# FIELD REPORT

**Marketing title:**
Mountain Waters of the Czech Republic

**PI Names:**
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**Country:**
Czech Republic

**Research site / region:**
Jizera Mountains

**Date field report completed:**
15th November 2010

**Period covered:**
1 Nov 2009 to 31 Oct 2010

**Report completed by:**
Josef Krecek

Dear Volunteers,

Many thanks for joining our research expeditions in 2010. I very much appreciate your help in the Jizera Mountains where we worked to gather data on water, soil and vegetation relating to the long-term watershed restoration programme. The main aim of the project is to identify the optimum strategy to manage watershed-lake interactions in headwater regions that are affected by the acid atmospheric deposition. With your support, we were able to complete our twentieth year of field research sponsored by the Earthwatch Institute.

The main outcomes from our investigations are: The acid atmospheric deposition in the ecosystems of the Jizera Mountains has been decreasing, followed by changes in biota with a delay of 2 to10 years. In water reservoirs, there are developed stable populations of brook char, brown trout and minnow. However, with the recent progress in the forest re-growth, and slightly increasing deposition of nitrogen, a new peak of acidity (and its consequences) might still occur in the near future.

We very much enjoyed the time spent together in the Jizera Mountains and our discussions about both the environment, and Czech history and culture.

Yours faithfully,

Josef Krecek
Lead Earthwatch Scientist

**SECTION ONE**

**Top highlight from the past field season**

In 2010, analyses of the LANDSAT imagery of the region showing the amount of green vegetation present were compared with the leaf area observed in the investigated catchments. The leaf area index (LAI) measured by the field survey, and the normalized difference vegetation index (NDVI) estimated from the aerial images from the LANDSAT satellite project, were compared and calibrated. Then, the maps of NDVI and LAI characteristics of the Jizera Mountains Region were constructed in the time horizon 1986 - 2010, and the progress in the watershed restoration evaluated.

Installing meteorological station 2 (photo: Josef Krecek, 2010)

**Non-technical overview of results**

In 2010 the field expeditions collected hundreds of samples of water, soil and vegetation in headwater basins of the Jizera Mountains.
These data contributed to the evaluation of the long-term progress in watershed restoration: forest re-growth, increase in deciduous tree species, catchment stabilization, and increasing biota in surface waters.
In distant areas of experimental catchments, the Earthwatch teams installed two additional automatic meteorological stations. Data registered there were found to be very useful, particularly to evaluate characteristics of the catastrophic flood in the Jizera Mountains which took place in August 2010. The teams also undertook the annual maintenance of gauging stations at experimental catchments.

Sampling rain water (photo: Josef Krecek, 2010)

Measuring soil pH and moisture (photo: Josef Krecek, 2010)

**SECTION TWO: TECHNICAL REPORT**

## 1. REPORTING AGAINST RESEARCH OBJECTIVES

### Objective 1:

Long-term monitoring of the climate, water cycle, atmospheric deposition, and water quality in selected headwater stream profiles and reservoirs

### Progress toward/against Objective 1:

In 2010, the acid atmospheric deposition in the open field shows the stagnation of the last years. However, the load of nitrogen is slightly increasing: the ration of N/S was 1.35. In surface waters, the population of brook char (*Salvelinus fontinalis)* was found still dominant, but at the same time the populations of brown trout (*Salmo trutta m. fario*) and minnow (*Phoxinus phoxinus*) have increased.

Sampling soil (photo: Josef Krecek, 2010)

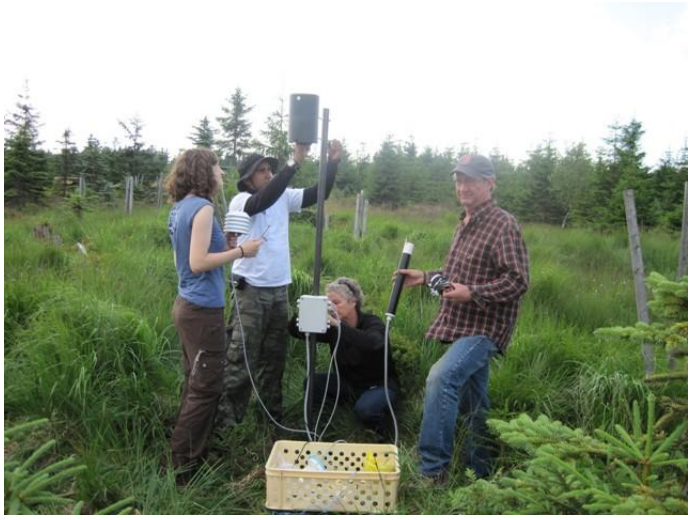
Digging soil profile (photo: Josef Krecek, 2010)

**Objective 2:**

Study effects of forest practices on hydrology and bio-geo-chemistry in experimental basins

**Progress toward/against Objective 2:**

Jizerka and Oldrichov successfully continued the long-term observation in experimental catchments. The field teams helped us to maintain existing gauging stations and in distant areas of experimental catchments, we installed two additional automatic meteorological stations. Data from experimental basins helped us, particularly, to evaluate the effect of soil-vegetation complex on the catastrophic flood observed in August 2010.



Installing meteorological station 1 (photo: Josef Krecek, 2010)

**Objective 3:**

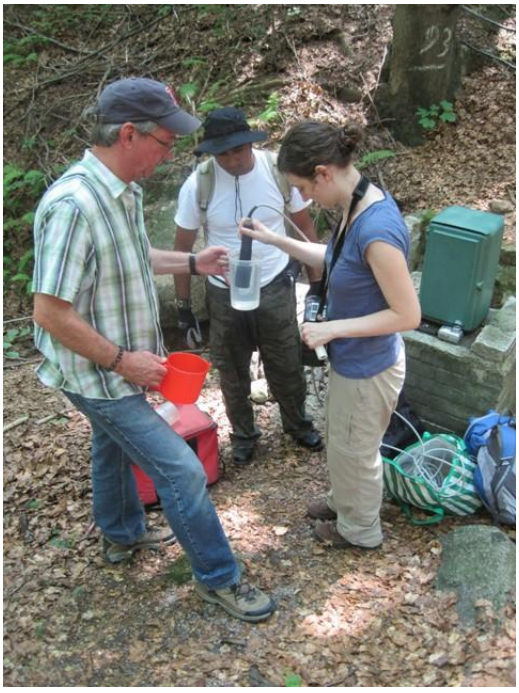
The study of temporary (episodic) acidification in streams and reservoirs of Bedrichov, Sous and Josefuv Dul

**Progress toward/against Objective 3:**

In 2010, in the base-flow periods, pH in streams reached values of 6.2 - 6.8, while during the snow-melt episodes in April, and, namely, during the extreme rain-storm in August, pH of stream waters decreased to the pH level in precipitation (4.4 - 4.8).

Increasing concentrations of toxic aluminium corresponded to the drop in pH, however, they did not exceed the critical value of 300 ug/l.

Sampling zooplankton (photo: Josef Krecek, 2010)



Testing surface water (photo: Josef Krecek, 2010)

**Objective 4:**

Study of liming at the Sous reservoir

**Progress toward/against Objective 4:**

On the 20th April 2010, 75 tons of magnesium limestone powder were applied to the surface of the Sous reservoir: pH in water increased from 4.6 to 7.8, and then decreased to 5.8 in the autumn. A relatively higher density of diatoms found in the summer corresponds to a side effect of liming.

**Objective 5:**

Study of environmental effects of the herbaceous vegetation in acidified mountain watersheds

**Progress toward/against Objective 5:**

In 2010, the leaf area values of vegetation cover observed in the field were compared with data on NDVI (normalized difference vegetation index) analyses from the LANDSAT imagery. The maps of NDVI and LAI characteristics in the Jizera Mountains were constructed in the time horizon 1986 - 2010 to evaluate the progress in the watershed restoration.

Sorting grass samples (photo: Josef Krecek, 2010)

Forest inventory (photo: Josef Krecek, 2010)

## 2. PARTNERSHIPS

The Watershed Authority of the Elbe River (Hradec Kralove, Czech Republic) provided us with boats at the investigated reservoirs Bedrichov, Sous and Josefuv Dul and the Office of the Authority of the Protected Landscape Area (Liberec, Czech Republic) provided us with their kind permission to work in natural reserves of the Jizera Mountains, and also to drive the forbidden road system there.

## 3. CONTRIBUTIONS TO CONVENTIONS, AGENDAS, POLICIES, MANAGEMENT PLANS

### International

Agenda of the European Environment Agency:

- Europe's Ecological Backbone: Recognizing the True Value of our Mountains (EEA Report No 6, Copenhagen).
- The adoption of the agenda on the management of mountain watersheds in Europe (27th Session of the EFC/FAO Working Party on the Management of Mountain Watersheds, FAO, Rome, Italy).

### National or regional

Outcomes are used by the Watershed Authority of the Elbe River (Ministry of the Environment) for the following:
1) Better understanding the basin-lake relationship in headwater areas.
2) Mapping the regional water budget in the Jizera Mountains.
3) Mapping normalized vegetation index (NDVI) in the Jizera Mountains

### Local

Restoration of the regionally threatened community of brown trout (*Salmo trutta morpha fario*) in the upper plain of the Jizera Mountains, and reintroduction of minnow (*Phoxinus phoxinus*), an endangered species in the Czech Republic.

## 4. DISSEMINATION

### Publications:

Krecek, J., 2010: Impact of the acid atmospheric deposition and commercial forest practices in protected watersheds of the Jizera Mountains (Czech Republic). In: Europe's Ecological Backbone: Recognizing the True Value of our Mountains, EEA Report No 6, European Environment Agency, Copenhagen, ISSN 1725-9177, Box 6.6: 100.

Krecek, J. & Z. Horicka, 2010: Recovery of headwater catchments and lakes affected by the acid atmospheric deposition. In: Beheim, E., Rajwar, G.S., Haigh, M.J. and J. Krecek (eds.) Integrated Watershed Management. Springer, Dordrecht (NL), 200 - 207.

Krecek, J., Novakova, J. & Z. Horicka, 2010: Ellenberg's indicator in water resources control: the Jizera Mountains, Czech Republic. Ecological Engineering, 36: 1112-1117.

Krecek, J. & J. Novakova, 2010: Possibilities and limits of Ellenberg's indicators in water resources recharge. In: Revitalization of the Landscape. Proceedings of the Czech Technical University, Prague (CZ), ISBN: 978-80-01-04531-2, 61-66.

Beheim, E., Rajwar, G.S., Haigh, M.J. and J. Krecek (eds.), 2010: Integrated Watershed Management. Springer, Dordrecht (NL),
ISBN: 978-90-481-3768-8, 273 pp.

Burdova, L., 2010: Fish and benthos of the Cerna Nisa stream and their contamination by metals in the period of recovery from acidification. Diploma thesis, Faculty of Science, Charles University in Prague. 141 pp.

Husek, J., 2010: The effect of selected parameters of stream water on gill morphology of brook charr and the structure of ichthyofauna of the Jizera Mountains. Diploma thesis, Faculty of Science, Charles University in Prague. 89 pp.

Krcmar, V., 2010: Estimates of the water budget in the Jizera Mountains by remote sensing. BSc thesis, Faculty of Civil Engineering, Czech Technical University in Prague, 39 pp.

Lamac, L., 2010: Episodic acidification in a small mountain watershed. BSc thesis, Faculty of Civil Engineering, Czech Technical University in Prague, 34 pp.

Zerak, J., 2010: Estimates of the tree vitality. BSc thesis, Faculty of Forestry, Czech Agricultural University in Prague, 42 pp.

**Visual:**

Maps of NDVI (Normalized Difference Vegetation Index) in the Jizera Mts., 1986, 1992, 2009 and 2010.

Slides from the field expeditions of 2010.

**Digital:**

The database of observed information will be analyzed in detail, to produce planned publications and lectures.

**Meetings and conferences:**

Presentation of the Czech National Paper in the 27th Session of the EFC/FAO Working Party on the Management of Mountain Watersheds, Strbske Pleso (Slovakia), 7 - 10th April 2010 (Josef Krecek).

International Conference on Global Change of the World's Mountains, Centre for Mountain Studies, University of the Highlands and Islands, Perth (UK), 26-30th September 2010 (Josef Krecek).

**Educational resources:**

Czech Technical University (Prague) - J Krecek:
Lessons in the undergraduate courses on Hydrology and Climatology, and Applied Hydrology;
Lessons in the graduate course on Regional Hydrology.
BSc thesis (student Vlastimil Krcmar): Estimates of the water budget in the Jizera Mountains by remote sensing.
BSc thesis (student Lukas Lamac): Episodic acidification in a small mountain watershed.

Charles University (Prague) - Z. Horicka:
Lessons in the undergraduate course on Hydrobiology of water reservoirs.

MSc thesis (student: Lucie Burdova): Fish and benthos of the Cerna Nisa stream and their contamination by metals in the period of recovery from acidification.
MSc thesis (student Jiri Husek): The effect of selected parameters of stream water on gill morphology of brook charr and the structure of ichthyofauna of the Jizera Mountains.

Czech Agricultural University (Prague) - J. Novakova:
Lesson in the undergraduate courses on Applied Botany, and Landscape Ecology.
BSc thesis (student Jan Zerak): Estimates of the tree vitality.
Other (specify):

Graduate (PhD) students Petr Puncochar and Pavel Vesely have continued gathering the data from the Jizera Mountains for preparation of their thesis.

## 5. DEVELOPING ENVIRONMENTAL LEADERS

Educational excursion for students: Problems of the drinking water supply in the Jizera Mountains (32 undergraduate students, Faculty of Civil Engineering, Czech Technical University in Prague, May 2010)

## 6. LONG TERM IMPACT OF PROJECT

### 6.1 Taxa of conservation significance enhanced, restored or maintained

Support of the population of minnow (*Phoxinus phoxinus*) in headwaters of the Jizera Mountains

### 6.2 Habitats enhanced, restored or maintained

Restoration of the regionally threatened community of brown trout (*Salmo trutta morpha fario*) in the upper plain of the Jizera Mountains and reintroduction of minnow (*Phoxinus phoxinus*), endangered species in the Czech Republic.

### 6.3 Ecosystem services enhanced, restored or maintained

Ecosystem services oriented to the multi-resource management of headwater catchments, and to the protection of lowland areas against the flood risk.
Ecosystem services related to the impacts of global climate change.

### 6.4 Cultural heritage enhanced, restored or maintained

Support of traditional forestry practices.

### 6.5 Livelihood assets enhanced, restored or maintained

In the time scale of the "hydrological year", local volunteers were used to help us to collect stream water in 2 gauging stations and 4 rain-gauges.

### 6.6 Any other actions or activities that enhance natural and social capital

Support of mixed forests near the native composition.

Sampling lake water (photo: Josef Krecek, 2010)

Installing fog collector (photo: Josef Krecek, 2010)