosphere Territory is one of the most unique natural regions of Kyrgyzstan and its territory is 43,100 km^2 (4 314 400 ha). Administrative boundaries of the Issyk-Kul region are located at the following coordinates: 42^0 59'00" - $08^0$30'41" of the North latitude and 75^0 38'00" - $80^0$18'00" of the East longitude.

"Issyk-Kel" Biosphere Territory is a part of the geographical region of the Northern Tien Shan, which includes closed basin of Issyk-Kul Lake, surrounded by the Kungei Ala-Too ranges on the North and the Teskey Ala-Too ranges on the South with its unique landscapes of the valley, as well as highlands syrt (*"syrt" from Kyrgyz language translates as "outside" -a remote pastures outside the basin*) landscapes of deserts and steppes of the Central Tien-Shan with permafrost, the highest peaks and the large area of glaciers that forms flow of the Aral and Tarim Basin. There are 834 glaciers of various sizes - from less than 0.1 km to 11.0 km and occupying 650.4 km^2 and there are 3297 glaciers totally with total area of 4304 km^2 in the Biosphere Reserve territory. This is about 40% of a total number of glaciers in the country and half area of all glaciers in the country. The role of glaciers as a natural component quite multisided, but they present the greatest value as accumulators of clean fresh water and formation of river flows.

Issyk-Kul Lake is of a tectonic origin, formed as a result of fractures, break offs and surface deflections. An extensive part went down and filled with water while adjacent areas rose to 3000-3500 m above the lake and have formed ridges of the Teskey Ala-Too in the south and the Kungey Ala-Too in the north of the lake. Isolated uplands Chaarzhoon (2722m) and the Ala-Bel close the the valleyin the East and, the Kara-Koo and the Kyzyl-Ompol. Mountainous rim of Issyk-Kul ends in the west by a narrow Boom gorge through which Chu River flows. Chu River is only 4 km away from the Issyk-Kul Lake. The lake's length is 180 km, the maximum width is 60 km, average depth is 280 m, maximum is 668 m, and the area of 6236 km^2. Depths of 100 meters are mostly assimilated by living organisms, comprise about 38% of the landscape. The volume of water is 1738 km^3, length of a coastline is 688 km. The water level fluctuates depending on seasons. Rise of the water level reaches 21-22 cm in average during the period of spring and summer heavy water entrance due to snow and glacier waters, and decreases in the period of autumn and winter.

Issyk-Kul Lake basin may be classified as oligotrophic basin because of the great depths, weak irregularity of the coastline, climatic originality and hydrologic conditions. Thus, phytoplankton production does not exceed 488 mg / m^3, zooplankton - 910 mg/m^3, zoobentosa-10g/m^2.

Issyk-Kul Lake is the second largest lake among lakes of the world lying on the altitude of 1200 m above sea level, being slightly inferior to the area of Titicaca Lake. Issyk-Kul Lake has no outlets, therefore, the water is salty but, salinity is small 5,968 g/l and it is 5.5 times less than salinity of the seawater. The lake has a chloride-sulphate-sodium-magnesium type of mineralization. Insignificant rate of the total mineral content of water indicates that the Issyk-Kul Lake as a drainless basin is of a young age.

The water is characterized by a rich content of dissolved oxygen, differs by high transparency, which is explained by the weak development of organic life and water salinity, promoting coagulation of colored organic substances. Waters of the Issyk-Kul Lake are close to the sea and ocean water on transparency, and depending on the sun fall the lake's color changes from light blue to the dark blue color. The territory of the Issyk-Kul region can be divided into two hydrological areas according to a water balance: formation area and dispersal area of the flow. All syrt highlands to the south from the Teskey Ala-Too and flanks of ranges surrounding the Issyk-Kul Lake up to the foothills serve as the area of formation, and only a narrow strip of coastal area of the Issyk-Kul belongs to the dispersion area of the flow. There are more than 400 rivers, creeks and streams in the territory of the basin. They belong to the basin of Naryn river, Tarim, Balkhash and undrained Issyk-Kul Lake system.

118 rivers and streams head towards the lake in the Issyk-Kul basin and only 49 of them flow into it. The river network reflects the distribution of precipitation in the basin. In the western part of the lake basin, which is poor in rainfall, the river network is poorly developed and relative flow rate is not high. In the eastern part of the lake, where amount of precipitation is higher, a dense hydrographic network is developed well and rivers are more abundant. Rivers located in the eastern part of the basin have the highest relative water flow. Rivers of the western part of the basin have significantly lower water flow.

The vast complexity of the region's relief is deep roughness, different exposures of mountain slopes relative to the sun and air stream, which creates the unique features of climate diversity and defines clearly represented vertical climatic zone.

Please enclose a map showing the general location of the biosphere reserve.

Biogeographical Region

Indicate the name usually given to the biogeographical region in which the biosphere reserve is situated.

"Issyk-Kel" Biosphere Territory is located in the Palaearctic region, covering Europe and Asia to the north of the Himalayas without the Arabian Peninsula, and the North Africa up to the southern edge of Sahara Desert as well.

Topography of the region

Briefly describe the major topographic features (wetlands, marshes, mountain ranges, dunes, landscapes, etc.).

Landscapes of the Issyk-Kul region are characterized by variety, contrast and mosaics. The landscape differentiation complexity is determined by history of development, orography, general arid climate, and large amplitudes of altitudes. Various types of landscapes interchanged

by altitude are formed and developed on the slopes of the mountain ranges and massifs, which have different ordinary orientations and various conditions of insolation. At the same time, there is a clear effect of latitude zoning that defines variety of landscapes of the northern and southern parts of the region. Meridional varieties linked with the local features of the atmospheric circulation are observed (the western part - deserts and steppes, eastern part - steppes, meadows and forests). Landscape differentiation of the territory is complicated as well by intermountain cavities located at absolute altitudes. The largest part is occupied by the high mountain meadows and grasslands, alpine meadows and rocks. More than 3% of the area (4304 square kilometers) is occupied by glaciers.

Climate

Briefly describe the climate of the area using one of the common climate classifications.

Temperate continental climate of the "Issyk-Kel" Biosphere Territory is the mildest in Central Asia. It is determined by the unfrozen Issyk-Kul Lake. The lake raises the air temperature up to about 10° in January and makes summers indulgent, which is unusual for the Central Asian climate. The average temperature is 16,5-16,9°C in July and August in Karakol (1774 m.), 13.9 - 14,2 °C in Dzhetyoguz (2300 m.), 9,5 - 9,7 °C in Chon-Kyzylsuu Gorge and in the area of Physical-Geographical Station (2555 m.), , 6-6,2 °C in the Highlands at the snout of Karabatkak glacier (3250 m).

Cloudless weather is dominated in the Issyk-Kul due to the indulgent summer. Sun shines for 300-320 hours or 67% or 70% in June and August in Karakol but, in midmountain - in Chon Kyzylsuu (2555 m) for 190-240 hours. Intensive solar radiation is determined by the high solstice: 70-72° during the summer and 23° during the winter solstice. Warm and dry west wind coming through Boom Gorge (locally named "Ulan" and "Boom") (60%) dominates in the "Issyk-Kel" Biosphere Territory. Sometimes the cold east wind "Santash" meets with the western wind and causes waterspouts. Coastal winds - breezes are common in Issyk-Kul region, which blow from the lake to the shore in day-time (local name - "sea wind"), and from the shore to the lake at night time - ("Hilly"). Wind direction in the gorges is the same.

Precipitation on the mountains of the Central Asia is considerably linked with the western winds. It is amazing that air currents occurring in the Atlantic Ocean passing through thousands of miles and parching deserts of the Central Asia bring the ocean humidity to Tien-Shan and considerably define the weather character on the Tien-Shan mountains. The air passing through the Boom Gorge is expanded and drained in the Issyk-Kul Basin. Air masses are saturated with humidity of evaporations of the lake passing the surface of the Issyk-Kul Lake and create precipitations, which are essential to a warm season when they fall to the eastern part that is favorable for humidity condensation. Due to these characteristics the precipitation in the basin increases from west to east: 115 mm per year in the western part (Balykchy), 200-250 mm in the middle (Bokonbaevskoe, Cholpon-Ata), 415 mm in the eastern part (Karakol), and 570-676 mm near the Kungei Ala-Too (Kurmenty, Tup).

Geology, geomorphology, soils

Briefly describe the main land formations and characteristics.

Geologically, the "Issyk-Kel" Biosphere Territory covers the eastern part of the Kyrgyz Tien-Shan and belongs to the three structural-facial tectonic zones: the North, the Middle, and the South, which are different from each other by the history of geological development, stratigraphic sequence types, magmatism and divided by the deep Teskey, Atbashi-Enilchek faults and structural line of Nikolaev as well. Rocks from Proterozoic age to modern geological and genetic complexes are involved in the engineering and geological structures of above mentioned areas. The Issyk-Kul Basin is closed and characterized by sustainable bucking according to the neotectonic structure. More than 70% of the total area is located on the 9 point seismic zone in accordance with the latest seismic zoning map of the republic (1996).

Bedrocks are presented by rock and half-rocksoils: topsurface deposits represent complex genetic type of crumbly, loose and cohesive soils. Loose soils consist of gravitational and solifluctional, and alluvial complexes. Loose-bounds – deluvial, proluvial and glacial silts; cohesive soils combine deluvial and proluvial, and glacial deposits. The Issyk-Kul Basin is part of the Central Tien-Shan mountain and hollow canton, within which the Issyk-Kul and Sary-Jaz soil subcantons are marked out among others. Within the Issyk-Kul soil subprovince the West Pre-Issyk-Kul and East Pre-Issyk-Kul Districts is marked out.

The West Pre-Issyk-Kul soil canton covers the western part of the basin with its mountain slopes up to the villages of Korumdu on the north and to Barskoon on the south bank. Soil feature of the canton is the presence of gray-brown stony and light-brown soils. The East Pre-Issyk-Kul soil canton encompasses the eastern part of the basin with mountain slopes descending to it and is characterized by the significant moisture (400-500 and even 600 mm. rainfall). Humid continental climate during the year contributes to the development of grass stand under which brown and black soils are formed. There are massifs with a close groundwater occurrence, where semi-hydrogenic and hydrogenic soil series are formed.

The Sary-Jaz soil canton orographically coincides with the territory of the Khan-Tengri massif, which is a thick structure with substantial heights and large glaciation. The characteristic soil feature of this sub-canton is widespread humus content throughout its structure.

Significance for conservation of biological diversity: habitats and characteristic species

List main habitat types (e.g. humid tropical forest, savanna woodland, alpine tundra, coral reef, seagrass beds) and land cover (e.g. residential areas, agricultural land, grazing land).

Type of habitat:

Semi-desert and desert ecosystems of the foothill zone (1600-2400 m. above sea level) with gray-brown gravel soil;

Foothill steppe ecosystems with light chestnut and light brown soils (1600-2400 m. above sea level);

Meadows of the soil moisture with dark chestnut and humus soil (1600-2400 m. above sea level);

Juniper and fir forests with mountain forest soils (2000-3000 m. above sea level);

Alpine and subalpine meadows with meadow chestnut soils (2600-4000 m. above sea level);

Alpine tundra ecosystems - syrts (2700-3500m. above sea level);

Aquatic ecosystems – the Issyk-Kul Lake, mountain lakes and rivers.

Main species:

Semi-desert and desert ecosystems of the foothill zone (1600-2400 m. above sea level) with gray-brown gravel soil

Flora and fauna: thistle, sagebrush, akantolemon, ephedra, perovskite, multifoliate Karagan, gerbils, ground-squirrels, lizards, chat (Oenanthe), Pallas sand grouse, Black-bellied sandgrouse,

Foothill steppe ecosystems with light chestnut and light brown soils (1600-2400 m. above sea level)

Flora and fauna: East Indian bluestem (Andropogon ischaemum), esparto grass, valeziys fescue, mole voles, yellow gopher, skylarks, kestrels;

Meadow soil moisture with dark brown and black soil humus (1600-2400 m. above sea level)

Flora and fauna: Kentucky bluegrass, Junggar sedge, buckthorn, korotkoostisty barley, common vole, muskrat, green toad, Central Asian frog, sandpipers, gulls, ducks;

Juniper and fir forests with mountain forest soils (2000-3000 m. above sea level)

Plant and animal species: spruce Tien Shan, Schrenk spruce, Turkestan juniper, dog rose, barberry, red deer, roe deer, bear, lynx, owl, long-eared owls, hawks, chickadees, nutcracker, juniper grosbeak.

Alpine and subalpine meadows with meadow chestnut soils (2600-4000 m above sea level)

Flora and fauna: ling (Carex stenocarpous), Tien Shan fescue, lady's mantle (Alchemilla vulgaris), geranium, ibex, argali, gray marmot, leopard

Alpine tundra ecosystems - *syrts* (2700-3500 m. above sea level)

Flora and fauna: Kentucky bluegrass, fescue, Reaumur, gray marmot, narrow-skulled voles and silver, argali, ibex, manul, bearded vulture, golden eagle, vulture;

Aquatic ecosystems – the Issyk-Kul Lake, mountain lakes and rivers

Endemic fish species: the Issyk-Kul Marinka, Issyk-Kul rudd, scaleless osman (Diptychus dybowskii);

Imported species: Sevan trout (Salmo ischchan), pike perch, peled.

Major anthropogenic impacts:

Recreation zone, poaching, illegal logging of forests and bushes, collecting of medicinal herbs, capturing rare animals for commercial purposes, local plots of lands of the mining industry (mines, quarries, tailings).

Relevant habitat management practices:

Organization and monitoring of environmental protection regime, measures directed at implementation of the Concept of Sustainable Development of the Ecological and Economic System of Issyk-Kul (the Issyk-Kul Development Concept)" until 2020, measures on conservation of the existing state of the environmental use, ecological enlightenment of the local population.

Habitats of special interest:

Describe and indicate the location of habitats which are unique or exceptionally important from the point of view of conservation.

All existing types of the large landscapes play significant role in preserving biodiversity.

Spruce and juniper forests of the Kungey and Teskey Ala-Too ranges are inhabited by various types of species including endemic and endangered animals.

Alpine and sub-alpine meadows and grasslands at 2600-4000 m. are home to tens of animal species, birds, rare species of animals and insects, and many rare and valuable plants.

The Issyk-Kul Lake along with surrounding ecosystems, especially by wet meadows and wetlands: habitat and wintering area of tens of thousands of waterfowl and semi-aquatic birds.

Endangered or threatened flora and fauna:

Identify species (with scientific names) or groups of species of particular interest for conservation, in particular if they are threatened with extinction.

Mushrooms:

1. Dog stinkhorn. *Mutinus caninus* (Huds. Ex Pers) – decorative type, used in traditional medicine - Veselkova - Phalaceae.2. Tien Shan Skutiger. *Scutiger tianshanicus* A. Bond. - very rare, endemic species - Skutiger - Scutigeraceae.

Plants:

1. Greigii Tulips, variegated tulip - *Tulipa greigii* Regel, *Liliaceae*. Species decreasing in number and habitat. The Central Asian endemic plant. Highly decorative plant and represents exceptional value for green construction, floriculture, breeding of new cultivars of tulips.

2. Tian-Shan Sibirko - *Sibiraea tianschanica Pojark.* Rosaceae Juss. Endemic, decorative and rare north Tian-Shan plant.

3. Chesneya shaggy - *Chesneya villosa* (Boriss.) R. Kam. et R. Vinogradova (*Chesniella villosa* (Boriss.), *Kostyczewia villosa* Korsh. (Boriss.)), Fabaceae Lindl. One of three very rare species of this type in Kyrgyzstan.

Fish:

1. Issyk-Kul Marinka - *Schizothorax issykkuli Berg*. Cyprinidae. Rare genus inhabiting the Issyk-Kul Lake. It was determined as a specific type in 1953, endemic decreasing in number, has a commercial value.

2. Issyk Kul scaleless osman - *Diptychus dybowskii lansdelli,* Gunther.

Cyprinidae Limnic. Lake typevery small numbered, critically endangered. Endemic, which possesses a higher growth rate in comparison with other forms.

Birds:

1. Ferruginous Duck - *Aythya nyroca* (Guldenstadt, 1770). - *Aseriformes*, Anatidae - . Monotypic. One of the four species in the avifauna of the Kyrgyz Republic.

2. White-headed Duck *Oxyura leucocephala* (Scopoli, 1769). . *Aseriformes*. *Anatidae*. Monotypic.

3. Black-throated Diver - *Gavia arctica* (Linnaeus, 1758). *Gaviiformes* - Gaviidae. Critically endangered species in the Kyrgyz Republic. Nominatypical subspecies is found in the KR. Domestic duck size bird.

4. Rosy Flamingo - *Phoenicopterus ruber* Linnaeus, 1758. *Phoenicopteriformes*. *Phoenicopteridae*. The only species of flamingos' family in the Kyrgyz Republic.

5. Black Stork - *Ciconia nigra* (Linnaeus, 1758). *Ciconiiformes*. *Ciconiidae.* One of the two species in the avifauna of the KR. Monotypic species.

6. Spoonbill - *Platalea leucorodia* Linnaeus, 1758. *Ciconiiformes*. *Threskiornithidae*. The only generitype in the KR. Nominatypical subspecies migrating through KR. *Platalea leucorodia leucorodia* Linnaeus, 1758.

7. Saker Falcon - *Falco cherrug. J*.E. Gray, 1834. *Falconiformes* . One of the ten species of this type of avifauna in the Kyrgyz Republic. Nominatypical subspecies of *Falco cherrug* migrate and winter in KR. *Falco cherrug* J.E. Gray, 1834. The other subspecies are sedentary.

8. Redhead falcon - *Falco pelegrinoides* Temminck, 1829. Falconiformes. One of the ten species of this type in avifauna of the Kyrgyz Republic. Subspecies F. P. *babilonicus* (P. L. Sclater, 1861) are present.

9. Tailed eagle - *Haliaeetus albicilla* (Linnaeus 1758). Falconiformes. Accipitriae. Rare endangered species. One of the eight species of eagles in the world fauna and one of the two species in the fauna of the KR. Nominatypicalsubspecies *Haliaeetus albicilla* (Linnaeus 1758) overwinter.

10. Lammergeier (bearded vulture) - *Gypaetus barbatus* (Linnaeus 1758). Falconiformes. Accipitriae - Accipitridae. The only generitype in the fauna of the KR. Subspecies *Gypaetus barbatus aureus* (Habliz 1783) is present.

11. Griffon Vulture - *Gyps fulvus* (Hablizl 1783). Falconiformes. Accipitriae- Accipitridae. One of the two species of this genus in the Kyrgyz Republic. Nominatypical subspecies *Gyps fulvus fulvus* (Hablizl 1783) is present.

12. Black Vulture - *Aegypius monachus* (Linnaeus 1758) Falconiformes. Accipitriae-Accipitridae. The only generitype of the genus in the fauna of the KR. Monotypic species.

13. Pallid Harrier - *Circus macrourus* (SG Gmelin, 1771). Falconiformes. Accipitriae-Accipitridae. One of the four generitypes of the genus in the fauna of the KR. Monotypic species.

14. Golden Eagle - *Aquila chrysaetos* (Linnaeus, 1758). Falconiformes. Accipitriae - Accipitridae. One of the four species in the fauna of the KR. Subspecies *Aquila chrysaetos daphanea* Severtzov, 1873 is present.

15. Bustard - *Otis tarda* Linnaeus, 1758. *Gruiformes* - Gruiformes . *Otidae*. Nominatypical subspecies Otis tarda tarda Linnaeus, 1758 is present in Kyrgyzstan.

16. Houbara bustard - *Chlamydotis undulata* (Jacquin, 1784). *Gruiformes* . *Otidae*. *Chlamydotis undulata macqueenii* inhabits the KR (JE Gray, 1832).

17. Little Bustard - *Tetrax tetrax Linnaeus,* 1758 *Gruiformes*. *Otidae*. For the last 30-40 years is not nestling in the Kyrgyz Republic. One of the rare species in Central Asia. Monotypic species.

18. Corncrake - *Crex crex* (Linnaeus, 1758) *Gruiformes* . Ralliddae. The only generitype of the genus in the fauna of the KR. Monotypic species.

19. Demoiselle - *Anthropides vigro* (Linnaeus, 1758). *Gruiformes*. Gruidae. One of the two species of the genus in the fauna of the KR. Monotypic species.

20. Lapwing - *Vaneiius gregarius* (Pallas, 1771). Charadriiformes . Charadriidae. Endemic of Kazakhstan and Russia. The only generitype. Monotypic species.

21. Slender-billed-Curlew - *Numenius tenuirostris* Vieillot, 1817. Charadriiformes . Charadriidae. One of the three generitypes in the fauna of the KR. Monotypic species.

22. Black-headed Gull - *Larus ichtyaetys* Pallas, 1773. Charadriiformes. Laridae. One of the six species in the KR. Monotypic species.

23. Black-bellied Sandgrouse - *Pterocles orientalis* (Linnaeus, 1758) Columbiformes. Pteroclidae. Low numbered and underinvestigated species. Subspecies *Pterocles orientalis arenarius* (Pallas, 1775) is present in Kyrgyzstan.

24. Great Spotted Woodpecker - *Dendrocopos major* (Linnaeus, 1758). *Piciformes*. *Picidae*. *Dendrocopos major brevirostris* (Reichenbach, 1854) is present in KR. 18 species of non peculiar difference of race are known.

Mammals:

1. Water shrew - *Neomys fodiens* (Pennant, 1774). *Insectivora*. *Soricidae*. Rare species for the KR. It inhabits the peripheral part of its range. The only generitype of the genus in the KR.

2. Dhole (Wild Dog) - *Cuon alpinus* (Pallas, 1811). *Carnivora*. *Canidae*. The species has not been registered in the KR for over the last 50 years. The only generitype of the genus in the fauna of the KR. 3. Central Asian otter - *Lutra lutra* Linnaeus, 1758. *Carnivora*. *Mustelidae*. Subspecies *Lutra lutra seistanica* (Birula, 1912) is present in the KR. One of the two subspecies of Central Asia.

4. Manul - *Otocolobus manul* (Pallas, 1776). *Carnivora*. *Felidae*. Rare species throughout the range.

5. Lynx - *Lynx lynx* Linnaeus, 1758. . *Carnivora*. *Felidae*. Rare subspecies *Lynx lynx isabellinus* (Blyth, 1874) is present in the Kyrgyz Republic.

6. Snow leopard - *Uncia uncia* Shreber, 1775. *Carnivora*. *Felidae*.

7. Red Deer (Tien Shan subspecies), *Cervus elaphus* (Linnaeus, 1758). ssp. *asiaticus* Lydekker, 1898. - *Artiodactyla*. *Cervidae*. Critically endangered mountainous Central Asian subspecies of Holarctic species throughout its range. Small numbered in the KR. Names *Cervus elaphus sibiricus* Severtzoy (1973) and *Cervus elaphus songaricus* Severtzov (1873) are improper as infra-subspecific.

8. Goitered gazelle - *Gazella subgutturoza* Guldenstaedt, 1780. Artiodactyla. *Bovidae* - Cavicorn. Endangered or completely disappeared species in the Kyrgyz Republic. The only species of the genus in the KR, Central Asia, and Kazakhstan.

9. Jerboa-jumper - *Allactaga saltator* Eversmann (1848). *Rodentia*. Allactagidae.

Species of traditional or commercial importance:

Indicate the use(s) of these species or varieties.

Species:

Collecting medicinal herbs for commercial purposes: *Berberis sphaerocarpa* (round-fruited barberry), *Tanacetum vulgare* (ginger plant), *Capsella bursa-pastoris* (shepherd's purse), *Origanum vulgare* (common oregano), *Achillea millefolium* (common yarrow), *Taraxacum officinale* (common dandelion), *Plantago major* (common plantain), *Thermopsis turkestanica* (Turkestan thermopsis), *Tussilago farfara* (common coltsfoot), *Ziziphora clinopodioides*, *Barbarea vulgaris* (common winter cress) *Echium vulgare* (common shiner), *Leonurus turkestanicus* (motherwort Turkestan), *Aconitum karakolicum Rapaics*- Karakol Aconite, Acontium *leucostomum Worosch - Aconite beloust*, sea buckthorn (Hippophae rhamnoides L.), ephedra, licorice;

Amateur hunting on hoofed mammals: mountain sheep (Ovis ammon), wild boar (Sus scrofa), roe deer (Sapreolus capreolus), ibex (Capra ibex): amateur hunting on: pheasant, ducks, partridges, hares, etc., hunting marmot, sports and amateur fishing

IV. ZONATION

Names of the different areas

Indicate the names of the different areas which make up the core area(s) and buffer zone(s).

Core zone with total area of 141,022 ha includes the following sections:

- Wetlands of international importance as Waterfowl Habitat (Ramsar Convention) within the bounderies of the Issyk-Kul Reserve and defined water area (19,842 ha.), including coastal zone (3,164 ha.), water area of the Issyk-Kul Lake (16,678 ha.);

- Preserved area of the "Kara-Kol" National Park with total area of 8,600 ha is composed of slope ecosystems of the Teskey Ala-Too forest belt;

- The "Sarychat-Ertash" State Reserve with total area of 72,080 ha is composed of *syrt* upland ecosystems;

- The total area of subalpine, alpine and nival zones of Teskey Ala-Too range belts (59 ha.); - Northern zone covers the northern slopes of Teskey Ala-Too Ranges lying abovethe State Forest Fund, from the Dzhylusuu Peak (3,985 m.) on the divide of Chon Kyzyl-Suu River and Kichine Kyzyl-Suu River upstreams to Tekele Pass on the divides of Jeti-Oguz and Karakol rivers;- Eastern zone extends from divides of Karakol and Jeti-Oguz rivers from Tekele Pass up to the tops of the Teskey Ala-Too (5,216 m.) and onwards to the borders of the "Sarychat-Ertash" State Reserve;

- Western zone covers the area from the Dzhylisuu top on the water-parting of the Chon Kyzyl-Suu and Kitchine Kyzyl-Suu rivers to the Teskey Ala-Too Peak, Kyzyl-Suu (4,590 m.) and the boundaries of the "Sarychat-Ertash"State Reserve;

- Southern zone covers the northern boundary of the Sarychat-Ertash State Reserve.

The buffer zone with the total area of 3, 501 516 ha includes the following areas:

- The protected Issyk-Kul Lake State Reserve zone, excluding human settlements, resorts, and croplands;

- Defined area of the Issyk-Kul Lake, excluding one kilometer zone belonging to recreational territories;

- Territory of the State Forest Fund on the Teskey Ala-Too, and Kungei Ala-Too Ranges;

- Territory of the State Land Reserve and farmlands located upwards to the State Forest Fund up to the peaks of the Kungei Ala-Too and Teskey Ala-Too Ranges;

- Territory of the Issyk-Kul region located at the southeast part of the Teskey Ala-Too Range up to the state border of the Kyrgyz Republic, excluding lands, settlements, industry areas, energy and mineral areas. 688,540 ha Buffer zone , including agricultural and industrial lands, transportation, communication, defense and other function as well as human settlements, recreational areas, , and the rest of the territory of the Issyk-Kul Basin, which is not incorporated into the buffer zone. Sanation zone, including anthropogenically affected areas, which are in need of regeneration and remediation measures (mineral deposits, tailings dams, highways, settlements, degraded lands, stock routes and stockyards).

Spatial configuration

A Biosphere Reserve Zonation map *showing the delimitations of all core area(s) and buffer zone(s)* ***must be provided****. Also indicate the approximate extent of the transition area(s).*

Size of terrestrial Core Area(s): 141022 ha.

If appropriate, size of marine Core Area(s): NA

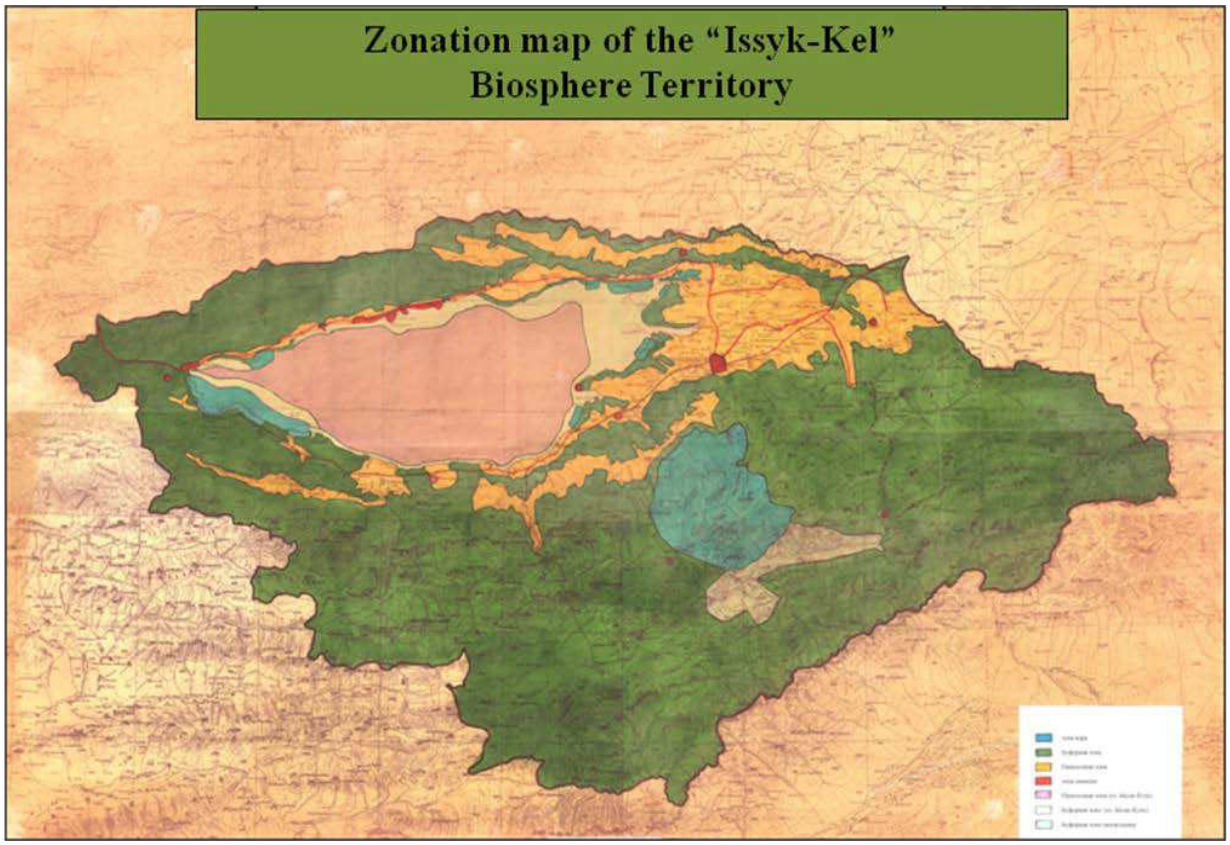
Size of terrestrial Buffer Zone(s)**:** 3,501,516 ha.

If appropriate, size of marine Buffer Zone(s): NA

Approx. size of terrestrial Transition Area(s) (if applicable): 688,540 ha.

If appropriate, approx. size of marine Transition Area(s): NA

Brief justification of this zonation (in terms of the various roles of biosphere reserves) as it appears on the zonation map.



The most important features of the environment have been assessed with respect to the value of their natural, social, and economic functions, and their sustainability to various impacts, including anthropogenic pressures. The results of this assessment formed the basis of the Biosphere Reserve zoning. Core zone includes all types of ecosystems in the region and serves as a platform for preservation of biodiversity of the most significant landscapes, glaciers and mountain rivers as the key environment-forming components. Any forms of the use of this zone except for research, monitoring, and environmental education is not allowed.

Buffer zone includes alpine and sub-alpine meadows, fir and juniper forests and shrubs. It plays a protective role for the core area and contributes to the biodiversity preservation function. Extensive use of timber and grazing resources, different kinds of tourism, limited hunting, fishing, mushrooms, berries, and medicinal plants collection is realized in this zone. Transition zone has a potential for a long sustainable development through environmentally-friendly land use, recreation and tourism. The zone serves to promote of environmentally reasonable use of all resources: land, water, and minerals.

V. HUMAN ACTIVITIES

Population living in the reserve

Approximate number of people living within the Biosphere Reserve.

Approximate number of population residing on the territory of the biosphere reserve is 444 500.

Seasonally – 1 006 050

Core Area (s): 20/50
Buffer Zone (s): 1000/6000.
Transition Area (s): 443 480/1 000 000

Brief description of local communities living within or near the Biosphere Reserve.

99% of a population of the Issyk-Kul basin is settled in a relatively narrow coastal line, in the lower part of the valley up to the height of 2,000 m., and on elongated at the latitudinal direction of Alabashs and Konurulen mountain valleys on the south-west as well. Moving progressively rom Balykchy to Karakol, settlements get more frequent and larger. The eastern part of the Issyk-Kul region is the most densely populated area, where 80% of the population of the lakeside basin is settled. These settlements are located along valleys of Tup, Jergalan, Karakol, Dzhetyoguz and Chon-Kyzylsuu rivers. It is explained by the soil fertility and good moisture content, as well as the fact that surge of settlers moved to the Issyk-Kul basin from the east through the Santash Pass and settled primarily in the eastern part of the river basin. Three-quarters of the population lives in rural areas. There are three cities (Balykchy, Cholpon-Ata and Karakol), several industrial villages (Jergalan, Kurmenty, Dzhargylchak, Ortho-Tokoi) and holiday resorts (Cholpon-Ata, Dzhetyoguz, Aksu, Koysary, Altyn-Arashan).

Indicate ethnic origin and composition, minorities etc., their main economic activities (e.g. pastoralism) and the location of their main areas of concentration, with reference to a map if appropriate.

Ethnic composition of the local population residing primarily along seaside line of the Issyk-Kul are Kyrgyzs, Russians, Ukrainians, Tatars, Dungans, and Uyghurs .

Main economic activities - livestock farming, agriculture (horticulture, grain and fodder production for livestock), provision of touristic and other services in summer.

Ethnic composition of the population of the region:						
	Number in 1989	**%**	**Number in 1999**	**%**	**Number in 2009**	**%**
TOTAL	403 917	100,00 %	413 149	100,00 %	438 389	100,00 %
Kyrgyz	273 257	67,65 %	328 278	79,46 %	377 994	86,22 %
Russian	92 615	22,93 %	54 351	13,16 %	35 275	8,05 %
Kazakh	6 433	1,59 %	6 979	1,69 %	6 464	1,47 %
Uyghur	3 730	0,92 %	3 969	0,96 %	3 897	0,89 %
Kalmyk	4 593	1,14 %	5 314	1,29 %	3 801	0,87 %
Dungan	2 686	0,66 %	2 948	0,71 %	3 124	0,71 %
Uzbek	3 756	0,93 %	3 459	0,84 %	2 982	0,68 %

Tatar	4 013	0,99 %	2 785	0,67 %	2 098	0,48 %
Ukrainian	7 366	1,82 %	2 772	0,67 %	1 170	0,27 %
German	1 770	0,44 %	492	0,12 %	300	0,07 %
Korean	245	0,06 %	133	0,03 %	133	0,03 %
Bulgarian	49	0,01 %	109	0,03 %	107	0,02 %
Bashkir	216	0,05 %	129	0,03 %	96	0,02 %
Turks	16	0,00 %	81	0,02 %	78	0,02 %
Belarusian	634	0,16 %	157	0,04 %	76	0,02 %
Azerbaijanis	220	0,05 %	82	0,02 %	54	0,01 %
Tajik	254	0,06 %	90	0,02 %	47	0,01 %
Ossete	104	0,03 %	43	0,01 %	36	0,01 %
Armenian	143	0,04 %	58	0,01 %	35	0,01 %
U.S. American	0	0,00 %	11	0,00 %	20	0,00 %
Chuvash	143	0,04 %	35	0,01 %	16	0,00 %
others	1 674	0,41 %	874	0,22 %	586	0,15 %

Name(s) of nearest major town(s).

Bishkek, the capital of Kyrgyzstan.
Alma-Ata, the southern capital of Kazakhstan

Cultural significance of the site
Briefly describe the Biosphere Reserve's importance in terms of cultural values (religious, historical, political, social, ethnological).

The "Issyk-Kel" Biosphere Reserve retains evidences of the ancient history including petroglyphs, stone idols (balbals) andunderwater ancient settlements. The Great Silk Road connecting Central Asia with China passed through this area.

The Issyk-Kul Lake is of the greatest importance and considered to be a national treasure of the Kyrgyz Republic, which represents natural site of the world's significance with a set of historical and cultural monuments, and is under protection of the state. Its waters strike with clearness, transparence and healing features, attracting large number of tourists, especially in summer.

Use of resources by local populations

Uses or activities in the Core Area(s):

It is strictly protected territory therefore, there are no activities conducted except those related to the scientific monitoring.

Main land use and economic activities in the buffer zone(s):

Tourism, amateur hunting, grazing, forestry activities are strictly controlled and regulated within an environmentally acceptable norms

Main land uses and major economic activities in the Transition Area(s):

Agriculture is the basic economic activity in the buffer zone. Farming (livestock breeding: sheep, cattle, yak, horse, and poultry; agriculture: grain and vegetable growing) are widely developed. Apiculture has developed for the last few years.

Industrial base includes dairy plant, cement and electric-bulb factories, small brick, motor transport and furniture manufactories, electric plant. There are dockyards in Balykchy and Karakol harbours, and agricultural machinery repair station in Teploklyuchenka. Bevey coal for local consumption is produced at 65 km. to the east Karakol in Dzhergalan . The cement plant in Kurmenty and the brick factory in Karakol work using domestically produced row materials. Kumtor Gold Mining Company is the largest industrial site. There is also military reservation, which is located close to Koi-sary Village (the East coast).

Possible adverse effects of uses or activities in the transition area(s) and remedial measures taken:

Intensive use of the richest natural resources of the Issyk-Kul region has a significant impact on the state of the unique nature of the lake. Irreversible processes with far-reaching consequences are taking place.

Data on extinction of some species of biota, blighting of the most scenically attractive landscapes (unique vegetation of sea buckthorn, barberry, ephedra, etc.) is present. State of the lake itself deteriorating and endangers its recreational value and possibility of normal existence of ecosystem. There are many problems of natural resource use, which need to be solved taking into account environmental criteria of originality of the local population. For instance, erosion of the croplands is an acute issue in agricultural sector. This problem was caused by plowing of slopes, incompliance with standards of crop rotation and watering rate, inadequate land plan and slicing of irritation network. Other problems include exploitation of forest and other types of vegetation, degradation of lands and vegetation of natural local pastures that are caused by overgrazing and non-compliance with organization of cattle grazing and crossing. Industrial complexes cause considerable problems to the ecosystem of the region including soil, subsoil, and aquifer degradation in the process of development of the numerous mining fields, collection of non-treated waters in processing agricultural raw materials, andnon-compliance with transportation and storage regulations of various toxic chemicals used in Kumtor gold mining field.

One of the most ghastly ecological disasters in the region was a cargo truck accident, which crashed into the Barskoon River that is close to its inflow to the Issyk-Kul Lake (May 20, 1998). As a result of the accident, about 1762 kg of sodium cyanide was dissolved in it.

Kadji-Sai tailings dam, which is located in a close proximity to the Issyk-Kul Lake presents another danger.

If known, give a brief summary of past/historical land use(s) of the main parts of the Biosphere Reserve:

The Kyrgyz are an ancient nation, who led nomadic life for centuries. Agricultural lands near the Issyk-Kul Lake began to be used for crop development with appearance of the Russian and Ukrainian settlers in the region.

Tourism

Indicate the number of visitors coming to the Biosphere Reserve each year

National: 500,000
Foreign: 1 030 000-1 040 000 per year (mostly tourists from Russia and neighboring countries) including:
2010 – 400000 (according to the local administrations);
2011 – 2 300 000 (according to the Ministry of Economic Regulation);
2012 – 1 104 100 (according to the data of the Department of Tourism of the Ministry of Culture and Tourism of the Kyrgyz Republic).

Type(s) of touristic activities (Study of fauna and flora, recreation, camping, hiking, sailing, horseriding, fishing, hunting...).

Hunting, hiking, study of flora and fauna, tourism (beach, mountain skiing, recreational activities, trekking, rafting, alpinism).

Tourist facilities and description of where these are located.

Tourist facilities are located alongside Issyk-Kul Lake basin. The North coast became the main resort zone of the lake due to the favorable climatic conditions. There are resort towns and villages, health and recreation resorts, youth camps and tourist centers: "Issyk-Kul" near Ananieva town, "Kazakhstan" near Bozteri Village and "Ulan" Tourist Base near the Toru-Aigyr Village.

Around 200 sports and tourist camps belonging to enterprises and institutions of Kyrgyzstan, Kazakhstan, and Uzbekistan emerge annually on the banks of the Issyk-Kul Lake. Most of them are located near Choctal on its northern shore, in area between Dolinka and Cholpon-Ata, near Bozteri, Komsomol, Korumdu, Ananeva and Kurmenty.

The Teskey Ala-Too branches are rich in medicinal minerals, mostly thermal and radioactive sources. Treatment in resorts located in Aksu, Dzhetyoguz, Tamga, Dzhergalan and backcountry "peoples' resorts" in Altyn-Arashan and Tyeplie Kluchi (Dzhilysu) is based on these sources. In addition to this, the local population use mineral sources of Ulahol, Turasu, Kokomoren, Kadzhisay, Dzhukuchak , Bozuuchuk, Keregetash, etc. Radioactive baths allow treating joint and spine diseases (rheumatism, articular gout), residual paralysis and paresis - consequences of infantile paralysis, and some deceases of the nervous system, skin and gynecological diseases as well.

Income and benefits to local communities
Indicate for the activities described above whether the local communities derive any income directly or indirectly and through what mechanism.

Tourism is an important source of income for local people of the coastal zone including merchants selling agricultural products. Selling traditional crafts (national souvenirs), photo services with eagles, falcons, yaks, etc. are sources of income as well.

VI. RESEARCH AND MONITORING PROGRAMMES

Brief description and list of publications of past research and/or monitoring activities.

Basic monitoring was conducted jointly with the National Academy of Sciences of the Kyrgyz Republic (NAS KR), Public Foundation "NABU" (NGO), the State Institute of Geodesy, Cartography, andLand Planning in cooperation with UNDP, GEF, OSCE, ADB, and other organizations.

As a result of such works “An open-air museum” near Bulan-Sogottu Village that have a large number of ritual paintings on stones, which dates back to XI millennium B.C. was opened.

Travel agencies were recommended a large range of touristic routes includingrafting along the Chu River from Orto-Tokoi Water Reservoir to Naryn Town and along Naryn River), tourist map of the Issyk-Kul Region with indication of natural, cultural and archeological monuments, tourist routes, and specially protected reservations was developed and published in Russian and English languages.

The "Principles of environmentally oriented development of the Ak-Suu Region and Karakol Town” research work was published, the same work has been done in Tyup region as well and is going to be published. The basis of the ecologically oriented development is aimed at sustainable ecological and economical development of the region. Inventorying of cultural and historical monuments of the region was conducted and published in three languages (Russian, English, and German). The brochure was distributed to tourists and information centers. Sign boards of natural, cultural, architectural and historical monuments are installed all over the Issyk-Kul Region in Kyrgyz and Russian languages. Researches of flora and fauna, cartographic sites, analysis of the state of floodplain forests , development of management plan of the “Baydamtal” Botanic Reserve were conducted by the Institute of Biology and Soil Science of the National Academy of Sciences of the Kyrgyz Republic in cooperation with the State Agency of Environment Protection and Forestry in order to preserve endemic species and extend the territory of the specially protected natural territory.

Helioplants (green energy) were installed in the Eco-Center building and in one of the resorts for heating purposes that serves as a demonstration facility.

The most wastewater treatment facilities of the resorts are in a poor condition. They are either connected to a central sewerage system of Cholpon-Ata City, which itself is in a critical condition or not functioning. Thus, complex actions are needed to be taken in this sphere through decentralization of wastewater treatment facilities and building new facilities.

The wastewater treatment facility with a soil filter was built on the territory of the Tourist Complex of the "Oaziz" Ltd. as a demonstration project. Water analysis indicated that the facility operates well.

Monitoring of the current state of the natural components *(flora and fauna of syrt areas, forest reserves, riverfront forests, and of waterfowl and semi-aquatic birds, censes, cultural, historical and natural monuments etc.*) has been carried out to analyze and assess the state of natural environment and population dynamics, and monitor populations of migratory waterfowl birds. The recommendations were given on a pond aquaculture in wetlands as well.

Monitoring on a determination of stocks of medicinal plants was conducted. This kind of work has not been done for the last 15 years. As a result of this work the Medicinal Plants Harvesting Rules and of Minimum Standards of Harvesting (limits) in the “Issyk-Kel” Biosphere Territory was developed and approved by the State Agency of Environment Protection and Forestry in order to regulate harvesting of the medicinal plants, determine sustainable use of stocks and harvesting rules, monitoring of restocking after harvesting. These guidelines were distributed among all local administrations, forestry enterprises and other stakeholders for the sustainable use of medicinal plants.

Recommendations on establishment of micro-reserves and justification for their establishment were given to preserve the Shor-Kol Lake (endemic area).

Brief description of on-going research and/or monitoring activities.

Abiotic research and monitoring:

1) Assessment of the lake water quality of areas close to the major resort facilities, industrial plants, and location of the waste water treatment facilities of large settlements;

2) Assessment of the quality of water of rivers, and of their impact on the water of the lake;

3) Assessment of the quality of the bottom sediments, which may accumulate pollution from the water;

4) The scientific and practical expedition on inventorying of the archaeological and natural monuments, petroglyphs;

5) Monitoring of the radio ecological state of the "Issyk-Kel" Biosphere Territory;

6) The research of the natural and anthropogenic landscape modifications of the "Issyk-Kel" Biosphere Territory;

7) The climate and temperature regime in the reserves.

Biotic research and monitoring:

Monitoring of the current state of the natural components (flora and fauna of syrt areas, forest reserves, riverfront forests, censes of waterfowl birds);

Monitoring on determination of the medicinal plants stocks;

Monitoring works on conduction inventorying of vegetation of the sea buckthorn in "Issyk-Kel" Biosphere Territory;

Socio-economic research:

Social and economic research in Ak-Suu region and Karakol City;

Social and economic research of the state of natural resources, social, and economic development of Tyup region.

Estimated number of national scientists participating in research within the Biosphere Reserve on a permanent or occasional basis.

On a regular basis - 20, part-time- 40

Estimated number of foreign scientists participating in research within the Biosphere Reserve on a permanent or occasional basis.

On a regular basis -5, part-time- 30

Research station(s) within the Biosphere Reserve

Issyk-Kul University named after K. Tynystanov, Karakol City.
Biological Station in Cholpon-Ata City
Tien Shan Geophysical Station
Issyk-Kul State Reserve
Sarychat-Ertash State Reserve

Permanent research station(s) outside the Biosphere Reserve.

Outside the "Issyk-Kel" Biosphere Territory there are institutes of the National Academy of Sciences including Institute of Biology and Soil Sciences, Institute of Geology, Institute of Water Problems and Hydropower, Institute of Seismology, Institute of Biotechnology, Institute of Mountain Phisiology, Kyrgyz National State University named after J. Balasagun, Kyrgyz State University named after I. Arabaev, National Agriculture University, Kyrgyz State Medical Academy, which conduct researches related to the specially protected areas.

Research facilities of research station(s) (meteorological and/or hydrological station, experimental plots, laboratory, library, vehicles, computers etc.).

Meteorological stations

Hydrological posts

Tien-Shan Geophysical Station

Experimental plots in forest ecosystems

Biological Station of the Institute NAS of the KR

Public Foundation "NABU"

Biosphere Territory "Issyk-Kel" has the Internet access

Other facilities (e.g. facilities for lodging or for overnight accommodation for scientists etc.).

There are no other facilities.

Indicate how the results of research programmes have been taken into account in the management of the biosphere reserve

Methodologies and recommendations of scientific organizations are used in the major activities of the reserve including preservation, recreation, and use of natural territories with a rich cultural and natural heritage; long-term support provided for sustainable economic and social development of territories; long-term ecological monitoring and researches including ecological education and awareness raising.

VII. EDUCATION, TRAINING AND PUBLIC AWARENESS PROGRAMMES

Describe the types of activities related to Environmental education and public awareness:

Biosphere Territory conducts seminars, round tables, conferences for school and university students, local population of the region. Information on various issues related to the reserve is covered by mass media (spcialized newspaper “Ak-Kuu” is published by the Biosphere Territory on a quarterly basis, newspaper «Jer-Ene" is published by the State Agency of Environment Protection and Forestry, and TV programmes). Different kinds of thematic booklets, pamphlets about the reserve are published. Excursions for students are organized on a regular basis.

Training programmes for specialists:

Different kind of workshops for scientists, local population, decision-makers at different levels, and training and awareness raising workshops, introduction workshops with German biosphere reserves were conducted in the process of establishment of the Biosphere Territory.

The visit to the "Seven" Biosphere Reserve located in France was organized within the framework of implementation of the project on the National Environmental Strategy supported by the European Commission connected with the state of pastures on the territory of the Chon Ak-Suu model area.

Indicate whether there are facilities for education and training activities, as well as visitors' centres for the public:

Ecological and Information Center in Cholpon-Ata City;

Touristic and Information Center at the “Issyk-Kel” Eco-post;

Administration of the "Issyk-Kel" Biosphere Territory, Balykchy City.

VIII. INSTITUTIONAL ASPECTS

State, Province, Region or other administrative units

List in hierarchical order administrative entity(ies) in which the Biosphere Reserve is located (e.g. state(s), counties, districts).

The Kyrgyz Republic

Issyk-Kul Region (Ton, Tyup, Issyk-Kul, Ak-Suu, Jeti-Oguz rayons (administrative units))

Management plan/policy

Indicate if a management plan or policy exists for the overall biosphere reserve.

The Conception on Sustainable Development of Ecological and Economic System of the "Issyk-Kul" (2020) was approved by the Presidential Decree № 98, dated February 10th, 2009.

If yes, briefly describe the main characteristics of this plan and precise the modes of application.

The Conception was adopted to:

- achieve the high level of social development of the region and provision of the quality life for every citizen of the Issyk-Kul region in a sustainable environment;

- create conditions for the development of competitive, resource-saving and multiform economic system of innovative form, which is effectively integrated into the social and economic development of the country;

- Preserve and maintain sustainable environmental development.

Authority in charge of administration of the whole, i.e. of implementation of this

plan/policy:

The Government of the Kyrgyz Republic

The control on the implementation of the Conception is entrusted with the Department of Economic and Social Policy of the President's Office of the Kyrgyz Republic.

The Program on Sustainable Development of Ecological and Economic System of the "Issyk-Kul" 2009-2011 was developed to implement the Conception.

According to the plan the governmental bodies (ministries, agencies etc,) submit annual reports on implementation of the Program to the State Agency.

Local governments submit annual reports to the Issyk-Kul Regional State Administration.

The State Agency and the Issyk-Kul Regional State Administration summarize these reports and submit to the Department of Economic and Social Policy of the President's Office of the Kyrgyz Republic.

Total number of staff of Biosphere Reserve:

The total number of staff of the "Issyk-Kel" Biosphere Territory - 109 (as of 15 January 2012) including:

“Issyk-Kel” State Reserve – 33;

Sarychat-Ertash State Reserve – 29;

“Karakol” National Park – 24.

Financial source(s) and yearly budget:

Indicate the source and the relative percentage of the funding (e.g. from national, regional, local administrations, private funding, international sources etc.) and the estimated yearly budget in the national currency.

Sources of the funding of the Biosphere Territory consist of the state budget and extra-budgetary sources collected from the entrance fees to the Biosphere Territory.

By year	State funding (in soms)	Extrabudgetary sources (in soms)	%
2009	3,318,400	6,979,036	47,54
2010	2,752,500	3,878,166	70,97
2011	2,741,400	6,713,624	40,83

Authority in charge of administration

The biosphere reserve as a whole:

The State Agency of Environment Protection and Forestry under the Government of the Kyrgyz Republic, Directorate General of the "Issyk-Kel" Biosphere Territory.

Core area(s):

State administrations of the state reserves (Issyk-Kul, Sarychat-Ertash and "Karakol" State Nature Park)

Buffer zone(s):

The State Agency of Environmental Protection and Forestry under the Government of the Kyrgyz Republic;

Directorate General of the "Issyk-Kel" Biosphere Territory.

Mechanisms of consultation and co-ordination among these different authorities:

The "Issyk-Kel" Biosphere Territory is under jurisdiction of the State Agency of Environmental Protection and Forestry under the Government of the Kyrgyz Republic.

The State Agency is a governmental executive authority, which realizes the policy and regulation of relations in the field of environmental protection, environmental safety and environmental management.

There is the Advisory Committee of the Biosphere Territory “Issyk-Kel” for pooling of interests and implementing programs of the Biosphere Territory.

On the Advisory Committee are heads of the government bodies, local governments, business enterprises, research institutions, nongovernmental organizations. Member of the Committee is defined with consultation Regional State Administration and agreed with the State Agency on Environment Protection and Forestry. Usually the number of the Committee is 7 or 9 persons but it should not be less than 5.

Where appropriate, National (or State, or Provincial) administrations to which the biosphere territory reports

Reserve’s administration reports to the State Agency of Environment and Forestry under the Government of the Kyrgyz Republic.

Mechanism for consultation of local communities

Indicate how and to what extent local people living within or near the Biosphere Reserve

- have been associated to the biosphere reserve nomination:

During the drafting of the nomination dossier of the Issyk-Kul reserve awareness raising activities on the importance of biosphere reserves and their significance to the world’s community among local population were carried out.

- participate to the decision process and management resources:

Local residents are interested in the development of the Biosphere Territory as it contributes to develop different kinds of tourism on a new basis without a negative impact on the environment and fosters production of environmentally friendly goods and products, and traditional handicrafts.

- People involved in decision-making and resource management:

Local communities are involved in implementation of projects related to the development of the reserve and in fundraising activities.

Indicate whether you consider the participation of local communities to be satisfactory and, if not, what measures are envisaged to improve this situation

Participation of the local communities in reserve management is limited. They are involved mostly in project implementation activities. For example: the project on supporting the joint

management of forest resources, sustainable pasture management, energy efficiency, "mountain bridges."

Protection regime of the core area and possibly of the buffer zone

Indicate the type (e.g. under national legislation and date since when the legal protection came into being and provide justifying documents (with English or French summary of the main features).

The Issyk-Kul State Reserve occupies 19 842 ha. of wetlands of internationally recognized habitat for waterfowl within boundaries of the Issyk-Kel State Reserve established by the Governmental Decree # 392 dated 04/08/1976, amended on 3.06.1980 (#308), 13.05.1985 (#214).

Protected area of the "Karakol" National Park (Governmental Decree #225 dated April 15th, 1997, 8600 ha.) represents slope ecosystems of the forest belt of the Teskey Ala-Too Range.

The territory of the Sarychat-Ertash State Reserve (Government Decree # 76 of March 10th, 1995; 72 080 ha.) represents the unique ecosystem of syrt uplands.

Within the boundaries from the Sarychat-Ertash State Reserve to “Karakol” National Park, the territory of the subalpine, alpine and nival belt of Teskey Ala-Too occupies 40 500 ha.

A buffer zone with a total area of 3,497,745 ha includes:

The protection zone of the Issyk-Kul State Reserve protection zone occupies 3771 ha., excluding settlements, resorts, and croplands ;

Defined water zones of the Issyk-Kul Lake excluding one km. zone along docksides of resorts – 457145 ha;

The territory of the State Forest Funds of the six forestries -178,368 ha;

The area of subalpine and alpine belts of the Teskey Ala-Too and Kungei Ala-Too with a total area of 881,671 ha, including 291,406 ha lands for agricultural use;

The area of mountain ranges, syrt highlands of the Central Tien-Shan – 1,980,561 ha, including 701,969 ha lands for agricultural use.

Land tenure of each zone

Percentage of ownership in terms of national, state/provincial, local government, private, etc.

Core Area(s):

Core zone is under 100% state ownership

Buffer Zone(s):

State owned -90%
Local administration owned - 10%

Transition Area(s):

State - 68%
Private - 22%
Local administration - 10%

Foreseen changes in land tenure.

No changes are foreseen in land tenure.

Is there a land acquisition programme, to purchase private lands, or plans for privatization of public lands?
Programme of the Kyrgyz Republic on Monitoring of Lands for Agricultural Use for 1999-2005 and subsequent years has been developed and approved by the Governmental Decree #115 of March 1, 1999.

Contact address/(es): *Contact address of the biosphere reserve for all official correspondence.*

Name: "Issyk-Kel" Biosphere Territory
Street: Naryn Highway - 10,
City, Postal Code: Balykchy, 722 300
Country: the Kyrgyz Republic
Telephones: +996 3944 7 04 01, 03944 7 04 16;
Fax: +996 3944 7 04 01, 03944 7 04 02
E-mail: biosfera.ik@rambler.ru

IX. CONCLUSION

Brief justification of the way in which the biosphere reserve fulfils each criteria of the article 4 of the Seville Strategy:

1. Representative ecological systems - graduation of human interventions.

The "Issyk-Kel" Biosphere Territory encompasses the most typical and well-preserved natural complexes of the Issyk-Kul basin, representing the broad spectrum of its diverse landscapes including lake, desert, dry and wet steppe, mountain forests, alpine meadows, nival-glacial landscapes.

Issyk-Kul basin is a unique natural formation, the landscapes of which are formed under conditions of the large continental basin surrounded by mountain ranges (4800-5200m) with a large unfrozen Issyk-Kul Lake in the middle, a surface of which is located at the altitude of 1608 m. above the sea level. The high degree of isolation of the basin from the direct intrusion of air masses and from the surrounding territories creates conditions for the formation of a specific climate system that affects all other components of the natural complex.

The elongation of the basin from the west to the east to 275 km., with a width of 65 km., as well as the amplitude of the heights reaching 3,600 m. within the basin, defines a rich mixture of different types of landscapes - from the desert in the western plains to the alpine meadows and

glacial-nival in the highlands of the eastern Pre-Issyk-Kul region. The petrophyte and psammophyte communities of the western part and typical boreal biocoenosis of the forest-meadow-steppe belt with massifs of Schrenk spruce are unique to the entire Central Asian region.

Of special importance are the coastal and aquatic fauna and flora of the Issyk-Kul Lake. The lake is the spot for migratory birds and wintering of dozens waterfowl. The lake is recognized by the Ramsar Convention as a place of wintering waterfowl and semi-aquatic birds.

Other significant feature of the basin is the abundance of natural formations with a huge recreational and therapeutic potential taking into account more than 100 deposits of diverse mineral waters, 7 deposits of peloids, around 500 km. of natural untapped beaches, and more than 30 picturesque of gorges, and dozens of waterfalls.

2. Significance for biological diversity conservation

The "Issyk-Kel" Biosphere Reserve and all administrative territory of the Issyk-Kul Region is the unique natural feature with high diversity of landscapes surrounding the unfrozen lake, which is situated at altitude of 1608 m. above sea level, and surrounded with high mountain ranges all around. Such location protects the lake's basin from air intrusion, and presence of a great number of hot springs forms a specific climate system.

Uniqueness of ecosystems and sites of the world's historical and natural heritage of the Issyk-Kul led to establishment of the "Issyk-Kel" Biosphere Reserve in 1998, which was included into the global network of the UNESCO Biosphere Reserves. It is one of the largest reserves of the world.

The "Issyk-Kel" Biosphere Reserve – specially protected natural territory of national importance was established by the Governmental Decree of the Kyrgyz Republic # 623 "About the "Issyk-Kel" Biosphere Reserve" of September 25 1998 and aimed at:

- preservation, recreation and use of natural territories with rich natural and cultural resources;
- long-term support provided for sustainable economic and social development of territories including recreational use taking into account preservation and recreation;
- long-term ecological monitoring and researches including ecological education and awareness raising.

Issyk-Kul as a natural feature has an official status of national treasure of the Kyrgyz Republic, which is approved by the Law of the Kyrgyz Republic # 115 "About ecological and economical system of the Issyk-Kul" of August 13 2004.

3. Approaches to sustainable development on a regional scale

The main activity of the Issyk-Kul State Reserve is conservation and monitoring of wintering waterfowl and semi-aquatic birds along with the natural reproduction of typical and unique natural complexes.

The main functions of the Sarychat-Ertash State Reserve include preservation of the ecosystems, alpine plateau and syrt's of the Inner Tien–Shan and its habitats.

The main function of the "Karakol" National Park is a conservation of natural and cultural complexes in general.

They all pursue common goals to protect endangered species of flora and fauna along with natural and cultural complexes as a whole. Activities endangering sustainable development of natural environment within their territories are not allowed.

Facilitating sustainable development through environmental education, awareness raising to form a sustainable public support of the Biosphere Territory is the main goal of the Information Center.

The area and geographic location of the «Issyk-Kel" Biosphere Territory allow creating approaches and ways for a long-term ecologically oriented development at regional level.

4. Appropriate size to serve the three functions

In accordance with the Law on «The Biosphere Territories in the Kyrgyz Republic" and the international standards set by the UNESCO "Man and Biosphere" Programme (MAB), the "Issyk-Kel" Biosphere Territory ensures implementation of the following functions:

- conservation of the natural landscapes, ecosystems, species and genetic diversity;

- promotion of economic and cultural development of the region, ensuring links between environment and environmentally friendly sustainable human development;

- conducting long-term researches and monitoring of the state of the environment and supporting activities related to environmental education , providing professional trainings for specialists and managers dealing with natural resources, and serving as a base for approbation, standardization and transfer of new technologies to the region.

Vast territory of the reserve (43,100 000 sq. km) contributes to implement all the three functions of the Biosphere Reserve: the core zone of 141,022 ha includes all the main ecosystems of the region and ensures biodiversity conservation. Buffer zone of 3,501,516 ha promotes biodiversity conservation through traditional knowledge and environment-friendly management. Environmentally oriented practices of the land-use that ensure sustainable development are implemented in the transition zone (688, 500 ha.)

5. Appropriate zonation to serve the three functions:

In accordance with the Law on "The Biosphere Territories in the Kyrgyz Republic" and the international standards, the "Issyk-Kel" Biosphere Territory is divided into zones with different regimes of protection and use.

The Core zone covers an area of 141,022 hectares, i.e. approximately 3.28% of the total area. Any kind of economic activities/interventions are prohibited on this territory.

The buffer zone covers an area of 3,501,516 hectares, i.e. 81.3% of the total area. Establishment of new settlements, construction and exploitation of industrial and other facilities, conducting

geological explorations and mining, forest felling by way of final cutting, immigration (acclimatization) of new plant and animal species, and any other activities that could have impact on the hydrological core regime or on the ecosystem as a whole are strictly prohibited.

The transition zone with a total area of 688,540 hectares includes agricultural lands, and lands for industrial, transportation, communication, defense and other use, residential areas, territories of resorts and remaining part of the territory of the Issyk-Kul basin, which are not included in the buffer zone as well. Different types of production activities that comply with environmental requirements ensuring sustainable environmental and economic development of the territory are allowed in this zone.

The sanation zone includes anthropogenically affected areas requiring regeneration and remediation measures (mineral deposits, tailings, highway lines, settlements, degraded lands, stock routes and stopping areas for cattle).

6. Participation of public authorities and local communities

Conception of Sustainable Development of Ecological and Economic System of "Issyk-Kul" for 2020 is approved by the Presidential Decree #98 of 10.02.2009. Advisory Board was established within the structure of the Generale Directorate of the Biosphere Territory. The Board consists of representatives of the region, various administrations, and communities and provides wide public participation. The Board takes part in the management activities of the Biosphere Territory.

7. a) mechanisms to manage human use and activities
b) Management policy or plan
c) Authority or mechanism for implementation
d) Programmes for research, monitoring, education and training

a) Establishment of committees for pasture management in the buffer and transition zones.

b) The development plans of the Biosphere Territory include the following activities:

• Development of measures to eliminate poaching, illegal hunting;
• Study of the structural organizations, functioning and dynamics of natural ecosystems of the territory;
• Research of common and rare species of flora and fauna;
• The development of eco-tourism;
• Conducting research activities.

c) The "Issyk-Kel" Biosphere Territory Administration.

Issyk-Kul State Reserve Administration.
Sarychat Ertash State Reserve Administration.
"Karakol" National Park Administration.

Does the biosphere reserve have cooperative activities with other biosphere reserves (exchanges of information and personnel, joint programmes, etc.)?

National level:

Cooperation with the “Sary-Chelek” Biosphere Reserve.

Through twinning and/or transboundary biosphere reserves:

Partnership links with the Schorfheide-Chorin Biosphere Reserve;

The "Issyk-Kel" Biosphere Territory staff members were trained in Germany, May 2001;

Consultative assistance was provided to representatives of the State Agency of Environment Protection of the Republic of Tajikistan in the planning of the biosphere territory in 2012.

At present, preliminary work on establishment of the "Khan Tengri" Natural Park is carried out in order to explore opportunities for creation of the transboundary territory for snow leopard's range (in situ) conservation.

Within the World Network (including Regional Networks):

Opportunities for cooperation with Altai Biosphere Reserve are being explored.

Obstacles encountered, measures to be taken and, if appropriate, assistance expected from the Secretariat

1. **Absence of the modern laboratory.** In order to improve the quality of monitoring of the ecological state of waters of rivers flowing into the Issyk-Kul Lake, its waters, air, soil, and conducting in-depth analysis of content in plants and fragments of origin of animals it is necessary to establish the laboratory with up to date technologies.

2. **State of the waste treatment facilities.** As was noted before, the most wastewater treatment facilities of the resorts are in a poor condition. They are either connected to a central sewerage system of Cholpon-Ata City, which itself is in a critical condition or not functioning. Thus, complex actions are needed to be taken in this sphere through decentralization of wastewater treatment facilities and building new facilities.

3. The decision of the Government of the Kyrgyz Republic on necessity of detailed inventorying and explicational works (land measuring, mapping, inclusion of legal relations on studied areas into a database) was taken during establishment of territorial boundaries and zoning of the Biosphere Territory. There works have not been accomplished. Of special importance is the issue of establishment of boundaries and sanation zones, i.e. inventorying of degraded and anthropogenically disturbed lands. At present, there are no established and approved sanation zones, which need to be regenerated, re-cultivated, and subject to measures against erosion and deforestation.

Annex II recommendations after its 25th session meeting 27-30 May 2013 in Paris

In respondence to the 2nd periodic review about the development progress of Biosphere Reserve Issyk Kul the UNESCO ICC MAB has published following recommendations after its 25th session meeting 27-30 May 2013 in Paris:

"The Committee welcomed the periodic review report for the sites which is located in north-east Kyrgyzstan and designated in 2001. The total surface area of the site is 4,311,588 hectares. The core area remains strictly protected and is devoid of any activities except for scientific research. The local communities derive their livelihood from selling items to tourists, notably handicrafts. Tourism has been described as an important source of income for the local people. The Advisory Committee concluded that the site partially fulfills the Statutory Framework criteria for biosphere reserves. The Committee recommended to the authorities to develop and submit to the MAB Secretariat by the end of December 2013, a management structure and plan which includes local communities in decision making and resource management as part and parcel of the management system of the biosphere reserve."

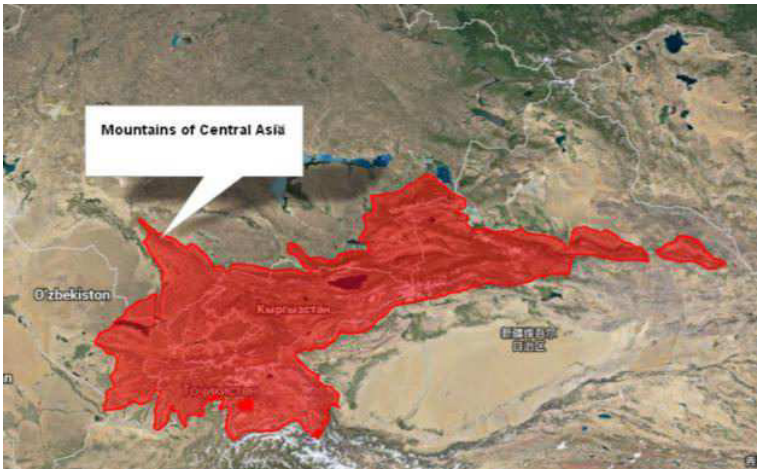
Available at, dated 19th November 2013: www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/man-and-biosphere-programme/about-mab/icc/icc/25th-session/ pp: 27

Annex III International recognition of biodiversity

Conservation International – - Mountains of Central Asia Biodiversity Hotspot -

Hotspot Original Extent (km²)	863,362
Hotspot Vegetation Remaining (km²)	172,672
Endemic Plant Species	1,500
Endemic Threatened Birds	0
Endemic Threatened Mammals	3
Endemic Threatened Amphibians	1
Extinct Species†	0
Human Population Density (people/km²)	42
Area Protected (km²)	59,563
Area Protected (km²) in Categories I-IV*	58,605

†Recorded extinctions since 1500. *Categories I-IV afford higher levels of protection.



The Mountains of Central Asia hotspot consists of two of Asia's major mountain ranges, the Pamir and the Tian Shan. Politically, the hotspot's 860,000 square kilometers include southern Kazakhstan, most of Kyrgyzstan and Tajikistan, eastern Uzbekistan, western China, northeastern Afghanistan, and a small part of Turkmenistan. The hotspot has many mountains above 6,500 meters in elevation, as well as major desert basins, the largest of which is the Fergana Valley. The hotspot holds a large number of endemic plant species, but water stress and civil conflict have placed much of its unique biodiversity under serious threat.

The Pamir mountain range, which includes the Eastern Pamir, Western Pamir and Pamir-Alai Mountains, was known to early Persians as the "roof of the world." The Eastern Pamir are plateau-like with limited altitudinal variation, while the Western Pamir are characterized by sharp ridges, steep slopes and deep valleys and gorges. The hotspot's highest peak is Kongur, which rises to 7,719 meters in the Chinese Pamir; four other peaks are above 7,000 meters. The 300-km-long, 150-km-wide Fergana valley separates the Pamir from the Tian Shan Mountains, a complex series of ranges extending for 2,500 kilometers from west to east. The hotspot also holds more than 20,000 glaciers, covering around 18,000 km².

The climate in the Mountains of Central Asia is generally arid. Precipitation falls mainly in winter and spring and varies from more than 1,500 millimeters in the Gissar Range in the west of the hotspot to less than 100 millimeters in the Eastern Pamir.

The predominant vegetation types in the hotspot are desert, semi-desert and steppe on all the lower slopes and foothills and in some of the outlying ranges and major basins. Patches of riverine woodland survive in the Ili valley and a few other places. At higher altitudes, steppe communities, dominated by various species of grasses and herbs occur, while shrub communities are widespread in the lower steppe zone. Spruce forests, the only coniferous forest type in the hotspot, occur on the moist northern slopes of the Tian Shan, while open juniper or archa forest occurs widely between 900 and 2,800 meters. Subalpine and alpine meadows occur in the western part of the mountains, from 2,000 to 4,000 meters and above. At the very highest and coldest elevations, there is limited vegetation cover and diversity, with cushion plants, snow-patch plants and tundra-like vegetation.

The flora of the Mountains of Central Asia is a mix of Boreal, Siberian, Mongolian, Indo-Himalayan and Iranian elements. There are more than 5,500 known species of vascular plants in the hotspot, about 1,500 of which are endemic. There are also 64 endemic genera, including 21 from the family Umbelliferae and 12 from the family Compositae. The endemic flora includes several tree species, grasses (such as Atraphaxis muschketovii and Stipa karatavica), and numerous herbs. There are many species of wild onion, including Allium pskemense, a very rare large onion found only in a small part of the Pskem Range of the Western Tien Shan.

A type of walnut-fruit forest unique to Central Asia can be found above the steppe zone in warm sheltered coves in the western Pamir-Alai and Tien Shan. The fruit and nut trees in these diverse forests include walnut (Juglans regia), almonds (Amygdalus communis and A. bucharensis), pears (Pyrus korshinskyi and P. regelii), plums (Prunus sogdiana and P. ferganica), and cherry (Cerasus mahaleb), along with maples (Acer turkestanicum and A. semenovii) and a few Chinese walnuts (Juglans cathayana) that survive in one location in the eastern Tien Shan. This ancient forest type contains ancestors of domestic fruit varieties and is an important storehouse of wild genetic diversity. About 90 percent of this habitat has been lost in the last 50 years.

More than 16 endemic species of tulip grow in the steppe and meadow zones of the Mountains of Central Asia. The largest of these is the rare, brilliant orange-red Greig's tulip (*Tulipa greigii*), often known as the king of the tulips, which is only found in western Tian Shan. Collecting for horticulture and decoration has led to the decline of many of the hotspot's tulip species.

Unique and Threatened Biodiversity: in Tian Shan Mountain including whooper swans (*Cygnus cygnus*) and snow leopards (*Uncia uncia*, EN) and other.

[http://www.conservation.org/where/priority_areas/hotspots/europe_central_asia/Mountains-of-Central-Asia/Pages/default.aspx]

[Map of Mountains of Central Asia Biodiversity Hotspot (http://globalspecies.org/kmlserver/getkml/22/hotspot)]

WWF GLOBAL 200 Ecoregion

Tian Shan montane steppe and meadows

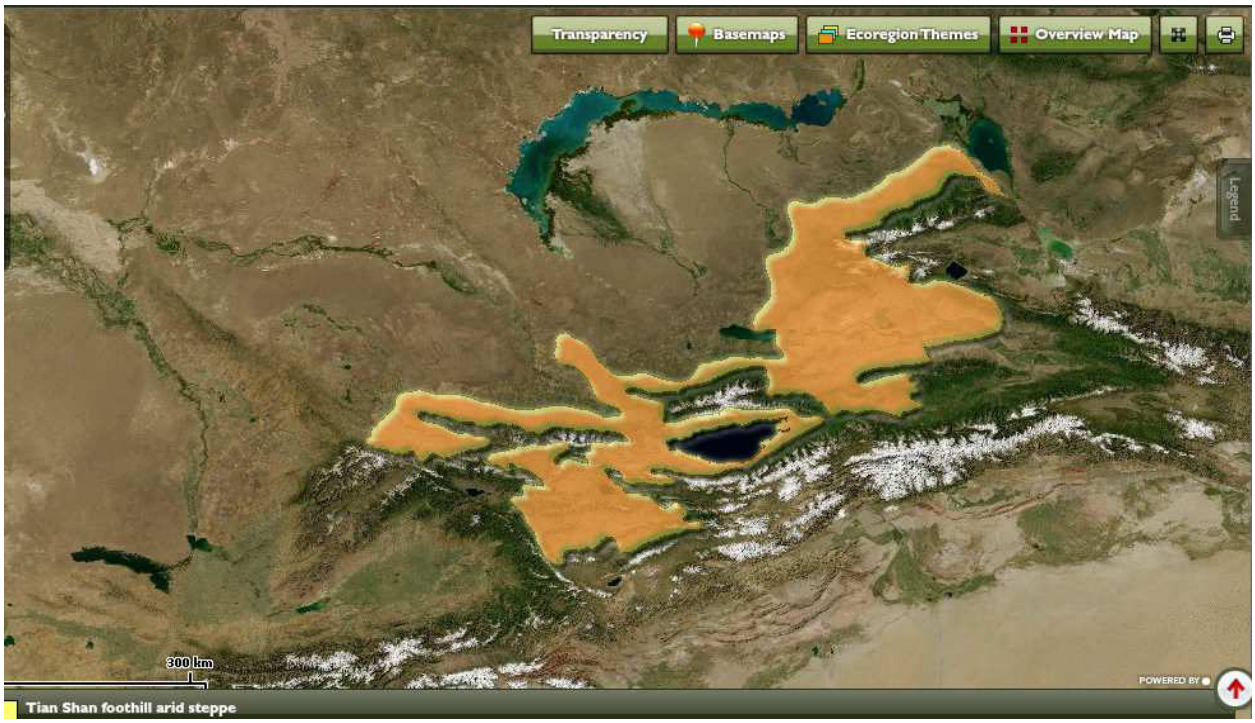
The Tian Shan, or Celestial Mountains, is a large, isolated range surrounded by the desert basins of northern China. Middle elevations catch enough arctic moisture to support a parklike landscape of meadows and spruce forests. Above lay alpine meadows, rocky slopes, and glaciers. Below, steppes extend outward to the desert floor. Because of its size and variety of habitat types, the Tian Shan is diverse, with more than 2,500 plant species. Although hunting pressure is severe, snow leopards still occur here, as do the ungulate species that comprise their prey base.

Scientific Code (PA1019)

Ecoregion Category: Palearctic

Size: 108,100 square miles

Status: Vulnerable



OLSON, D. M. & DINERSTEIN, E. (2002): The Global 200: Priority ecoregions for global conservation. Annals of the Missouri Botanical Garden 89(2):199-224.

Freshwater Ecoregions of the world (FEOW) site 627 - Lake Issyk Kul - Upper Chu -

The Issyk Kul – Upper Chu ecoregion supports a comparatively poor native fauna, with less than 15 species from three families. This fauna is a typical example of the local Central Asian fish complex originating from Central Asian Montane fauna (a term by Berg), which is characterized by the presence of the loaches of Triplophysa sensu lato and cyprinids of the subfamily Schizothoracinae, with a small addition of leuciscins of Siberian origin.

The whole former fish community is an example of a native lacustrine ecosystem that lacked a predatory member. Only larger-sized individuals of osmans and L. schmidti fed occasionally on smaller fishes. Introductions of the predators destroyed the ecosystem completely.

There are a number of endemic subspecies in the ecoregion, including Gymnodiptychus dybowskii var. primitive, G. dybowskii lansdelli, Issyk-Kul naked loach (Triplophysa "strauchii" ulacholica), and Issyk-Kul marinka (Schizothorax pseudoaksaiensis issykkuli). Near-endemics include Ili marinka (S. issykkuli), Leuciscus bergi, Gobio lepidolaemus nikolskyi, Diptychus maculatus oschanini, Gymnodiptychus dybowskii bergianus, and Triplophysa stoliczkai elegans.

Leuciscus bergi is a near-endemic Issyk Kul dace. It has a wider distribution than L. schmidti since it is a pelagic, mostly planktivorous species. It inhabits the whole littoral zone, as well as depths down to 120-150 m. It spawns in shallow waters at depths between 1-8 m. It is a small fish (up to 175 mm) that was once the most numerous fish in the lake. It migrates from deepwater to shores in spring and back in autumn, and forms local aggregations. Its present state is not known, but there are indications that it is rarer now than before.

Phoxinus issykkulensis relictus is a relict form from the Upper Chu River. It was described from a single locality. However, there are reports that it was not found in its type-locality later. There is no other data.

Gymnodiptychus dybowskii var. primitive is only known by the original description from the Karakol and Karkara rivers of the Issyk Kul basin. There is no other data. It is commonly identified as Dyptychus dybowskii.

Gymnodiptychus dybowskii lansdelli is the main form of lacustrine osmans. It has two ecological morphs: those that spawn in the lake, so-called winter osman; and those that enter rivers for spawning, so-called summer osman. In the lake it feeds on mollusks over muddy or loamy

bottoms 15-30 m deep. It overwinters in holes 40-90 m deep. It migrates for spawning, and winters and forages in groups. It attains an age of 20 years. It was once the main object of fisheries, but it is now rare. The state of the population needs further study, as well as special protection.

Issyk-kul naked loach (Triplophysa "strauchii" ulacholica) is a small fish, once numerous in the shallows among water vegetation. There is no recent data.

www.feow.org/ecoregions/details/lake_issyk_kul_upper_chu

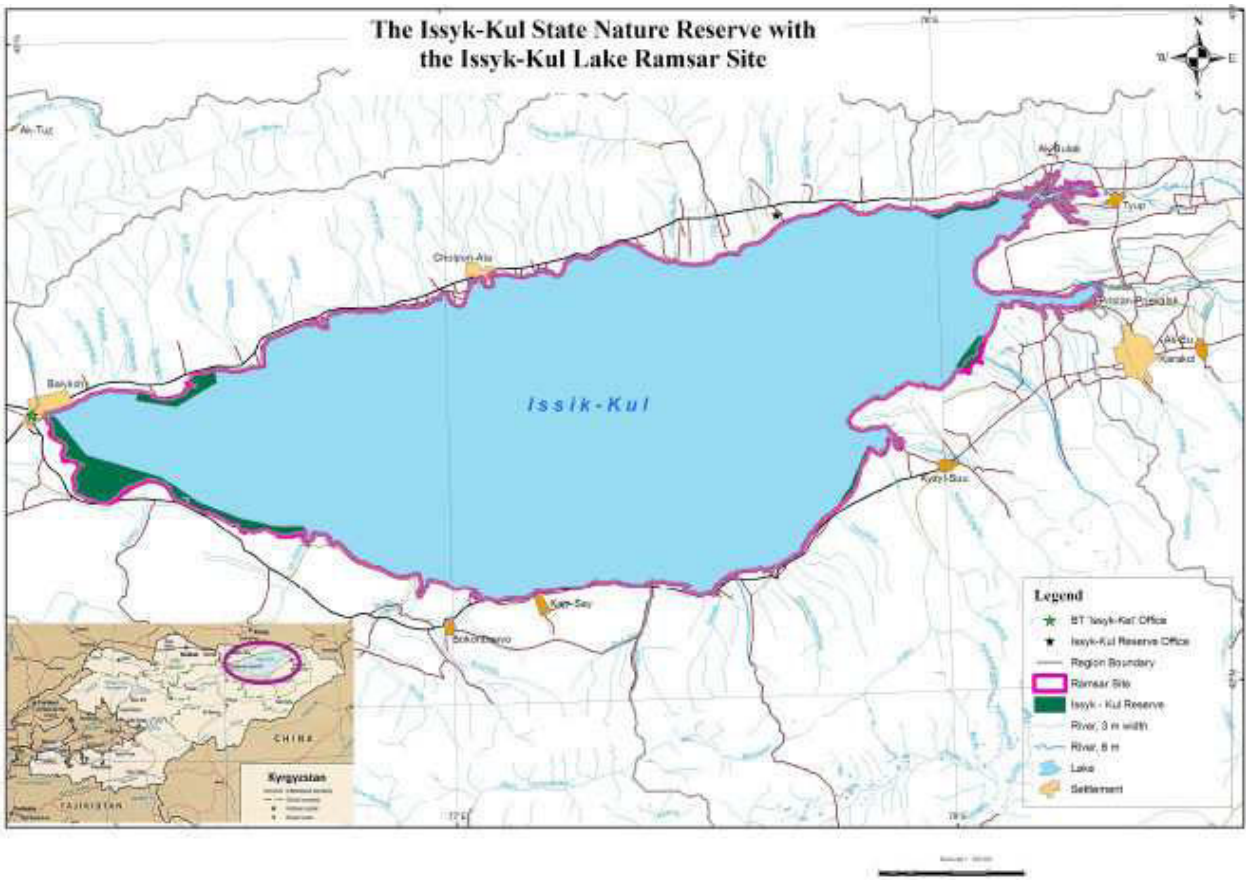
RAMSAR CONVENTION - Issyk-Kul State Reserve with the Lake Issyk-Kul

General overview of the site:

Issyk-Kul Lake is high altitude, deep, light salted, unfrozen lake. The Issyk-Kul Lake is the habitat of native fishes and important wintering area for waterfowl and semi-aquatic birds. There are 60-70 thousand wintering waterfowls in the Ramsar Site. This was one of the main reasons for the inclusion of the Issyk-Kul Lake and Issyk-Kul Reserve in the List of Wetlands of International Importance.

There are 267 bird species, out of 18 species are included in the Red Data Book of the Kyrgyz Republic and 3 are in the IUCN Red List: Ibis bill (Ibidorhyncha struthersii), Bar-headed Goose (Anser indicus), White-headed Duck (Oxyura leucocephala). The Issyk-Kul Lake is the place for wintering birds like Dalmatian Pelican (Pelecanus crispus), Great Flamingo (Phoenicopterus ruber), Whooper Swan (Cygnus cygnus) and White-tailed Eagle (Haliaeetus albicilla). Issyk-Kul Lake is the habitat of 28 fish species, from them 7 - endemics to Issyk-Kul Lake.

They are Gobio gobio lepidolaemus Kessler 1872; Leuciscus bergi Kaschkarov, 1925; Leuciscus schmidti (Herzenstein, 1896); Phoxinus issykkulensis Berg, 1912; Schizothorax issykkuli Turdakov et Lushin, 1954, (Schizothorax pseudoaksaiensis issykkuli Berg, 1907); Diptychus dybowskii lansdelli Gunter, 1889; Triplophysa strauchi ulacholicus Ankin, 1905 Schizothorax issykkuli, Diptychus dybowskii lansdelli are included in the Red Data Book of the Kyrgyz Republic



Ramsar Criteria applies: 1, 2, 3, 4, 5, 6, 7, 9

ramsar.wetlands.org/Database/SearchforRamsarsites/tabid/765/Default.aspx

Birdlife International – Important Bird Area (IBA)
Eastern Issyk Kul lake

Location	Kyrgyzstan, Ysyk-Köl
Central coordinates	78° 10.60' East 42° 46.50' North
IBA criteria	A4i, A4iii
Area	0 ha
Altitude	1,609 m
Year of IBA assessment	2010

Site description Territory includes mudflats along the shores, sea buckthorn thickets growing along the 2 km length of shores, shallow floodplains, estuaries of Tyup, Djergalan, Kara-Kol, Kizil- Suu rivers. The territory is situated in close proximity to Karakol city.

Populations of IBA trigger species

Species	Season	Period	Population estimate	Quality of estimate	IBA Criteria	IUCN Category
Northern Pintail Anas acuta	passage	1976-1986	6,000-12,000 individuals	medium	A4i	Least Concern
Ruddy Shelduck Tadorna ferruginea	unknown	1976-1986	600-6,000 unknown	medium	A4i	Least Concern
Red-crested Pochard Netta rufina	winter	1976-1986	2,000-4,000 individuals	medium	A4i	Least Concern
Common Goldeneye Bucephala clangula	winter	1976-1986	400-1,000 individuals	medium	A4i	Least Concern
Black-necked Grebe Podiceps nigricollis	winter	1976-1986	200-400 individuals	medium	A4i	Least Concern
Demoiselle Crane Anthropoides virgo	passage	1976-1986	2,000-6,000 individuals	medium	A4i	Least Concern
A4iii Species group – water birds	passage	1976-1986	9,000-22,000 individuals	medium	A4iii	
A4iii Species group – water birds	winter	1976-1986	15,000-40,000 individuals	medium	A4iii	

Habitats -

IUCN habitat	Habitat detail	Extent (% of site)
Shrubland	Low bushes; Scrub	18%
Grassland	Humid	55%
Wetlands (inland)	Raised bogs	30%
Coastline	Lagoons; Mudflats & sandflats; Shingle & stony beaches	28%
Artificial - terrestrial	Arable land; Forestry plantations	10%

Land use -

Land-use	Extent (% of site)
agriculture	10%
hunting	20%
nature conservation and research	50%

Other biodiversity Mammals occurring here are fox, ondatra, jackal, badger, weasel, water shrew and voles. Amphibians are Marsh frog and European green toad. Plants are sea buckthorn thickets, plantings of poplar, elm, barberry, sedges and reed.

Protection status Issyk-Kul reserve consists of 12 sites in the IBA territory consists of 7 sites.

Acknowledgements Data-sheet compiled 25-09-2006 by S. V. Kulagin (NABU), received by BirdLife Cambridge May 2008, translated by Tsovinar Hovhannisyan in summer 2010, entered into WBDB by Rory McCann in autumn 2010.

References Ardamin I. (1976) Wintering of Waterfowl in Issyk-Kul. Studies of Issyk-Kul reserve. Frunze “Kyrgyzstan” p. 45-62 Kydyraliev A. (1976) Waterfowl and waterbirds of Issyk-Kul reserve. Studies of Issyk-Kul reserve. Frunze “Kyrgyzstan” p. 24-44 Counts of waterfowl. Chronicle “Nature of Issyk-Kul reserve” 1987 Yanushevich A. I. and others (1959) Birds of Kyrgyzstan Vol. 1

BirdLife International (2014) Important Bird Areas factsheet: Eastern Issyk Kul Lake. Downloaded from http://www.birdlife.org on 14/01/2014

Birdlife International – Important Bird Area (IBA) Western Issyk Kul lake

Location	Kyrgyzstan, Ysyk-Köl
Central coordinates	76° 15.30' East 42° 26.90' North
IBA criteria	A1, A4i, A4iii
Area	2,700 ha
Altitude	1,609 m
Year of IBA assessment	2010

Site description The territory includes dry steppes and semi-deserts, part of Issyk-Kul lake, foothill- adyr areas. Vertical differentiations of relief, heterogeneity of soil conditions make vary landscapes of dry-steppes and stony-deserts. Territory is close to Balykchy city.

Populations of IBA trigger species

Species	Season	Period	Population estimate	Quality of estimate	IBA Criteria	IUCN Category
Whooper Swan Cygnus cygnus	winter	-	200-500 individuals	medium	A4i	Least Concern
Red-crested Pochard Netta rufina	winter	-	2,000-6,000 individuals	medium	A4i	Least Concern
Black-necked Grebe Podiceps nigricollis	winter	-	400-8,000 individuals	medium	A4i	Least Concern
Saker Falcon Falco cherrug	breeding	-	2-6 breeding pairs	unknown	A1	Endangered
A4iii Species group – water birds	winter	-	25,000-80,000 individuals	medium	A4iii	

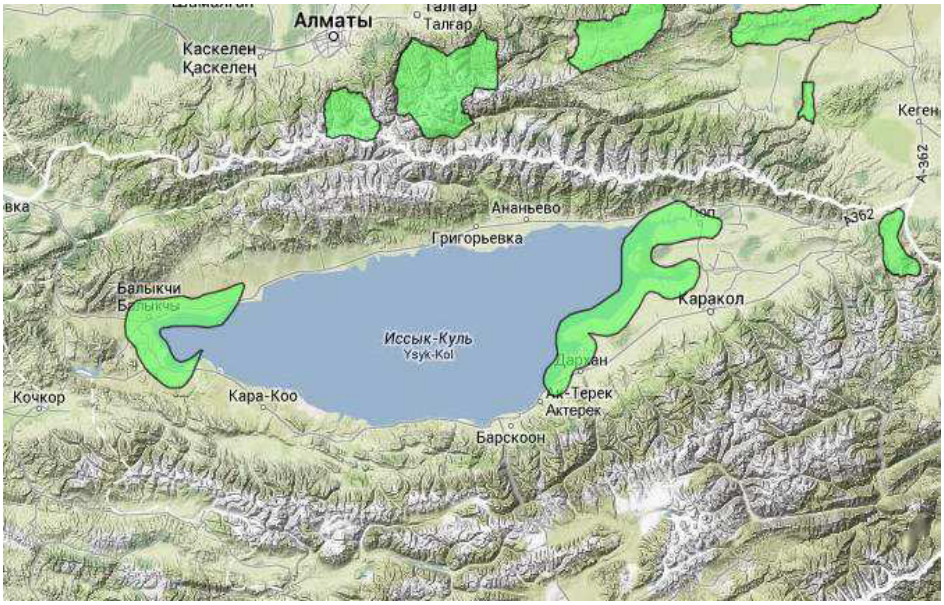
Habitats -

IUCN habitat	Habitat detail	Extent (% of site)
Shrubland	Low bushes	24%
Desert	Desert & semi-desert - stony	6%
Wetlands (inland)	Water-fringe vegetation	10%
Coastline	Lagoons; Mudflats & sandflats	53%

Artificial - terrestrial	Forestry plantations	5%

Land use -

Land-use	Extent (% of site)
hunting	20%
nature conservation and research	50%



Other biodiversity Mammals dominating in steppes areas are: European suslik, jerboa, vole, Tolai hare, as well as Long-eared hedgehog, predators'- wolf, fox, manul and weasel. Reptiles are presented with 2 species: Steppe runner and Multi-Ocellated Racerunner. Plants are ephedra, nitaria, Pine, Thermopsis genus and sea buckthorn. Lake Issyk-Kul hosts 28 species of fish and 8 of them are endemics such as Naked Osman, Balkhash Marinka and others

Protection status Territory of Issyk-Kul reserve consists of 12 small sites surrounding the lake

Acknowledgements Data-sheet compiled 24-09-2006 by S. V. Kulagin (NABU), received by BirdLife Cambridge May 2008, translated by Tsovinar Hovhannisyan in summer 2010, entered into WBDB by Rory McCann in autumn 2010.

References Ardamin I. (1976) Wintering waterfowl in Issyk-Kul. Studies of Issyk-Kul reserve. Frunze "Kyrgyzstan" p. 45-62 Kidiraliev A. (1976) Waterfowl and water birds of Issyk-Kul reserve. Studies of Issyk-Kul reserve. Frunze "Kyrgyzstan" p. 24-44 Counts of waterfowl. Chronicle "Nature of Issyk-Kul reserve" 1987 Yanushevich A. I. and others (1959) Birds of Kyrgyzstan, vol. 1

Map - http://www.birdlife.org/datazone/geomap.php?r=i&bbox=-150%20-50%20150%2080

BirdLife International (2013) Important Bird Areas factsheet: Western Issyk Kul Lake. Downloaded from http://www.birdlife.org on 21/12/2013