BRYOFLORISTICAL DATA FROM AUSTRIAN PART OF SOPRON HILLS (ÖDENBURGER-GEbirge, E-AUSTRIA)

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Abstract: The Austrian part of Sopron Hills was a neglected area from the point of view of bryophyte floristics. In the investigated area 141 bryophytes were found, out of these 21 liverworts and 120 mosses. There were nine species new to Burgenland: Jungermannia gracillima, Pellia neesiana, Campylopus pyriformis, Leucobryum juniperoides, Orthotrichum lyellii, Pohlia elongata, Pohlia proliferata, Pseudephemerum nitidum, Trichodon cylindricus.

Some species were detected from the territory which are otherwise rare in Austria, such as: Fossombronia wondraczekii, Riccardia palmata, Brachythecium mildeanum, Didymodon cordatus, Didymodon vinealis, Fissidens adianthoides, Microbryum davallianum, Plagiothecium elatum, Pleuridium acuminatum, Pleuridium subulatum, Pottia intermedia, Pseudephemerum nitidum.

13 species are listed as threatened in the Red Data List of bryophytes in Lower Austria, and so do 11 species in the overall Austrian Red Data list of bryophytes. No species of the Annex II of the FFH-directive were found.

Keywords: bryophytes, rare species, red-list status, Burgenland

INTRODUCTION

To date no significant bryological research has been carried out at the Austrian part of the Sopron Hills, leaving this territory almost unexplored. The overall Burgenland itself has only a very marginal recent bryological examination. The research of Latzel (1941) involved only the Hungarian parts of the Lower Alps. The work of Maurer (1965) on the moss species of the Burgenland presents field data for the Southern part of the Burgenland. Schlüsslmayr (2001) examined the Leithagebirge in northern Burgenland and Zechmeister (2004, 2005a) studied the bryophyte flora of the
Seewinkel. Another research of Zechmeister (2008) involved the peatmoss habitats of the Burgenland. Within the region of these studies only the work of Zechmeister (2005b) describes the serpentine outcrops in the area. Preliminary results for the Sopron Hills have first been published by Szűcs and Szmorad (2009). No checklist or Red Data List can be found for the Burgenland. The Red Data List of Lower Austria, which was based on abundant latest floristical data, has been published only recently (Zechmeister et al. 2013). Nevertheless, the Sopron Hills are located beyond the boundaries of the Lower Austria region, which makes the relation and direct comparison of the obtained data difficult.

The proposed article intends to fill this gap in knowledge and provides the latest bryofloristical results for the Sopron Hills.

**Study area**

The Sopron Hills are the north-eastern and relatively low height (between 600 and 800 m a.s.l.) subrange of the Alps. To the west they are separated from the adjacent, nearly north-south running Rosalia Hills by a saddle above the village of Sieggraben (Szmorad 2011).

In aspect of geology the western part of the hills towards the Rosalia Hills is covered with miocene sandy, gravel–clay sediments. In the southern part of the hills (between Ritzing and Neckenmarkt, also south of Kalkgruben) there are penetrations of Leitha limestone, and acidic sandstones located between Neckenmarkt and Harka. In the north-western part of the region, large-scale areas are covered with a Badenian clay formation (Szmorad 2011). The most frequent soil types of the territory are brown forest soils. The hydrographic network of the area consists of small streams. The eastern hill front is warmer and dryer, the western, inner area is much cooler and has higher precipitation. The mean annual temperature varies between 8–9 °C, and the annual precipitation usually between 650–900 mm (Király 2004, Szmorad 2011).

From the phytogeographical point of view the Sopron Hills are situated in the border region of the Eastern Alpine (Noricum) and the Pannonian (Pannonicum) floristic regions. In the hills the mesophilous and acidophilous deciduous forests are dominant, but there are large-scale areas of secondary coniferous forest stands (Király 2004, Szmorad 2010).
MATERIALS AND METHODS

The fieldwork has been carried out between 2009 and 2014. The main habitats, such as acidophylous deciduous and mixed forests, planted coniferous forests, wetlands, grasslands, streams, forest roads, lakes, quarries and buildings were investigated based on a subjective site selection. Bryophytes were collected from all available substrates (soil, concrete, tree bark and root, decayed wood, stone and plastic foil).

The nomenclature follows Köckinger et al. (2015). The species names are given, as well as the Red Data List status which was given to these species for Lower Austria by Zechmeister et al. (2013), number of sampling site(s) and the substrate within. Specimens have been deposited in bryophyte collections of the Eszterházy Károly University in Eger (EGR) and in the private herbarium of Harald Zechmeister at University of Vienna. The site details are listed in the appendix.

Figure 1. The sampling sites in the investigated area
RESULTS

List of species
In total 141 species were found, out of these were 120 bryophytes and 21 liverworts.

Hepaticeae

**Blasia pusilla** L. – LC – 79, 80: on soil

**Calypogea fissa** (L.) Raddi – LC – 101: on soil

**Cephalozia bicuspidata** (L.) Dumort. – LC – 98, 101: on soil

**Cephaloziella divaricata** (Sm.) Schiffn. – LC – 7, 38, 62, 66, 63, 90: on soil

**Conocephalum conicum** (L.) Dumort. – LC – 46: on soil

**Fossombronia wondraczekii** (Corda) Lindb. – NT – 79: on soil

**Frullania dilatata** (L.) Dumort. – LC – 13: bark of *Fagus sylvatica*; 86: bark of *Malus sylvestris*

**Jungermannia gracillima** Sm. – LC – 63, 66: on soil

**Lophocolea bidentata** (L.) Dumort. – LC – 75, 67, 84: on soil

**Lophocolea heterophylla** (Schrad.) Dumort. – LC – 14: root of *Alnus glutinosa*; 16: on bark; 15, 78: on decayed wood; 90: on soil; 108: on rooted *Picea abies* trunk

**Lophocolea minor** Nees – LC – 33: on soil

**Metzgeria furcata** (L.) Dumort. – LC – 108: on bark of *Tilia*; 119: on bark of *Fagus sylvatica*

**Nowellia curvifolia** (Dicks.) Mitt. – LC – 108: on rooted *Picea abies* trunk

**Pellia endiviifolia** (Dicks.) Dumort. – LC – 4, 79: on soil

**Pellia neesiana** (Gottsche) Limpr. – LC – 30: on soil

**Plagiochila asplenoides** (L. emend. Taylor) Dumort. – LC – 46, 108: on soil

**Plagiochila porelloides** (Torr. ex Nees) Lindenb. – LC – 70, 84: on soil

**Ptilidium pulcherrimum** (Weber) Vain. – LC – 90: on soil; 91: bark of *Quercus petraea*

**Radula complanata** (L.) Dumort. – LC – 19: bark of *Acer campestre*; 46: bark of *Acer pseudoplatanus* and *Alnus glutinosa*; 78: bark of *Corylus avellana*; 119: bark of *Fagus sylvatica*

**Riccardia palmata** (Hedw.) Carruth. – VU – 108: on rooted *Picea abies* trunk

**Scapania nemorea** (L.) Grolle – LC – 101: on soil
Musci

Abietinella abietina (L. ex Hedw.) M.Fleisch. var. abietina – LC – 87: on soil

Amblystegium riparium (L. ex Hedw.) Schimp. – LC – 16: on bark and root; 77: on piece of wood

Amblystegium serpens (L. ex Hedw.) Schimp. – LC – 19: bark of Acer campestre; 21, 71: on concrete; 74: bark of Alnus glutinosa, bark of Sambucus nigra; 78: bark of Corylus avellana

Anomodon attenuatus (Hedw.) Huebener – LC – 116: on limestone

Anomodon viticulosus (Hedw.) Hook. & Taylor – LC – 116: on limestone

Atrichum undulatum (Hedw.) P.Beauv. – LC – 2, 3, 8, 10, 12, 14, 62, 63, 90: on soil

Barbula convoluta Hedw. – LC – 5: on soil

Barbula unguiculata Hedw. – LC – 44, 77, 89: on soil

Bartramia pomiformis Hedw. – LC – 108: on soil

Brachytheciastrum velutinum (L. ex Hedw.) Ignatov & Huttunen – LC – 1, 14, 16: on decayed wood and soil; 7, 33, 46: on soil; 74: bark of Alnus glutinosa

Brachythecium albicans (Neck. ex Hedw.) Schimp. – LC – 39, 42, 87: on soil

Brachythecium glaerosum (Bruch ex Spruce) Schimp. var. glareosum – LC – 3, 10, 11, 87: on soil

Brachythecium mildeanum (Schimp.) Schimp. – EN – 109: on soil

Brachythecium rivulare Schimp. – LC – 16: on root; 50: stump of Alnus glutinosa; 75, 76, 89: on soil; 78, 106: on decayed wood

Brachythecium rutabulum (L. ex Hedw.) Schimp. – LC – 16: on bark; 78: on decayed trunk, on concrete; 4, 39, 42, 77: on soil; 83: on decayed wood

Brachythecium salebrosum (Hoffm. ex F.Weber & D.Mohr) Schimp. – LC – 7: on soil; 14, 74: bark of Alnus glutinosa, bark of Sambucus nigra

Bryum argenteum Hedw. – LC – 116: on soil

Bryum capillare Hedw. – LC – 104: on soil

Bryum elegans Nees var. elegans – LC – 73: on soil

Bryum moravicum Podp. – LC – 47: bark of Fraxinus sp.; 119: bark of Fagus sylvatica

Bryum rubens Mitt. – LC – 62: on soil
Calliergonella cuspidata (L. ex Hedw.) Loeske – LC – 3, 20, 55, 56, 63, 75: on soil; 71: on plastic foil; 78: on concrete, on decayed wood

Campylopus pyriformis (Schultz) Brid. – VU – 53: on soil

Ceratodon purpureus (Hedw.) Brid. – LC – 2, 6, 7, 10, 11, 13, 39, 42, 48, 60, 62, 87, 90: on soil

Cirriphyllum crassinervium (Taylor) Loeske & M.Fleisch. – LC – 116: on limestone

Cirriphyllum piliferum (Schreb. ex Hedw.) Grout – LC – 18, 39, 42, 48, 63, 77: on soil

Climacium dendroides (Hedw.) F.Weber & D. Mohr – LC – 18: on soil

Cratoneuron filicinum (L. ex Hedw.) Spruce – LC – 37, 50, 56, 77, 78: on soil

Dicranella heteromalla (Hedw.) Schimp. – LC – 2, 7, 10, 12, 13, 62, 63, 68, 79, 90: on soil

Dicranella staphylina H. Whitehouse – LC – 39: on soil

Dicranella varia (Hedw.) Schimp. – LC – 77: on soil

Dicranum montanum Hedw. – LC – 10, 12, 15: on decayed wood; 81: on decayed log; 91: bark of Quercus petraea; 91: on soil

Dicranum polysetum Sw. ex anon. – LC – 62: on soil

Dicranum scoparium Hedw. – LC – 6: on decayed wood; 13, 38, 42, 90, 91: on soil; 82: stump of Alnus glutinosa

Didymodon cordatus Jur. – NT – 111: on soil; 115: surface of calcareous building; 116: on limestone

Didymodon rigidulus Hedw. – LC – 115: surface of calcareous building; 116: on limestone

Didymodon vinealis (Brid.) R.H. Zander – EN – 115: surface of calcareous building

Drepanocladus aduncus (Hedw.) Warnst. – LC – 77: on soil

Encalypta streptocarpa Hedw. – LC – 116: on limestone

Eurhynchiastrum pulchellum (Hedw.) Ignatov & Huttunen var. pulchellum – LC – 70: on soil

Eurhynchium angustirete (Broth.) T.J. Kop. – LC – 14: decayed wood; 39, 42, 63, 67, 68, 73, 84, 91: on soil

Fissidens adiantoides Hedw. – NT – 57: on soil

Fissidens bryoides Hedw. – LC – 73: on soil

Fissidens taxifolius Hedw. subsp. taxifolius – LC – 1: on soil

Funaria hygromertica Hedw. – LC – 62, 120: on soil

Grimmia pulvinata (Timm. ex Hedw.) Sm. – LC – 71: on concrete

Herzogiella seligeri (Brid.) Z. Iwats. – LC – 6, 15: on decayed wood
**Heterocladium heteropterum** (Brid.) Schimp. – LC – 43: on soil

**Homalia trichomanoides** (Hedw.) Brid. – LC – 49: on root

**Homalothecium lutescens** (Hedw.) H.Rob. – LC – 3: on soil

**Homalothecium philippeanum** (Spruce) Schimp. – LC – 47: bark of *Fraxinus* sp.; 116: on limestone

**Homomallium incurvatum** (Schrad. ex Brid.) Loeske – LC – 21: on concrete; 116: on limestone

**Hylocomnium splendens** (Hedw.) Schimp. – LC – 18, 91: on soil

**Hypnum cupressiforme** Hedw. var. *cupressiforme* – LC – 1: on decayed wood and soil; 14: root of *Alnus glutinosa*; 47: bark of *Fraxinus*; 78: bark of *Alnus glutinosa*; 8, 38, 84, 90, 91: on soil; 90: bark of *Malus sylvestris*

**Hypnum cupressiforme** var. *lacunosum* Brid. – LC – 73: on soil

**Hypnum lindbergii** Mitt. – LC – 71: on plastic foil; 78: on decayed wood, 4, 39, 48, 84: on soil

**Isothecium alopecuroides** (Lam. ex Dubois) Isov. – LC – 119: root swelling of *Fagus sylvatica*

**Leskea polycarpa** Ehrh. ex Hedw. – LC – 19: bark of *Acer campestre*

**Leucobryum glaucum** (Hedw.) Ångstr. – LC – 91: on soil

**Leucobryum juniperoides** (Brid.) Müll.Hal. – LC – 90, 91: on soil

**Leucodon sciuroides** (Hedw.) Schwägr. – LC – 86: bark of *Malus sylvestris*

**Microbryum davallianum** (Sm.) R.H.Zander – EN – 44: on soil

**Mnium hornum** Hedw. – LC – 108: root swelling of *Tilia* sp.

**Mnium marginatum** (Dicks.) P.Beauv. – LC – 115: surface of calcareous building

**Orthotrichum affine** Schrad. ex Brid. – LC – 28: bark of *Fraxinus* sp.

**Orthotrichum anomalum** Hedw. – LC – 21: on concrete; 116: on limestone

**Orthotrichum cupulatum** Hoffm. ex Brid. var. *cupulatum* – LC – 116: on limestone

**Orthotrichum diaphanum** Schrad. ex Brid. – LC – 65: bark of *Sambucus nigra*

**Orthotrichum lyellii** Hook. & Taylor – LC – 28: on bark of *Fraxinus* sp.

**Orthotrichum obtusifolium** Brid. – LC – 25: on bark of *Fraxinus* sp.

**Orthotrichum pallens** Bruch ex Brid. – LC – 35: bark of *Fagus sylvatica*

**Orthotrichum speciosum** Nees – LC – 35: bark of *Fagus sylvatica*
Oxyrrhynchium hians (Hedw.) Loeske var. hians – LC – 82: root swelling of Alnus glutinosa; 89: on soil
Palustriella commutata (Hedw.) Ochyra var. commutata – LC – 57, 100: on soil; 71: on plastic foil
Phascum cuspidatum Schreb. ex Hedw. var. cuspidatum – LC – 44, 45: on soil
Physcomitrium pyriforme (Hedw.) Bruch & Schimp. – LC – 60: on soil
Plagiomnium affine (Blandow ex Funck) T.J.Kop. – LC – 78: on decayed trunk; 18, 73, 90: on soil
Plagiomnium cuspidatum (Hedw.) T.J.Kop. – LC – 16: on root; 18: on soil; 78: on concrete
Plagiomnium elatum (Bruch & Schimp.) T.J.Kop. – VU – 68: on soil
Plagiomnium rostratum (Schrad.) T.J.Kop – LC – 106: on decayed wood
Plagiomnium undulatum (Hedw.) T.J.Kop. – LC – 21, 68, 75, 78: on soil; 15: on decayed wood; 82: stump of Alnus glutinosa
Plagiothecium cavifolium (Brid.) Z.Iwats. – LC – 12, 63: on soil
Plagiothecium denticulatum (L. ex Hedw.) Schimp. – LC – 12: on soil; 15: on decayed wood
Plagiothecium laetum Schimp. var. laetum – LC – 12, 13, 16: on soil
Plagiothecium nemorale (Mitt.) A.Jaeger – LC – 12: on soil
Plagiothecium succulentum (Wilson) Lindb. – LC – 16, 63: on soil
Platygyrium repens (Brid.) Schimp. – LC – 78: bark of Alnus glutinosa
Pleuri
dium acuminatum Lindb. – VU – 2, 62: on soil
Pleuri
dium subulatum (Hedw.) Rabenh. – NT – 5, 63: on soil
Pleurozium schreberi (Willd. ex Brid.) Mitt. – LC – 18, 39, 42, 62, 84: on soil
Pogonatum aloides (Hedw.) P.Beauv. – LC – 62, 63: on soil
Pohlia elongata Hedw. var. elongata – LC – 12: on soil
Pohlia melanodon (Brid.) A.J.Shaw – LC – 1, 89: on soil
Pohlia nutans (Hedw.) Lindb. subsp. nutans – LC – 2, 6, 63, 90: on soil
Pohlia proligera (Kindb.) Lindb. ex Broth. – VU-R – 54: on soil
Pohlia wahlenbergii (F.Weber & D.Mohr) A.L.Andrews var. wahlenbergii – LC – 5: on soil
Polytrichum formosum Hedw. – LC – 2, 6, 11, 13, 90: on soil
Polytrichum juniperinum Willd. ex Hedw. – LC – 48, 79, 90: on soil

114
**Polytrichum piliferum** Schreb. ex Hedw. – LC – 8, 62, 70, 90, 111: on soil

**Pottia intermedia** (Turner) Fürnr. – VU – 39: on soil

**Pottia truncata** (Hedw.) Bruch & Schimp. – LC – 35: on soil

**Pseudephemerum nitidum** (Hedw.) Loeske – EN – 98: on soil

**Pseudeleskeella nervosa** (Brid.) Nyholm – LC – 19: bark of Acer campestre

**Pseudoscleropodium purum** (L. ex Hedw.) M.Fleisch. – LC – 39, 42, 84, 90, 114: on soil

**Pterigynandrume filiforme** Hedw. var. filiforme – LC – 119: on bark of Fagus sylvatica

**Pylaisia polyantha** (Hedw.) Schimp. – LC – 19: bark of Acer campestre; 74: bark of Sambucus nigra; 78: bark of Corylus avellana

**Racomitrium canescens** (Timm. ex Hedw.) Brid. subsp. canescens – LC – 89: on soil

**Rhizomnium punctatum** (Hedw.) T.J.Kop. – LC – 16: on root and bark; 74: bark of Alnus glutinosa; 15, 83: on decayed wood; 46, 50, 82: stump of Alnus glutinosa

**Rhyncostegium murale** ((Neck. ex Hedw.) Schimp. – LC – 21: on concrete; 115: on calcareous building

**Rhytidiadelphus squarrosus** (L. ex Hedw.) Warnst. – LC – 18, 42, 84: on soil

**Schistidium crassipilum** H.H.Blom – LC – 21, 71: on concrete

**Syntrichia ruralis** (Hedw.) F.Weber & D.Mohr – LC – 86: on concrete

**Tetraphis pellucida** Hedw. – LC – 16, 106, 113: on decayed wood

**Thuidium assimile** (Mitt.) A.Jaeger – LC – 39: on soil; 78: on decayed wood

**Thuidium delicatulum** (Hedw.) Schimp. – LC – 18, 38, 84: on soil

**Thuidium tamariscinum** (Hedw.) Schimp. – LC – 18, 78: on decayed wood; 42, 68: on soil

**Trichodon cylindricus** (Hedw.) Schimp. – LC – 1, 17: on soil

**Tortula muralis** Hedw. var. muralis – LC – 71: on concrete

**Ulota bruchii** Hornsch. ex Brid. – LC – 25, 110: bark of Fraxinus sp.

**Ulota crispa** (Hedw.) Brid. – LC – 17: bark of Betula pendula
DISCUSSION

On the basis of these results, the bryophyte list of the project area was compared to the national (Grims and Köckinger 1999, Saukel and Köckinger 1999) and regional bryophyte Red Data List (Zechmeister et al. 2013) as well as to the Hungarian Red data List (Papp et al. 2010) (Table 1).

Table 1. The Red Data List status of bryophytes in Lower Austria (Niederösterreichs) (Zechmeister et al. 2013), Austria (Grims and Köckinger 1999, Saukel and Köckinger 1999) and Hungary (Papp et al. 2010).

| Species name                                      | Lower Austria | Austria | Hungary |
|--------------------------------------------------|---------------|---------|---------|
| Blasia pusilla (Hepaticeae)                      | LC            | LC      | EN      |
| Calypogea fissa                                 | LC            | LC      | NT      |
| Fossombronia wondraczekii                        | NT            | VU*     | DD      |
| Jungermannia gracillima                          | LC            | LC      | NT      |
| Notwellia curvifolia                            | LC            | LC      | VU      |
| Pellia neesiana                                 | LC            | LC      | unknown |
| Plagiochila asplenoides                          | LC            | LC      | NT      |
| Ptilidium pulcherrimum                           | LC            | LC      | NT      |
| Riccardia palmata                                | VU            | LC      | NT      |
| Scapania nemorea                                | LC            | LC      | VU      |
| Brachythecium mildeanum (Musci)                  | EN            | VU*     | LC-att  |
| Brachythecium glaerosum var. glareosum           | LC            | LC      | NT      |
| Campylopus pyriformis                            | VU            | EN*     | DD      |
| Dicranella staphylina                            | NT            | LC      | NT      |
| Didymodon cordatus                               | NT            | VU*     | LC-att  |
| Didymodon vinealis                               | EN            | VU*     | LC      |
| Eurhynchiastrum pulchellum var. pulchellum       | LC            | LC      | NT      |
| Fissidens adiantoides                            | NT            | reg. VU*| NT      |
| Heterocladium heteropterum                       | LC            | LC      | unknown |
| Microbryum davallianum                           | EN            | VU      | LC-att  |
| Mnium hornum                                     | LC            | LC      | NT      |
| Orthotrichum cupulatum                           | LC            | reg. VU*| LC-att  |
| Orthotrichum obtusifolium                        | LC            | LC      | NT      |
| Palustriella commutata var. commutata             | LC            | LC      | EN      |
| Plagiommium elatum                               | VU            | VU      | LC-att  |
| Plagiothecium succulentum                        | LC            | VU      | LC      |
| Pleuridium acuminatum                             | VU            | LC      | LC-att  |
| Pleuridium subulatum                             | NT            | LC      | LC-att  |
| Pohlia elongata var. elongata                    | LC            | LC      | DD      |
| Pohlia proligera                                 | VU-R          | LC      | DD      |
| Pottia intermedia                                | VU            | LC      | LC-att  |
| Psudephememerum nitidum                          | EN            | VU      | LC-att  |
| Ulota bruchii                                    | LC            | LC      | VU      |
| Ulota crispa                                     | LC            | LC      | NT      |
No species of the Annex II of the FFH-directive were found in the investigated area. However, *Leucobryum* sp. which is part of the Annex V of the respective directive was found several times (for details see the species list and corresponding site numbers).

The bryophyte flora of the investigated area resembles that of other lowlands in northern or southern Austria and despite its position in eastern Austria it has only a very small number of species typical or widespread in the Pannonian area (e.g. *Didymodon vinealis*). This is due to the fact that most habitats in the Sopron Hills do not represent typical eastern Austrian habitats as natural dry grasslands or vineyards. Furthermore, most of the sites are situated at comparable higher elevation as most of the sites in the east of Austria. In addition the investigated sites represent a wide range of woods and consequence microclimate and soils are more humid than at „typical” Pannonian sites.

Related to its bedrock the flora is dominated by acidophilous species and only a very few species related to calcareous bedrock were found. The large extent of woods in the area favours a wide range of shade tolerant plants, as well as epiphytes and species restricted to dead logs. Compared to other studies in the centre of the Pannonian area of the Burgenland (e.g. Zechmeister 2005b) which is slightly north of the study area, hepatics show a comparable high number in this study, which is mainly a result of the more humid situation in the investigated area. The number of threatened species is low in our study as the investigated sites were situated within habitats which are neither threatened by human activity and none rare in occurrence, too.

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APPENDIX

Site details
1. Burgenland, Bezirk Oberpullendorf, Ritzing, Angerwald, near country border, planted Picea abies forest (21.10.2009) N47°38'24.7" E16°29'43.9", 477 m. [8364.4]
2. Burgenland, Bezirk Oberpullendorf, Ritzing, Angerwald, near country border, Fagus sylvatica forest (22.10.2009) N47°38'21.9" E16°30'4.0", 472 m. [8365.3]
3. Burgenland, Bezirk Oberpullendorf, Ritzing, near village, on gravelly forest road (23.07.2013) N47°38'33.9" E16°28'19.4", 430 m. [8364.4]
4. Burgenland, Bezirk Oberpullendorf, Ritzing, near village, next to gravelly forest road (23.07.2013) N47°38'34.9" E16°28'17.0", 433 m. [8364.4]
5. Burgenland, Bezirk Oberpullendorf, Ritzing, lake (23.07.2013) N47°38'45.5" E16°28'11.0", 436 m. [8364.4]
6. Burgenland, Bezirk Oberpullendorf, Ritzing, on embankment of forest road (23.07.2013) N47°38'57.7" E16°28'20.3", 478 m. [8364.4]
7. Burgenland, Bezirk Oberpullendorf, Ritzing, forest road (23.07.2013) N47°39'01.1" E16°27'50.2", 552 m. [8364.2]
8. Burgenland, Bezirk Oberpullendorf, Ritzing, in deciduous forest by forest road (23.07.2013) N47°39'01.6" E16°27'37.8", 544 m. [8364.2]
9. Burgenland, Bezirk Oberpullendorf, Ritzing, in old Fagus sylvatica forest (23.07.2013) N47°38'57.7" E16°27'33.2", 518 m. [8364.4]
10. Burgenland, Bezirk Oberpullendorf, Ritzing, near lake, by stream (23.07.2013) N47°38'55.2" E16°27'28.0", 494 m. [8364.4]
11. Burgenland, Bezirk Oberpullendorf, Ritzing, dried puddles (23.07.2013) N47°38'41.0" E16°27'36.3", 467 m. [8364.4]
12. Burgenland, Bezirk Oberpullendorf, Ritzing, forest road (23.07.2013) N47°38'38.5" E16°27'58.2", 415 m. [8364.4]
13. Burgenland, Bezirk Oberpullendorf, Ritzing, by forest road (23.07.2013) N47°38'24.2" E16°28'14.0", 416 m. [8364.4]
14. Burgenland, Bezirk Oberpullendorf, Ritzing, crossroads (26.10.2013) N47°38'13.3" E16°27'32.4", 416 m. [8364.4]
26. Burgenland, Bezirk Oberpullendorf, Ritzing, border of coniferous forest (26.10.2013) N47°38'25.6" E16°28'50.0", 481 m. [8364.4]
27. Burgenland, Bezirk Oberpullendorf, Ritzing, in coniferous forest (26.10.2013) N47°38'27.1" E16°28'41.1", 449 m. [8364.4]
28. Burgenland, Bezirk Oberpullendorf, Ritzing, in little valley (26.10.2013) N47°38'31.2" E16°28'44.9", 434 m. [8364.4]
29. Burgenland, Bezirk Oberpullendorf, Ritzing, embankment of road, in wheel-tack (26.10.2013) N47°38'39.6" E16°28'45.2", 432 m. [8364.4]
30. Burgenland, Bezirk Oberpullendorf, Ritzing, embankment of road, in wheel-tack (26.10.2013) N47°38'40.4" E16°28'46.5", 435 m. [8364.4]
31. Burgenland, Bezirk Oberpullendorf, Ritzing, in old Fagus sylvatica forest (28.10.2013) N47°38'39.2" E16°29'5.1", 502 m. [8364.4]
32. Burgenland, Bezirk Oberpullendorf, Ritzing, in old Fagus sylvatica forest (28.10.2013) N47°38'30.7" E16°29'5.1", 502 m. [8364.4]
33. Burgenland, Bezirk Oberpullendorf, Ritzing, in deciduous forest, embankment of forest road (28.10.2013) N47°38'2.8" E16°29'9.8", 471 m. [8364.4]
34. Burgenland, Bezirk Oberpullendorf, Ritzing, in deciduous forest, embankment of forest road (28.10.2013) N47°37'35.7" E16°29'25.5", 379 m. [8364.4]
35. Burgenland, Bezirk Oberpullendorf, Ritzing, border of grassland (28.10.2013) N47°37'54.0" E16°29'30.6", 421 m. [8364.4]
36. Burgenland, Bezirk Oberpullendorf, Ritzing, grassland, stream (28.10.2013) N47°37'54.1" E16°29'38.2", 456 m. [8364.4]
37. Burgenland, Bezirk Oberpullendorf, Ritzing, border of Pinus sylvestris forest, by forest road (28.10.2013) N47°37'53.0" E16°29'42.9", 450 m. [8364.4]
38. Burgenland, Bezirk Oberpullendorf, Ritzing, gravelly road crossing (28.10.2013) N47°37'43.5" E16°30'22.4", 360 m. [8365.3]
39. Burgenland, Bezirk Oberpullendorf, Ritzing, arable field (28.10.2013) N47°37'33.9" E16°29'58.2", 398 m. [8364.4]
40. Burgenland, Bezirk Oberpullendorf, Ritzing, arable field (28.10.2013) N47°37'29.9" E16°30'9.4", 395 m. [8365.3]
41. Burgenland, Bezirk Oberpullendorf, Ritzing, valley, by stream (28.10.2013) N47°37'39.1" E16°30'26.2", 367 m. [8365.3]
42. Burgenland, Bezirk Oberpullendorf, Ritzing, valley, by stream (28.10.2013) N47°37'40.4" E16°30'24.1", 368 m. [8365.3]
43. Burgenland, Bezirk Oberpullendorf, Ritzing, gravelly road crossing (28.10.2013) N47°37'45.5" E16°30'12.1", 371 m. [8363.5]
44. Burgenland, Bezirk Oberpullendorf, Ritzing, valley, by stream (28.10.2013) N47°37'47.4" E16°30'10.4", 378 m. [8363.5]
45. Burgenland, Bezirk Oberpullendorf, Ritzing, valley, by stream (28.10.2013) N47°37'48.5" E16°30'08.6", 383 m. [8363.5]
53. Burgenland, Bezirk Oberpullendorf, Ritzing, embankment of forest road (28.10.2013) N47°37’53.3" E16°30’08.6", 401 m. [8365.3]
54. Burgenland, Bezirk Oberpullendorf, Ritzing, by forest road, little lake (28.10.2013) N47°38’05.8" E16°29’46.5", 449 m. [8364.4]
55. Burgenland, Bezirk Oberpullendorf, Ritzing, wet grassland (28.10.2013) N47°37’59.0" E16°29’20.4", 418 m. [8364.4]
56. Burgenland, Bezirk Oberpullendorf, Ritzing, wet grassland (28.10.2013) N47°38’00.4" E16°29’20.0", 421 m. [8364.4]
57. Burgenland, Bezirk Oberpullendorf, Ritzing, calcareous spring (28.10.2013) N47°38’05.6" E16°29’18.6", 447 m. [8364.4]
58. Burgenland, Bezirk Oberpullendorf, Ritzing, by forest road (28.10.2013) N47°38’07.3" E16°29’19.9", 510 m. [8364.4]
59. Burgenland, Bezirk Oberpullendorf, Ritzing, Angerwald, near country border, deciduous forest (30.10.2013) N47°38’29.3" E16°29’27.1", 521 m. [8364.4]
60. Burgenland, Bezirk Oberpullendorf, Ritzing, near country border, embankment of forest road (30.10.2013) N47°38’20.1" E16°31’23.8", 445 m. [8365.3]
61. Burgenland, Bezirk Oberpullendorf, Ritzing, abandoned gneis-stone quarry (30.10.2013) N47°38’35.5" E16°31’08.8", 440 m. [8365.3]
62. Burgenland, Bezirk Oberpullendorf, Ritzing, embankment of forest road (30.10.2013) N47°37’58.2" E16°31’42.5", 365 m. [8365.3]
63. Burgenland, Bezirk Oberpullendorf, Ritzing, embankment of forest road (30.10.2013) N47°37’31.3" E16°32’19.9", 380 m. [8364.1]
64. Burgenland, Bezirk Oberpullendorf, Ritzing, by forest road, little lake (28.10.2013) N47°37’53.3" E16°30’08.6", 401 m. [8364.1]
65. Burgenland, Bezirk Oberpullendorf, Ritzing, wet grassland (28.10.2013) N47°38’05.8" E16°29’46.5", 449 m. [8364.4]
66. Burgenland, Bezirk Oberpullendorf, Ritzing, wet grassland (28.10.2013) N47°37’59.0" E16°29’20.4", 418 m. [8364.4]
67. Burgenland, Bezirk Oberpullendorf, Ritzing, calcareous spring (28.10.2013) N47°38’00.4" E16°29’20.0", 421 m. [8364.4]
68. Burgenland, Bezirk Oberpullendorf, Ritzing, by forest road (28.10.2013) N47°37’41.7" E16°31’45.3", 340 m. [8365.3]
69. Burgenland, Bezirk Oberpullendorf, Ritzing, abandoned quarry, recultivated places (30.10.2013) N47°37’41.7" E16°31’45.3", 340 m. [8365.3]
70. Burgenland, Bezirk Oberpullendorf, Ritzing, embankment of forest road (30.10.2013) N47°37’30.1" E16°32’03.1", 325 m. [8365.3]
71. Burgenland, Bezirk Oberpullendorf, Neckenmarkt, fence of garden (30.10.2013) N47°37’31.6" E16°32’27.1", 290 m. [8365.3]
72. Burgenland, Bezirk Oberpullendorf, Neckenmarkt, weekend houses (30.10.2013) N47°37’32.0" E16°32’19.9", 300 m. [8365.3]
73. Burgenland, Bezirk Mattersburg, Marz, near recultivated quarry, by forest road (22.11.2013) N47°42’16.8" E16°23’47.1", 465 m. [8264.3]
74. Burgenland, Bezirk Mattersburg, Sieggraben, by stream (22.11.2013) N47°40’22.7" E16°23’54.6", 380 m. [8364.1]
75. Burgenland, Bezirk Mattersburg, Sieggraben, wet grassland (22.11.2013) N47°40’22.9" E16°23’55.8", 375 m. [8364.1]
76. Burgenland, Bezirk Mattersburg, Sieggraben, by stream (22.11.2013) N47°40’22.4" E16°23’58.1", 385 m. [8364.1]
77. Burgenland, Bezirk Mattersburg, Sieggraben, wetland and stream (22.11.2013) N47°40’22.4" E16°24’02.3", 380 m. [8364.1]
78. Burgenland, Bezirk Mattersburg, Sieggraben, wetland and stream (22.11.2013) N47°40’20.7" E16°24’06.1", 385 m. [8364.1]
79. Burgenland, Bezirk Mattersburg, Sieggraben, embankment of forest (22.11.2013) N47°40’18.6" E16°24’03.6", 400 m. [8364.1]
80. Burgenland, Bezirk Mattersburg, Sieggraben, by forest road, little pond (22.11.2013) N47°40'18.8" E16°23'59.5", 395 m. [8364.1]
81. Burgenland, Bezirk Mattersburg, Sieggraben, near forest road (22.11.2013) N47°40'18.6" E16°24'03.6", 395 m. [8364.1]
82. Burgenland, Bezirk Mattersburg, Sieggraben, valley, by stream (22.11.2013) N47°39'36.5" E16°22'53.1", 500 m. [8364.1]
83. Burgenland, Bezirk Mattersburg, Sieggraben, Satterhöhe, valley, by stream (22.11.2013) N47°39'43.5" E16°22'49.3", 470 m. [8364.1]
84. Burgenland, Bezirk Mattersburg, Sieggraben, border of grassland, embankment of forest road (22.11.2013) N47°39'40.6" E16°22'53.2", 455 m. [8364.1]
85. Burgenland, Bezirk Mattersburg, Sieggraben, valley, by stream (22.11.2013) N47°39'46.7" E16°22'52.9", 475 m. [8364.1]
86. Burgenland, Bezirk Mattersburg, Sieggraben, roadside (22.11.2013) N47°39'34.0" E16°22'45.1", 495 m. [8364.1]
87. Burgenland, Bezirk Oberpullendorf, Neckenmarkt, Millenium Teich, between two lakes (24.06.2014) N47°36'59.1" E16°34'05.0", 235 m. [8365.3]
88. Burgenland, Bezirk Oberpullendorf, Neckenmarkt, wall of road cut (30.07.2014) N47°38'07.9" E16°26'43.7", 420 m. [8364.4]
107. Burgenland, Bezirk Oberpullendorf, Ritzing, by stream, water conservancy building (30.07.2014) N47°38'09.3" E16°26'29.8", 400 m. [8364.4]
108. Burgenland, Bezirk Oberpullendorf, Ritzing, by stream (30.07.2014) N47°38'10.3" E16°26'29.3", 400 m. [8364.4]
109. Burgenland, Bezirk Oberpullendorf, Ritzing, in *Alnus glutinosa* marsh (30.07.2014) N47°38'10.8" E16°26'30.9", 405 m. [8364.4]
110. Burgenland, Bezirk Oberpullendorf, Ritzing, by stream (30.07.2014) N47°38'11.6" E16°26'26.8", 400 m. [8364.4]
111. Burgenland, Bezirk Oberpullendorf, Ritzing, by forest road (31.07.2014) N47°39'14.7" E16°26'38.9", 495 m. [8364.2]
112. Burgenland, Bezirk Oberpullendorf, Ritzing, by forest road (31.07.2014) N47°39'04.7" E16°26'38.1", 480 m. [8364.2]
113. Burgenland, Bezirk Oberpullendorf, Ritzing, by wet places (31.07.2014) N47°39'1.6" E16°26'26.6", 465 m. [8364.2]
114. Burgenland, Bezirk Oberpullendorf, Ritzing, near planted *Picea abies* forest, by forest road (31.07.2014) N47°38'49.9" E16°26'04.1", 460 m. [8364.4]
115. Burgenland, Bezirk Oberpullendorf, Ritzing, by stream, on milestone (31.07.2014) N47°38'12.5" E16°26'25.6", 405 m. [8364.4]
116. Burgenland, Bezirk Oberpullendorf, Ritzing, by road-crossing, monument (31.07.2014) N47°37'57.6" E16°26'21.3", 385 m. [8364.4]
117. Burgenland, Bezirk Oberpullendorf, Ritzing, in deciduous forest, couloir (31.07.2014) N47°38'41.2" E16°27'7.3", 525 m. [8364.4]
118. Burgenland, Bezirk Oberpullendorf, Ritzing, in deciduous forest, (31.07.2014) N47°38'40.1" E16°27'48", 515 m. [8364.4]
119. Burgenland, Bezirk Oberpullendorf, Ritzing, in deciduous forest, by forest road (31.07.2014) N47°38'39.9" E16°26'49.6", 530 m. [8364.4]
120. Burgenland, Bezirk Oberpullendorf, Ritzing, in road-crossing (31.07.2014) N47°39'03.4" E16°27'5.9", 540 m. [8364.2]