Final report of the project “Conservation of Rare Plants of Lake Baikal, Russia: Monitoring of Plants and Education of Local Community”

Project Leader: Denis Sandanov (NGO “EcoLeague”)

Introduction

The project is take place on the eastern shore of Lake Baikal. Lake Baikal is a UNESCO World Heritage Site. The Russian Federal Government has recently designated this region as a Special Economic Zone (SEZ) with the hopes of encouraging the tourism development.

Our project is focused on conservation of rare endemic plants of Lake Baikal. The main idea of the project will be accomplished through the monitoring of populations of rare plants, the study of the ecological and biological characteristics of these species, and the ecological education of the local community and of tourists.

We started our project at 15th of May 2008 and finished the field work at 10th of September 2009. Our studies covered two vegetation seasons.

During that time we worked on the following specific objectives:
1. Find and describe the main habitats of rare and endemic plants.
2. Study the biology of these plants and evaluate the factors which limit the number and distribution of their populations.
3. Observation of the seasonal growth of these plants and their life cycles.
4. Preparing and printing a number of pamphlets about these rare plants
5. Organize meetings with the local administration and the local community about nature conservation.
6. Conduct a sociological survey of the local community about economic development in the area and the designation of special zones of nature protection, recreation, and economic development.
7. Construct an interpretive nature trail with specific conservation signs.

Materials and Methods

We studied eco-biological peculiarities of rare plants: life cycles, vegetation periods, age structure of populations, quantity of individuals, seed productivity of plants, etc. On the base of such data we found the ways of conservation of rare plants.

Each vegetation season we organized monitoring of populations of rare plants. We counted quantity of individuals and analyzed the age structure populations.

On the experimental plots with rare plant’s population we studied soil characteristics and analyzed anthropogenic impact on the soils. Such technique is described on the Table 1.

Sociological survey was conducted according to random categorical sampling, based on age and gender. We did survey and interviews in three villages (Turka, Goryachinsk, Gremyachinsk), which are big settlements and will be the main points of SEZ development. Also these places are very popular among tourists. We prepared a questionnaires with 17 questions and asked 80 respondents.

Also we organized the sociological survey of tourists who spending week-end and vacation at eastern shore of Lake Baikal. This part of our project is began at July and finished at the end of September, 2008. Such period has the biggest number of tourists on the Lake Baikal because the climate is the most comfortable at that time.

We had a lot of meetings with local authorities. During these talks we received interesting information about development of SEZ and ideas how it can be improve.

We organized lectures and seminars for local school kids and teachers. In August 2009 we organized a concert and the party for local people with volunteers from Tahoe-Baikal Institute.
Table 1
Experimental evaluation of changes of soil characteristics under anthropogenic impact

<table>
<thead>
<tr>
<th>Indices</th>
<th>Degree of transformation</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vegetation Cover</strong></td>
<td></td>
<td>50-70% (base conditions for undisturbed are)</td>
<td>50%</td>
<td>80-90% (increasing as a result of sod soil and bunch grasses)</td>
<td>40% (irregular, high mosaic cover)</td>
<td>Bigger than 10% (small patches of vegetation)</td>
</tr>
<tr>
<td><strong>Floral Composition</strong></td>
<td></td>
<td>No changes from conditions at control site</td>
<td>Change of 5-10%, reduction of less resilient species</td>
<td>Change of 10-20%</td>
<td>Change of 50%, a lot of annual (therophyte) and bunch grasses</td>
<td>Completely changed, small number of species</td>
</tr>
<tr>
<td><strong>Thickness and Distribution of the Sod</strong></td>
<td></td>
<td>No changes from conditions at control site</td>
<td>Increasing of compactness of sod but decreasing of its thickness on 1-2 cm</td>
<td>Increasing of compactness of sod but decreasing of its thickness more than 2-3 cm</td>
<td>Small patches of sod, thickness is from 0 to 2-3 cm</td>
<td>Sod is not exist</td>
</tr>
<tr>
<td><strong>Disturbance of Topsoil</strong></td>
<td></td>
<td>No changes from conditions at control site</td>
<td>2 % of territory is disturbed</td>
<td>2-5 % of territory is disturbed</td>
<td>15-60% of territory is disturbed</td>
<td>More than 60% of territory is disturbed</td>
</tr>
<tr>
<td><strong>Soil Compactness</strong></td>
<td></td>
<td>No changes from conditions at control site</td>
<td>До 30 % (compacted the highest soil layer)</td>
<td>30-32% (compacted the highest soil layer)</td>
<td>Более чем 32 % (compacted the highest soil layer)</td>
<td>Critical soil compactness (very compacted the highest soil layer)</td>
</tr>
<tr>
<td><strong>Erosion</strong></td>
<td></td>
<td>No changes from conditions at control site</td>
<td>Small holes with erosion marks</td>
<td>Number of holes with erosion marks</td>
<td>Big holes and ditches, developing of ravine’ forming processes</td>
<td>System of ravines</td>
</tr>
<tr>
<td><strong>Humus Content</strong></td>
<td></td>
<td>No changes from conditions at control site</td>
<td>Reduction by 1-2%</td>
<td>Reduction by 2-3%</td>
<td>Reduction by 3-7%</td>
<td>Humus very sparse or absent</td>
</tr>
</tbody>
</table>
Results and Discussion

Before starting of our project we analyzed many materials about the main ideas of creation of SEZ. These results are briefly presented below.

One of the directions of re-structuring of the Russian economy is the increase of the modernized branches in its structure. Among similar branches is tourism which is considered more favorable for sustainable development of the country, rather than the enterprises of extracting branches. For the development of tourism creation of special economic zones which are called to involve additional investments is supposed. Russia does not belong to the number of countries with the developed infrastructure, social, economic resources for development of tourism. In such way, during the selection of the places for tourism development the main accent was made on their natural recreational resources. Therefore it is not casual, that practically all the zones have been created on the territory of the World natural heritage sites (Table 2). Certainly, the decision is much depended on quickness of state bodies which made an application, but even more depended on the uniqueness of natural objects. In our opinion, there is a high probability that creation of SEZ will be assigned to those regions which possess other World natural heritage sites. As a whole, by today this process is not insufficiently investigated from the scientific point of view – ways of interaction of market economy and preservation of sites of the World heritage are not known yet.

<table>
<thead>
<tr>
<th>No.</th>
<th>The name of a site</th>
<th>The name of the subject of the Russian Federation on which the site is located</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Virgin woods of Komi</td>
<td>Republic Komi</td>
</tr>
<tr>
<td>2</td>
<td>Volcanos of Kamchatka</td>
<td>Kamchatka territory</td>
</tr>
<tr>
<td>3</td>
<td>Gold mountains of Altai</td>
<td>Republic of Altai</td>
</tr>
<tr>
<td>4</td>
<td>Lake Baikal</td>
<td>Irkutskaya oblast, Republic of Buratya</td>
</tr>
<tr>
<td>5</td>
<td>Western Caucasus</td>
<td>Krasnodar territory, Republic of Adygea, Republic of Karachaevo-Circassia</td>
</tr>
<tr>
<td>6</td>
<td>Kurshkaya Sand-bar</td>
<td>Kaliningradskaya oblast</td>
</tr>
<tr>
<td>7</td>
<td>Central Sikhote Alin</td>
<td>Primorye Territory</td>
</tr>
<tr>
<td>8</td>
<td>Ubsu Nur Hollow</td>
<td>Republic of Tuva</td>
</tr>
</tbody>
</table>

In total on the territory of Russia 7 special economic zones for tourism and recreation were created (Fig. 1):

1. «Kurshkaya Sand-bar» on the territory of Zelenogradsky district of the Kaliningradskaya oblast
2. «New Anapa» on the territory of Anapsky district of the of Krasnodar Territory
3. «Grandee of Spa Utsa» on the territory of Predgorny district of Stavropol Territory
4. «Turquoise Katun» on the territory of Altaysky district of Altay Territory
5. «The Altay valley» on the territory of Maiminsky district and Chemalsky district of Republic Altai
6. «The Gate of Baikal» on the territory of Irkutsk district of Irkutskay oblast
7. «The Baikal Harbour» on the territory of area Pribaikal’sky district of Republic Buryatia.
Special economic zones for tourism and recreation on the territory of the Russia

The total area of six zones (without SEZ «The Baikal Harbour») is 153, 43 sq km. Our special zone is the most eastern and the biggest in territory - almost 5 times more, than the area of all other zones (Table 3).

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of SEZ</th>
<th>Area, sq km</th>
<th>Prospective number of tourists (thousands person in a year)</th>
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<tr>
<td>1</td>
<td>«Kurshkaya sand-bar»</td>
<td>66,21</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>«New Anapa»</td>
<td>7,8</td>
<td>360</td>
</tr>
<tr>
<td>3</td>
<td>«Grandee Spa Utsa»</td>
<td>8,43</td>
<td>160</td>
</tr>
<tr>
<td>4</td>
<td>«Turquoise Katun»</td>
<td>33,26</td>
<td>115</td>
</tr>
<tr>
<td>5</td>
<td>«The Altay valley»</td>
<td>8,55</td>
<td>94</td>
</tr>
<tr>
<td>6</td>
<td>«The Gate of Baikal»</td>
<td>29,18</td>
<td>1000</td>
</tr>
<tr>
<td>7</td>
<td>«The Baikal harbour»</td>
<td>700</td>
<td>1060</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>853,43</td>
<td>2849</td>
</tr>
</tbody>
</table>

Some experts have a skeptic attitude towards the prospects of creation SEZ. However, the creation of zones will affect on environment: construction of roads, hotels and other touristic infrastructure on the territory of SEZ.

Interests of the local population and nature conservation cannot always be taken into consideration at such big scale. The total amount of investments into objects of a tourist
The creation of SEZ «The Baikal Harbour» will go in several steps. The first point of SEZ development will be at the area, which is called “Peski” near the Turka and Goryachinsk villages. So, our team decided to focus the main part of work at this area. There are three species of rare plants grow on this territory. Results of our studies presented below.

Spotted Lady’s Slipper (*Cypripedium guttatum* Sw.) is one of the rare orchids which is included in the Red of Republic of Buryatia (2002) and Red Book of the Russian Federation (1988).

We studied age structure of the species (Fig. 2). It is shown that the studied population is pretty young (age structure factor is 0.135). The number of pregenerative individuals and density of population is very is very high. There were observed 50 individuals per square meter. We identified a lot of young plants and it is a result of biology of this species. *C. guttatum* is short-rhizome plant and vegetative way of distribution. The seeds are small and need to have symbiosis with a special fungi to further germination.

However, the territory occupied by plants is quite small and located near the main road. Reconstruction of main road is the major threat to population of this plant.

*On the X-coordinate age states (j – juvenile, im – immature, v – virginile, g1 – generative young, g2 – generative middle)
Analyzing of human influence on the plot showed the big changes of vegetation cover and soil characteristics, but whole ecosystem is stable (Fig. 3). Without any human influence soils on the plots can be recovered.

Human influence on the experimental plot with *Cypripedium guttatum* (near village Goryachinsk)

![Figure 3](image)

*Figure 3*

*Astragalus sericeocanus* Gontsch. is endemic plant of Lake Baikal. Its included in the Red of Republic of Buryatia (2002) and Red Book of the Russian Federation (1988). There are known only few localities of this species. One of places is located near Turka village. This legume plant grow only on the sandy dunes and dispersed by the seeds. It is known that legume seeds has high dormancy and long time of germination. Such biological peculiarity of this species and habitat lead to decreasing of its population. It is a result of many tourists who have rest on the beach zone of Lake Baikal.

We did studies on two different plots: first plot was followed near the main road, second one was followed far away from the main road. The results are shown on the Fig. 4.
Age status of population of *Astragalus sericeocanus* (results from the first plot is above)*

* On the X-coordinate age states (im – immature, v – virginile, $g_1$ – generative young, $g_2$ – generative middle, $g_3$ – generative old, ss – subsenile)

The density of population on the first plot is 0.0086 individuals per square meter. Age structure factor is 0.556, percent of seed’s forming is 25%. On the second plot we can see other situation: density of population is 0.086 individuals per square meter, age structure factor is 0.339, percent of seed’s forming = 63%. On the second plot (without human influence) are presented different age groups, population is younger and generative individuals produce more seeds.

*Craniospermum subvillosum* Lehm. is an endemic plant of Lake Baikal. Its included in the Red of Republic of Buryatia (2002) and Red Book of the Russian Federation (1988). This plant is early blooming and grow on the sandy beaches of both sides of Lake Baikal. During our field studies we found a new locality of this species on the beach at Talanki Bay, which not far from village Gremyachinsk. This plant is dispersed by seeds and survival of individuals is depends on the level of trampling down.
We observed one population of this species near Turka village where are a lot of tourists during summer time. Results are presented on the Fig. 5.

Figure 5

Age status of population of *Craniospermum subvillosum*

* On the X-coordinate age states (im – immature, v – virginile, g₁ – generative young, g₂ – generative middle, g₃ – generative old, s – senile)

Density of population is very small (0.01725 individuals per square meter). Age structure factor = 0.427. Population structure is stable, but it can be damaged according to increasing of number of tourists. We have an example that on the Olkhon island (west part of Lake Baikal) a big population of this species was eliminated after becoming of Olkhon the zone for recreation.

We found the new locality of this rare plant on our study area near Talanki Bay of Lake Baikal. This population is quite big and conditions for plant’s growing are very good. We want to continue our study at this site. This place has long stripe of beaches, but it is difficult to drive here on the car. Its one of the main reasons of prosperity of this population.

Studies of human influence near Turka village show such results (Fig. 6). On the experimental plots we saw big changes of whole ecosystem, especially erosion processes. Sandy dunes are ecologically sensitive areas and it is necessary to protect all habitats of rare plants.

Figure 6

Human influence on the experimental plot with *Astragalus sericeocanus* and *Craniospermum subvillosum* (near village Turka)
Results of our study conclude with:
1. There is high human impact on populations of rare endemic plants, especially on sandy dunes. It is necessary to monitor and control these populations.
2. Local people and tourists don’t know about rare plants on the territory of SEZ and it is urgent to share information about rare and endemic species.
3. Sandy dunes soils very sensitive to human activity and it is necessary to protect them.

**Sociological survey**

The goal of this survey was to determine the attitudes toward tourism and development of an SEZ in the Pribaikalsky area. Objectives for the project include:
- determine the attitude of local residents to tourism development in their villages;
- create a map of local values within the territory studied;
- deduce what local residents expect from authorities and their involvement in resolving problems associated with the SEZ.

Results of survey are presented on the next figures.
Sociological survey helps us to figure out the positive and negative influences of SEZ (see next figures).
Analysis of sociological data helped us to make such recommendations for future development of SEZ:

- Garbage disposal infrastructure and establish legal dumps
- Round-table discussions or meetings with local people to voice opinions
- Network with local authorities
- Training then fixed percent
- Offer government grants or loans for new business endeavors and local projects (ex: park)
- Support local infrastructure (bring in professionals, support schools and hospitals)
- Provide protection for cultural/natural areas of interest
- Different taxes/fees for tourists and locals
- Restrict outsiders’ purchase of land

Finally, we come to such conclusions:

- Local people do not know what to expect from the SEZ because plans are constantly changing.
- In future decisions regarding development of SEZs, all interested parties need to be considered and involved.

According sociological data and interviews with local elders, teachers, and nature-lovers we created the map of local values (see in attached file).
It is well known that the tourism on the Lake Baikal mostly non-organized. Therefore the impact on nature from non-organized tourists is quite strong. Our sociological group worked with such group of people and find out the main peculiarities of non-organized tourism at Lake Baikal:

1. Living in the tents;
2. Preparing food by oneself;
3. The lack of service and organized places for camping;
4. Main recreation activities is fishing and swimming
5. About 68% of non-organized tourists are from Republic of Buryatia. Other 32% of people came from different parts of Russia.
6. Mostly non organized tourists come to places of rest by their own car.

Our study showed the lack of ecological education among tourists. During survey we distributed information about our project.
Public outreach

At September 22-24, 2008 our NGO organized workshop “Experience and Problems of Cooperation between Governmental Agencies and Public Organizations in the Sphere of Rational Natural Resource Use”

The project was aimed at future collaboration in programs of rational use of natural resources. One of the objectives of this seminar was to help specialists from governmental agencies and members of public organizations in the development of plans for yearly events:

- Guarantee of public support of the government structure, specifically in the sphere of conservation;
- Development of educational projects in the Baikal watershed;
- Involvement of public-interest organizations in local programs supporting rational use of natural resources.

This workshop explored the working mechanisms of successful models of collaborative projects organized by government agencies and public organizations.

The goal of the workshop was to promote the acquisition of experience and knowledge among the local community, so that they can provide assistance to scientists and to the members of public organizations in the development of their plans and designs.

During workshop specialists from governmental agencies and local NGO’s made lectures and training techniques of involving the public and support of social activeness (interpretation, working with volunteers, fundraising).

Some ecological events as celebration of Baikal Day at 31st of August, 2008 was very successful because of the entertaining-educational component, which ensures the participation of members of the public of all ages and involves public organizations in local projects.

At December 19, 2008 our NGO organized practical seminar “Ecological methods and techniques for studying of rare species” for teachers of Biology, Ecology, and History of Pribaikalskii district of Buryatia (the area were our project is going on). The main goal of this seminar was to involve the teachers and students of local schools to ecological projects which are promoting on the territory of their district. This seminar was also supported by Department of Education and local administration of Pribaikalskii district of Buryatia. Lectures, discussion, and talks about conservation of rare and endangered plant species have received very positive feedback from teachers. Some lectures covered interesting topics about global conservation of whole unique ecosystem of Lake Baikal.
All participants of the seminar

After this seminar the Ministry of Education and Science of Republic of Buryatia offered to our NGO to organize a number of similar seminars during school teachers of Buryatia.

During January till end of March four ecological seminars were organized. The last seminar was at 27th of March, 2009 in Ulan-Ude and for this seminar teachers from 17 schools were involved.

Other workshop will organized by our team members in Eravninsky district of Buryatia at May 28-31, 2009. The teachers of Biology from 32 schools of Buryatia participated at this event. The workshop was organized in ecological camp “Indola” (Sosnovoozerskii district of Buryatia). During workshop we combine lectures with hands-on training (field trips, biological excursions).
Work at the lab

Lecture about rare plants
We published a special booklet about conservation of rare and endemic plants of Lake Baikal and distributed it in the local schools, local administration, local community, and tourists (Fig. 7).

Figure 7. Booklet devoted to our project
The main ideas of our study which were presented in this booklet we published in the journal “The world of Baikal” (this paper is presented in attached file). After this publication the administration of the SEZ interested in our project and asked us for recommendations how to preserve rare plants at this area.

The project leader Denis Sandanov prepared and published the learner's guide for school-teachers about methods of studying rare plants and their communities.

Results of our study also were presented at 2009 Annual Meeting of Society for Conservation Biology in Beijing.

Members of our team organized the competition of kid’s drawings. Later with school-kids of Kika village we prepare specific conservation signs which were installed on the interpretive nature trail in August 2009. This trail was built by our partners NGO Great Baikal Trail in 2008. Our team members worked as volunteers at this project.

Beginning of the trail
We also started work with ecological education of kids in the schools of Ulan-Ude. We usually organize competitions, environmental games, and ecological lectures.
The Web-site of our NGO (www.eco-liga.ru) was launched and now is contain full information about our project. It is prepared on Russian, but we are planning to develop our Web-site and further present also information on English.

In August 2009 our NGO with volunteers from Tahoe-Baikal Institute organized the concert and the party for local people. During this concert we had a lot of performances about nature conservation. This concert had many spectators from local settlements Goryanchinsk and Turka. After concert we received many positive feedbacks from local people.

All money which was raised during this event goes to support summer ecological camp for schoolkids. They are planning to set up trash containers on the beach of Lake Baikal.
At 20th of September 2009 our NGO initiated big round-table discussion between all ecological NGO’s of Lake Baikal area. The main idea of this discussion is to analyze the main challenges that each NGO have during their work and elaborated the general strategy for all NGO’s. This event brought together 16 ecological NGO’s of Baikal area with 35 their representatives. We have international guests at this discussion. Robert Birkby and Jennie Douglas (Seattle, USA) also participated at this event. This discussion was a good opportunity to sum up activities of ecological NGO’s and found the way of further collaboration. As a result, it was concluded that it is necessary to organize the coordination between all NGO for exchange of information and further joint work. Also we decided to publish the special edition of journal “The world of Baikal” where will be summarized all information about NGO’s of Baikal area.
Our team member Eduard Batotsyrenov opening the round-table discussion

Presentation of the projects of other NGO’s

In conclusion

The decision of Russian Federal Government about creation of special economic zones was declared at 3rd of February 2007. Since that time our NGO started work at the area of SEZ “Baikal Harbour”. We collected information about development at this area and start preliminary studies of rare plants populations. CLP Award gave the huge impact in our efforts. First of all, we analyzed the current condition of populations of rare endemic plants at the eastern shore of Lake Baikal where the SEZ will be created. Our results showed that condition of populations is stable at current level of human activity and can decrease during further development. We organized the constant monitoring on the experimental plots. Secondly, we raised public awareness about conservation of rare plants on the territory of SEZ. Sociological survey helped us to understand the main problems and expectations of local people. So, now different groups of local community quite familiar with the main ideas of our project. We made a good contact with local administration and NGO’s and we have plans for future collaboration. Thirdly, regional department of Russian Agency of SEZ interested in our results and recommendations. We had a
big discussion: “How we can preserve rare endemic plants on the territory of SEZ?”, because the decision about SEZ creation is already made and work of the development of the zone is started. As a result, we corrected the main scheme of development of the area “Peski” (first step of SEZ development). The area which is rounded by green circle is the place where rare plants grow. This territory is quite far from the main objects of SEZ, like hotels, SPA resorts, etc. and also buffered by the forest south-western part. We made the agreement with regional department of Russian Agency of SEZ that our NGO and volunteers will organize constant monitoring of rare plants at this place. The idea of creation of small botanical garden of rare plants arised during the workshop which was organized by CLP in Beijing before 2009 Annual Meeting of SCB. Hopefully, these ideas come true!

At the end of report it is need to mention that we have a new challenge now. At 5<sup>th</sup> of October 2009 President of Russian Federation Dmitry Medvedev abolished the Russian Agency of SEZ. All functions of this Agency now goes to Ministry of Economic Development of Russia. It’s really sad because we just made a good contacts with local authorities and now nobody doesn’t know what’s going on with SEZ development?! Some positive thing is that development of all special economic zones is stoped now. So, we also have time to improve our conservation work.
Acknowledgements

This study was supported by Conservation Leadership Program (CLP). Idea Wild provided important equipment for our research. Many thanks to our partner Tahoe-Baikal Institute for support of our field work. We are thankful for Moscow Department of Global Ecological Fund for their help and funding of the round-table discussion. We also want to express sincere gratitude for all volunteers who help us during the project implementation. It is necessary to mention that all CLP staff gave us useful advises and were open to different discussions about our project.

Budget

<table>
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<th>Budget (USD)</th>
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</tbody>
</table>

Note 1: We received 253,777 rubles, or 9000 $ per the exchange rate that the funds were wired from CLP (at 23rd of December, 2008)
Note 2: We exceed expenses for workshops because we planned to organize only four workshops, lectures, and seminars at our project. During the project implementation we understand that such kind of outreach can be very successful. As mentioned above our idea was supported by Ministry of Education and Science of Republic of Buryatia.
Note 3: We are planning to use the residue (106.39$) for dissemination of our project results.
Note 4: The column “Other funds” contains information about all expenses which were covered from other funds (support from Tahoe-Baikal Institute, the grant of Siberian Branch of Russian Academy of Sciences, and the grant from Global Ecological Fund).
Note 5: Receipts and bank wire details for all expenses can be provided upon request.