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Vegetation of the Lublin region (E. Poland) and its current changes

Dominik FIJAŁKOWSKI

1. INTRODUCTION

The Lublin region is located in the southeastern part of Poland. It covers four geographical regions: Pas Wielkich Dolin (Great Valleys Basin), Kotliny Podgorskie (Submontane Basins), Roztocze and Wyzyna Lubelska (Lublin Upland). The occurrence of 72 lakes of varied trophies: eutrophic, dystrophic and oligotrophic is characteristic of the region (cf. WILGAT 1954, KARZMARZ 1992). Similarly varied are the peat bogs: lower, raised and so-called transitional bogs occur here abundantly. The vascular flora and vegetation of the Lublin region have been studied since as late as 1945 mainly by scientists from the M. Curie-Skłodowska University in Lublin (e.g. FIJAŁKOWSKI 1959, 1966, 1971a,b,c, 1972a,b, 1978, 1983, 1991, FIJAŁKOWSKI and CHOJNACKA-FIJAŁKOWSKA 1990, IZDEBSKI 1962, 1963, 1967, KRZACZEK 1967a,b, 1968a,b, 1969, KRZACZEK and KRZACZEK 1969). Owing to these studies, the most interesting natural objects have been protected against destruction. More than 600 natural monuments have been preserved, and 110 reserves, two national parks (Roztoczanski and Poleski National Parks), 13 landscape and 11 areas of protected landscape have been established.

2. GEOLOGICAL, MORPHOLOGICAL, SOIL AND CLIMATIC CONDITIONS

The Lublin region is characteristic of a relatively small morphological diversity (Fig. 1). The lowest areas are located at an altitude of 150 m a.s.l., and the highest at 390 m a.s.l.

Pre-Cambrian geological formations occur at a depth of 500 m. Sedimentary rock is represented by palaeophytic formation, and especially by seams of coal (Fig. 2). Palaeophytic formations are about 400 m thick. Mesophytic, mainly Cretaceous, formations are overlying. In the W part of the Lublin region, they are even 2'000 m thick. Cretaceous formations crop up in almost all Lublin Upland and Roztocze and they form the present morphology and soils. Tertiary formations are frequently washed away or they occur in the form of sand hills in the Lublin Upland area. Only in some parts of middle Roztocze does limestone (lithotamnic) or less frequently sandstone occur. In the transi-

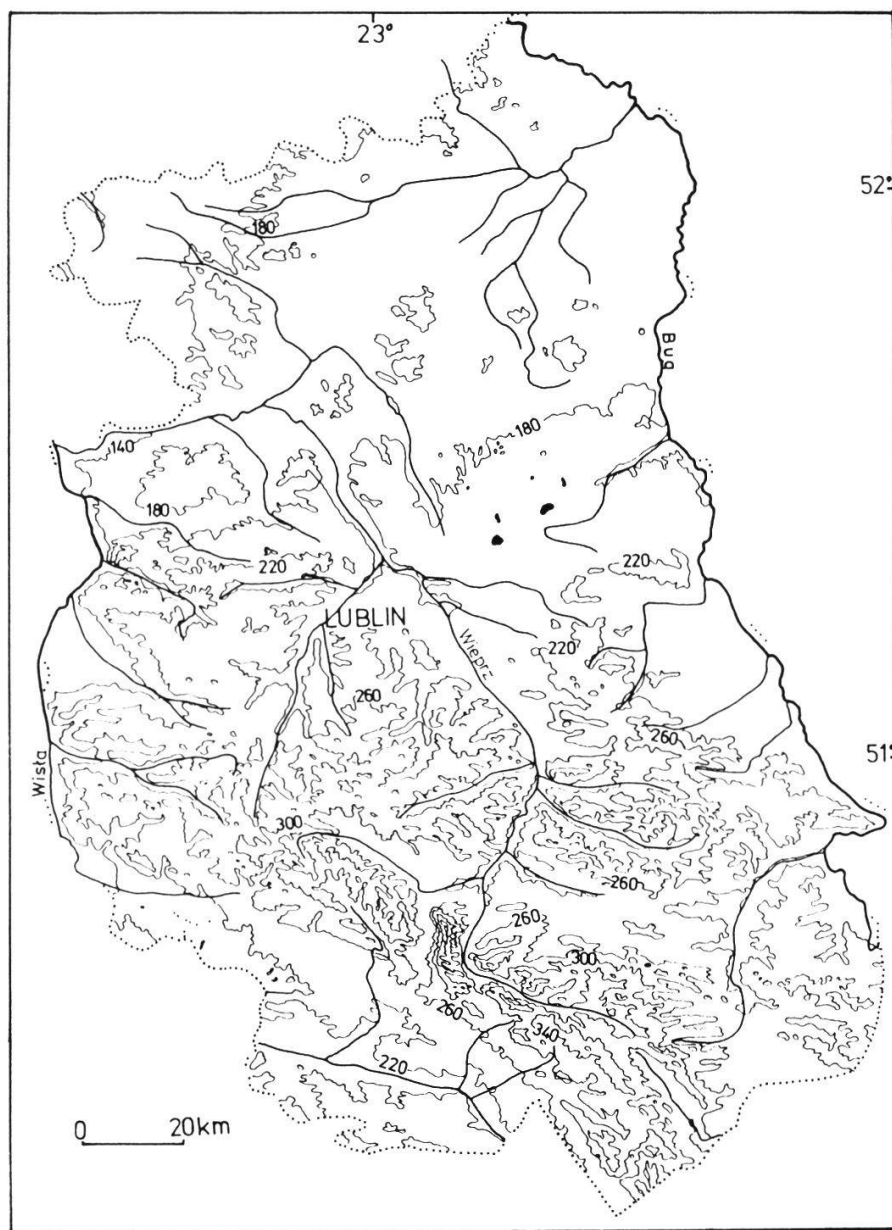


Fig. 1. Hypsometry of the Lublin region.

tion area between Roztocze and Kotlina Sandomierska basin, these formations underly sandstone and Quaternary silt in almost all of the Lublin Upland. Quaternary rock occurs mostly in the form of sand, clay, loess and peat. Varied kinds of the soil were formed out of these, Cretaceous and Tertiary formations. Podzolic soil developed from Quaternary sand (about 32% of the

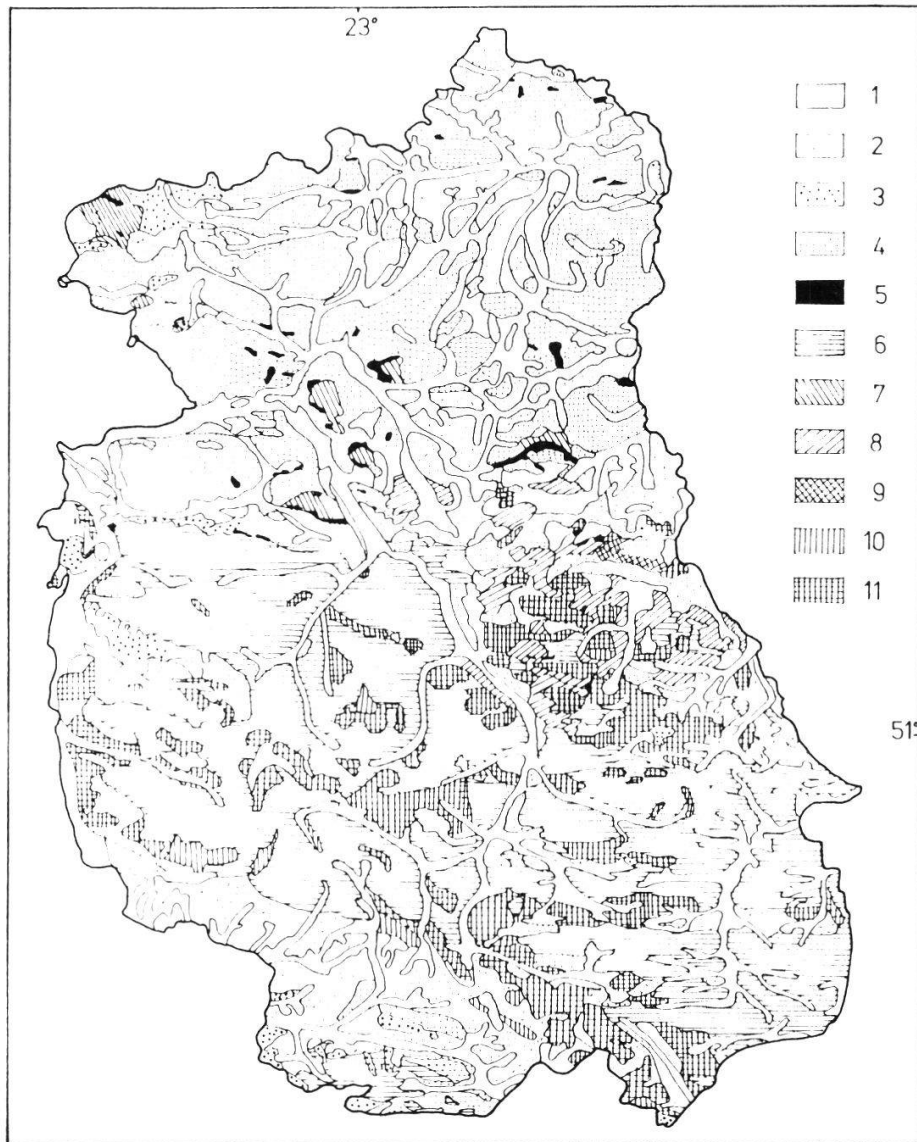


Fig. 2. Schematic geological map of the Lublin region. (FIJALKOWSKI 1972, slightly modified).

1 - mud, sand and peat, 2 - sand and gravel of fluvial accumulation, 3 - sand and gravel of fluvio-glacial accumulation, 4 - boulder clay and sand with boulders of ground glacial accumulation, 5 - sands, gravels and boulder embankments of glacial accumulation, 6 - loess and sandy loess, 7 - formations of frontal glacial accumulation, 8 - lacustrine mud (gyttja), peat, silt and sand of interglacial and interstadial accumulation, 9 - Tertiary silt and sand, 10 - Tertiary limestone and sand, 11 - Cretaceous marl and bedrock.

total Lublin region area); lessive and brown soil (16%) from clay, loess and gaize, bog soil from peat (12%); silt soil from fluvial sediment (4%). Chernozem soil covers 3% of the area, whereas Cretaceous and Tertiary rendzina 5%. The climate of the Lublin region is typically transitory. The mean annual temperature is 7.5°C. The maximum temperature may reach 39°C and the minimum to -37°C. The mean annual precipitation varies in different regions from 550 mm (N part) to 750 mm (S part).

3. FLORA AND VEGETATION

The vascular flora of the Lublin region comprises 1638 species. Some species, such as *Cytisus albus** and *Senecio doria* are found, in Poland, exclusively in this region (nomenclature after SZAFER et al. 1986). Species representing different geographical elements and ecological types are presented as an example below. Among the xerothermic plants, the following deserve notice: *Carlina acanthifolia* ssp. *onopordifolia**, *Echium rossicum* (= *Echium rubrum*)*, *Iris aphylla*, *Muscari comosum**, *Rosa gallica*. Among the species growing in other habitats, water, peat bog and forest, are the following: *Aldrovanda vesiculosa**, *Betula humilis*, *Carex chordorrhiza*, *Chamaedaphne calyculata*, *Isoetes lacustris*, *Litorella uniflora** (extinct), *Myriophyllum alternifolium**, *Rhynchospora fusca*, *Salix lapponum*, *Silene tatarica**. The following interesting species which occur in the region should also be mentioned: *Allium victorialis*, *Atropa belladonna*, *Cystopteris sudetica*, *Haquetia epipactis*, *Polystichum lonchitis*.

Distribution maps of species marked with an asterisk * are presented in Fig. 3.

About 437 well-defined plant associations of 25 basic classes have been recorded so far in the Lublin region (FIJALKOWSKI 1991). Their distribution exhibits great correlation with geographical regions.

Table 1 presents a list of plant classes and their estimated proportion in the four main regions. The data indicate that a differentiation in the abundance of classes exists in particular regions. This correlates, above all, with the size of the regions and the geological, soil and hydrological status.

Pas Wielkich Dolin is characterized by the domination of associations of the *Charetea*, *Lemnetea*, *Utricularietea intermedio-minoris*, *Litorelletea*, *Phragmitetea*, *Oxycocco-Sphagnetea*, *Nardo-Callunetea*, *Sedo-Scleranthetea* classes. Pas Kotlin Podgorskich is characterized mainly by the *Oxycocco-Sphagnetea*, *Scheuchzerio-Caricetea fuscae* and *Vaccinio-Piceetea* classes. Roztocze is known for the occurrence of the *Querco-Fagetea* and

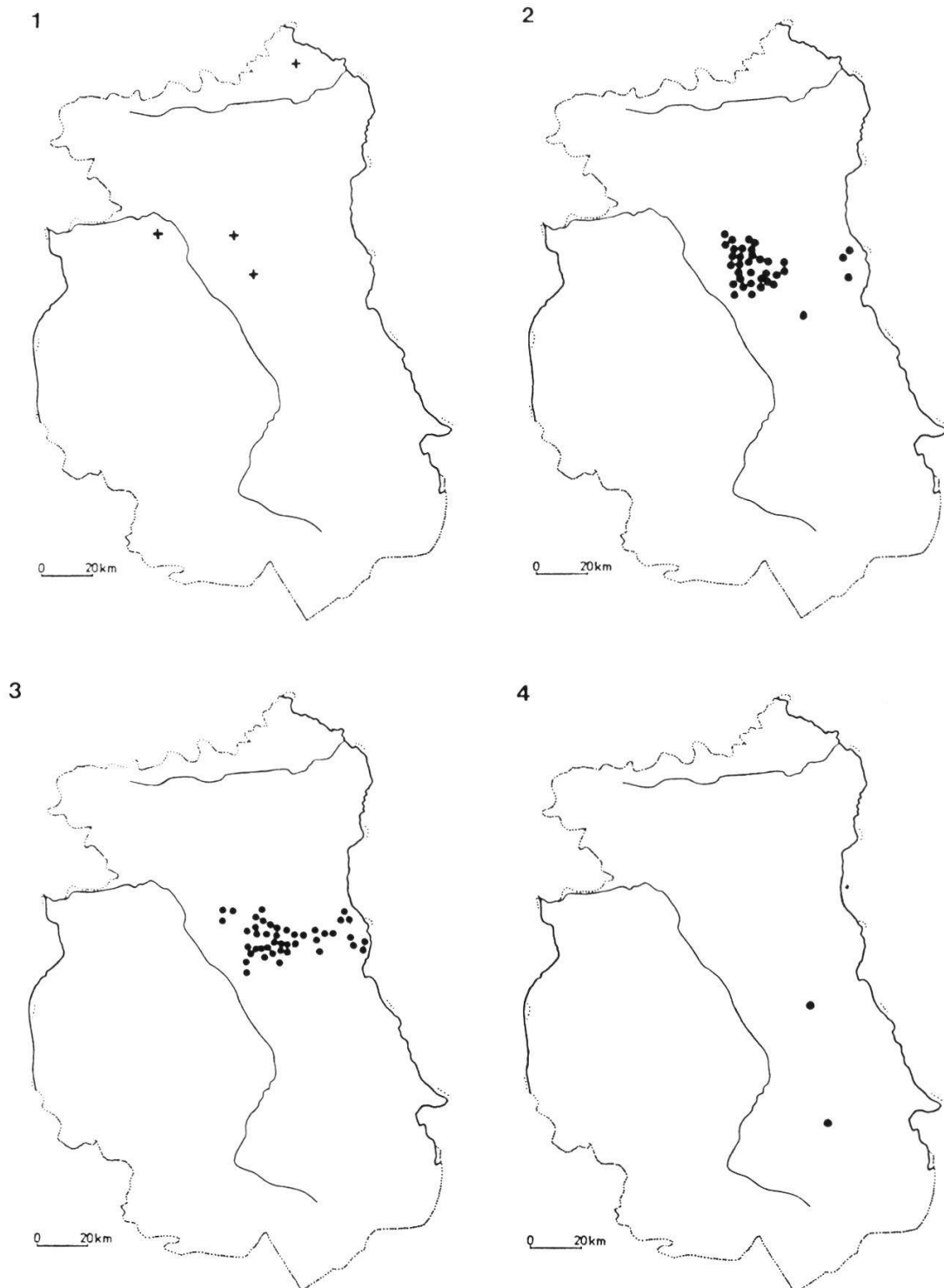


Fig. 3. Localities of six plant species in the Lublin region.
1 - *Litorella uniflora* (extinct), 2 - *Myriophyllum alternifolium*, 3 - *Aldrovanda vesiculosa*, 4 - *Carlina acanthifolia* ssp. *onopordifolia*.

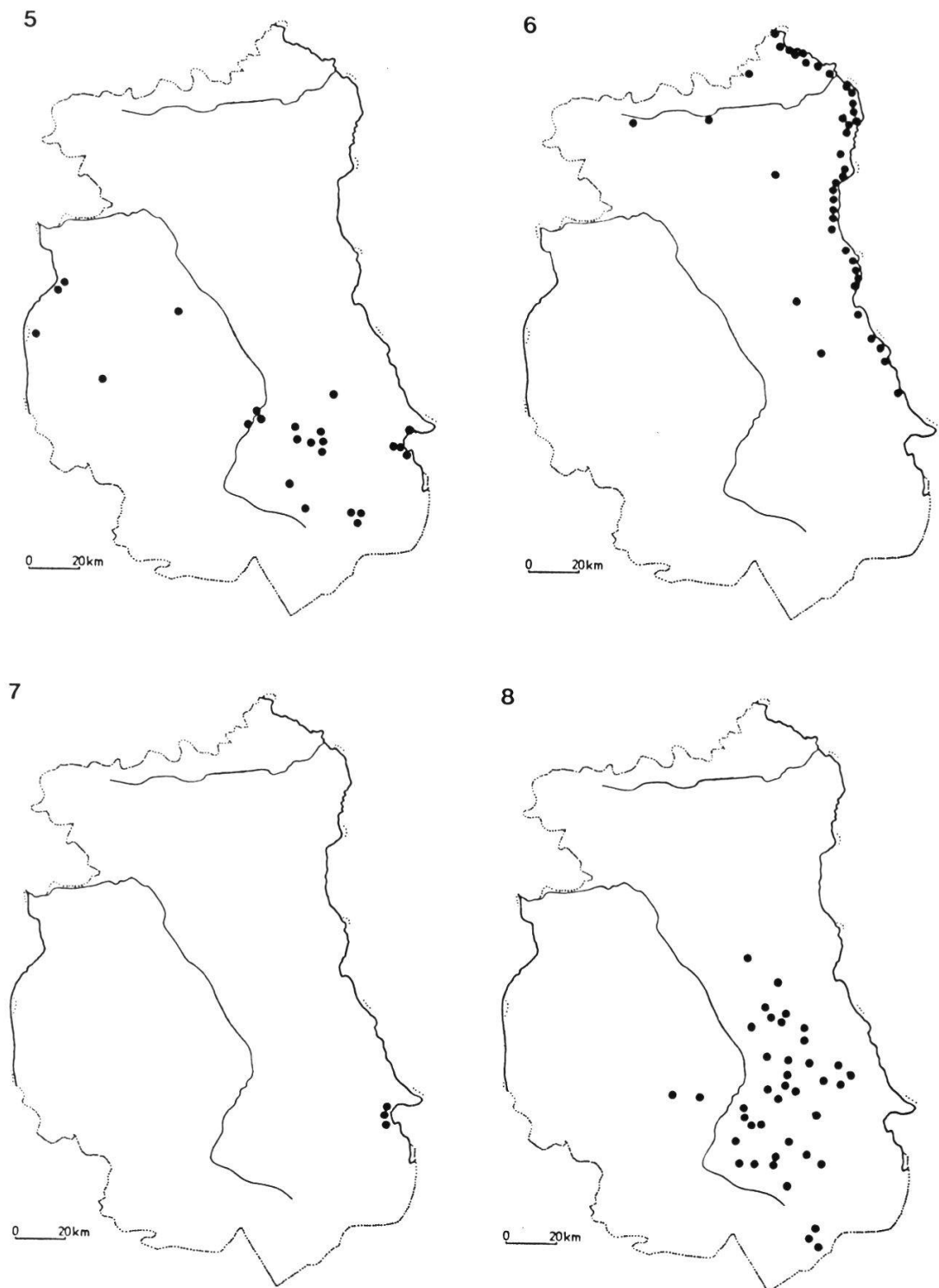


Fig. 3 (continued)

5 - *Echium russicum*, 6 - *Silene tatarica*, 7 - *Cytisus albus*, 8 - *Muscari comosum*.

Vaccinio-Piceetea classes. In the Lublin Upland plant associations of the *Molinio-Arrhenatheretea*, *Festuco-Brometea*, *Trifolio-Geranietea sanguinei*, *Rhamno-Prunetea* and *Quercu-Fagetea* classes are widely distributed.

The flora and plant communities in the Lublin region have become greatly impoverished in comparison to the situation of the 50's. The greatest losses in plant resources are caused by agriculture (25% of losses), then meadow (15%) and forest management (20%). Marked losses have also been caused by water and air pollution. About 1% of losses are the result of medicinal herb collection, urbanization, recreation and tourism, etc. Similar losses occur in plant communities.

Farming is especially harmful through the introduction of herbicides and more or less intensive agrotechnology, better seed clearing and intensified fertilization. Many plants disappear from forests where total clearings have

Table 1. Estimated proportion of plant classes in four basic subregions of the Lublin region.

Class	Surface in ha			
	Pas Wielkich Dolin	Pas Kotlin Podgorskich	Roztocze	Wyzyna Lubelska
<i>Charetea</i>	750	5	2	43
<i>Lemnetea</i>	1500	50	120	330
<i>Potamogetonetea</i>	700	120	80	100
<i>Utricularietea intermedio-minoris</i>	23	5	1	1
<i>Litorelletea</i>	150	30	5	15
<i>Isoeto-Nanojuncetea</i>	980	150	20	50
<i>Phragmitetea</i>	95000	2100	650	35000
<i>Molinio-Arrhenatheretea</i>	110000	15000	10000	90000
<i>Scheuchzerio-Caricetea fuscae</i>	1500	700	150	350
<i>Oxycocco-Sphagnetetea</i>	30000	20093	5	2
<i>Nardo-Callunetea</i>	280	60	20	40
<i>Sedo-Scleranthetea</i>	8000	50	150	1400
<i>Festuco-Brometea</i>	10	0	20	8970
<i>Trifolio-Geranietea sanguinei</i>	5	0	35	960
<i>Rhamno-Prunetea</i>	5	0	20	575
<i>Quercu-Fagetea</i>	40000	200	50000	97000
<i>Salicetea purpureae</i>	200	20	50	530
<i>Alnetea glutinosae</i>	5000	2000	500	2500
<i>Vaccinio-Piceetea</i>	40000	30000	20000	10000
<i>Epilobieteae angustifolii</i>	20000	5000	10000	15000
<i>Bidentetea tripartiti</i>	150	20	30	100
<i>Artemisieteae</i>	4000	400	600	5000
<i>Plantaginetea majoris</i>	5500	1000	2000	6500
<i>Chenopodietea</i>	300000	70000	90000	250000
<i>Secalieteae</i>	250000	50000	60000	300000

been performed and where *Pinus* monocultures have been introduced, and chemical fertilization and chemical pest control have been used.

The greatest losses in communities (>80%) were recorded in the following classes: *Charetea*, *Utricularietea*, *Litoretellea*, *Isoeto-Nanojuncetea*, *Chenopodietea* and *Secalietea*.

Individual communities within the classes reacted differently to anthropogenic factors. Losses in abundance >90% were recorded in the following associations: *Riccietum fluitantis*, *Sparganietum minimi*, *Ranunculo-Myosuretum*, *Rumicetum conferti*, *Armerio-Cynosuretum*, *Diantho-Armerietum*, *Schoenetus ferruginei*, *Equisetetum variegati*, community with *Salsola kali* and *Elatine alsinastrum*, *Fumarietum villantii*, *Arnoserido-Scleranthetum*, *Aphano-Matricarietum*, *Vicietum tetraspermae*, *Caucalido-Scandicetum*, *Euphorbio-Nigelletum*, *Radiolo-Centunculetum*, *Spergulo-Lolietum remotii*, *Herniario-Polycnemetum* and *Spergulario-Illecebretum*.

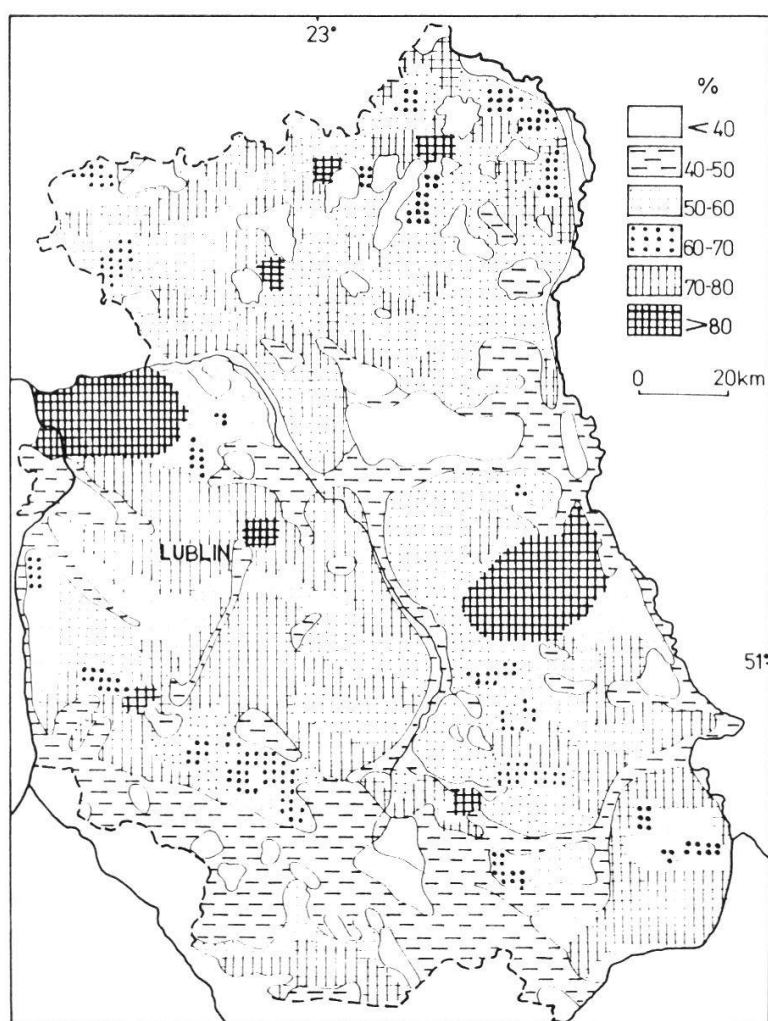


Fig. 4. Alteration of the plant cover (in %) in the Lublin region.

A few associations have increased, e.g. *Potamogetonetum pectinati* (1000%), *Galinsogo-Setarietum* (400%), *Arrhenateretum medioeuropaeum* (150%), *Potamogetonetum lucentis* (100%).

The problem of man-made plant cover alterations in the Lublin region is complex and only a generalization of it is presented in Fig. 4. More details will be published separately.

4. NATURE OBJECTS VISITED DURING THE 19TH IPE

4.1. THE "CZARTOWE POLE" RESERVE

The "Czartowe Pole" Reserve was established in 1958 and covers an area of 48.47 ha (FIJALKOWSKI 1973, 1983). It occupies slopes and the bottom of the Sopot River Valley. It is located in the zone where the heights of Roztocze drop to the Kotlina Sandomierska Basin (230-240 m a.s.l.). Surface layers are formed of light loamy sand which is several meters thick. They were cut apart by the Sopot River, down to the rocky base of Cretaceous formations. The bedrock is sloped considerably, resulting in a number of river rapids up to 0.5 m high. The upper part of the narrow valley is covered by podzolic soil form-

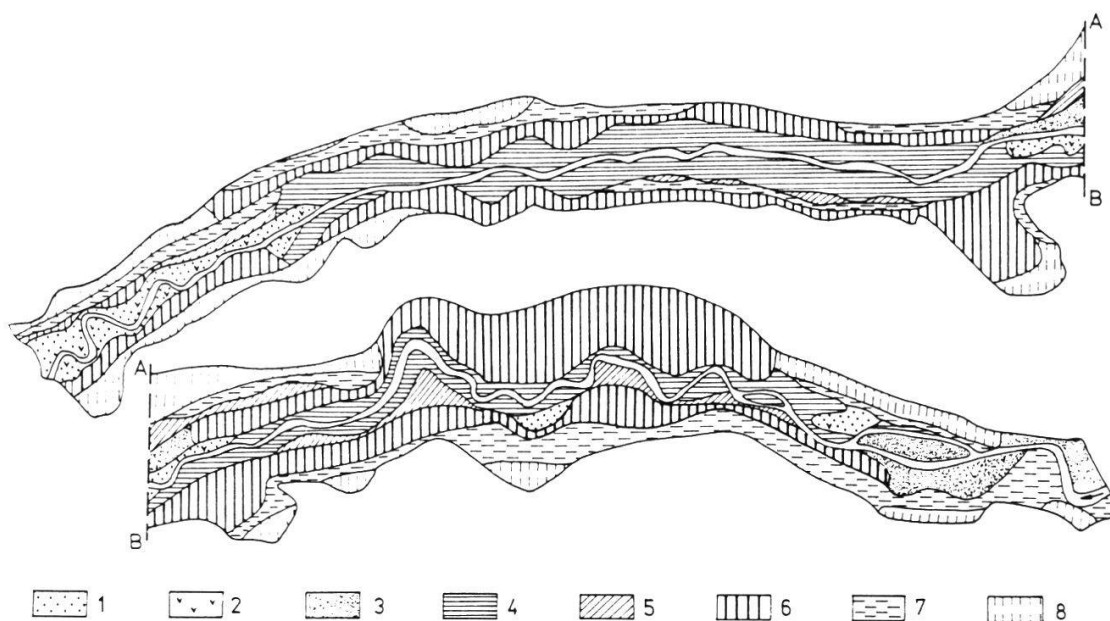


Fig. 5. Distribution of plant communities in the "Czartowe Pole" reserve. (FIJALKOWSKI 1973, modified).

1 - *Cynosurion*, 2 - *Magnocaricion elatae*, 3 - *Carici elongatae-Alnetum*, 4 - *Circaeo - Alnetum*, *Carici remotae-Fraxinetum*, *Stellario-Alnetum*, 5 - *Querco-Piceetum*, 6 - *Abietetum polonicum*, 7 - *Vaccinio myrtilli-Pinetum*, 8 - *Pino-Quercetum*.

ed of light loamy and loose sand, it occupies 20% of the reserve area. The slopes are covered by brown and lessive soil formed of light loamy sand, it occupies c. 50% of the total reserve area. The valley bottom is covered by slime-muddy and slime-boggy soils which occupy up to 30% of the area.

Podzolic soil is mainly covered with the forest associations: *Peucedano-Pinetum*, *Leucobryo-Pinetum*, *Molinio-Pinetum*, *Abietetum polonicum* and *Quercu-Piceetum* (Fig. 5). The valley bottom is covered with *Circae-Alnetum*, *Carici remotae-Fraxinetum*, *Stellario-Alnetum* and *Ribo nigri-Alnetum*. In some treeless stands, meadows occur which are composed of rush communities of the *Magnocaricion elatae*, *Molinio-Arrhenatheretea* and *Scheuchzerio-Caricetea fuscae*.

In the reserve 213 species of vascular plants were recorded. The following species are considered rare to the Lublin region: *Adoxa moschatellina*, *Asplenium trichomanes*, *Botrychium multifidum*, *Butomus umbellatus*, *Cephalanthera alba*, *Chimophila umbellata*, *Daphne mezereum*, *Dentaria bulbifera*, *Drosera intermedia*, *Dryopteris cristata*, *Epipactis latifolia*, *Euphorbia amygdaloides*, *Goodyera repens*, *Hedera helix*, *Hierochloe australis*, *Juncus squarrosus*, *Lilium martagon*, *Lycopodium complanatum*, *Lycopodium selago*, *Lysimachia nemorum*, *Mercurialis perennis*, *Ophioglossum vulgatum*, *Polypodium vulgare*, *Polystichum lobatum*, *Ribes alpinum*, *Senecio fuchsii*, *Veronica beccabunga*, *Veronica anagallis-aquatica* and *Viscum abietis*.

4.2. THE "BRZEZNO" RESERVE

The "Brzezno" Reserve was established in 1959 with an area of 157.78 ha (FIJALKOWSKI 1972, 1983). It includes a carbonate peat bog with flat (1 m high) elevations of washed chalk. It is flooded during spring thaw, and in summer the groundwater level reaches the surface only in the lowest places. The whole substratum is either alkaline or neutral. The elevations are covered with grasslands composed of the *Inuletum ensifoliae*, *Adonido-Brachypodietum pinnati*, and *Thalictro-Salvietum pratensis* associations. Lower sites are predominantly covered with *Molinietum medioeuropaeum*. Habitats flooded throughout a greater part of the year are occupied by *Caricetum elatae*, *Caricetum paradoxae* and *Cladietum marisci*. Thickets up to 10 m high are formed by various communities: *Salicetum pentandro-cinereae*, *Betulo-Salicetum repentis*, *Potentillo albae-Quercetum*, *Peucedano cervariae-Coryletum*, and other. Altogether 35 plant associations were recorded here. The flora of the reserve is very rich. It includes 554 vascular plant species. The fol-

lowing species will become rare in the Lublin region: *Aquilegia vulgaris*, *Astragalus onobrychis*, *Batrachium circinatum*, *Butomus umbellatus*, *Carex buxbaumii*, *Carex caespitosa*, *Carex distans*, *Carex tomentosa*, *Cirsium canum*, *Cladium mariscus*, *Cypripedium calceolus*, *Dianthus superbus*, *Equisetum variegatum*, *Fragaria viridis*, *Galium cruciata*, *Gentiana cruciata*, *Gentiana uliginosa*, *Gladiolus imbricatus*, *Inula ensifolia*, *Iris sibirica*, *Juncus inflexus*, *Liparis loeselii*, *Lotus tenuifolius*, *Orchis militaris*, *Pedicularis sceptrum-carolinum*, *Phyteuma orbiculare*, *Pinguicula vulgaris*, *Platanthera chlorantha*, *Prunella grandiflora*, *Schoenus ferrugineus*, *Senecio doria*, *Senecio paluster*, *Thalictrum lucidum*, *Tofieldia calyculata* and *Trollius europaeus*.

The "Brzezno" reserve also has a unique fauna.

4.3. CHALK QUARRIES IN CHELM

The chalk quarry was founded after World War II. Chalk containing 100% calcium was exploited here for the cement plant in Rejowiec, several kilometres from Chelm. After World War II, two cement plants were built in Chelm, multiplying the exploitation of chalk. Calciphilous plants become dominant on the calcium-rich substratum (FIJALKOWSKI 1963, 1971b). To date, 250 vascular plant species have been recorded in the area. They are mostly apophytes - plants of native origin (178 species). Alien plants - anthropophytes, are represented by 72 species.

Among the rare ruderal species recorded from the quarry are the following: *Aethusa cynapium*, *Bunias orientalis*, *Echinocystis lobata*, *Onopordon acanthium*, *Coronopus procumbens*, *Diploaxis muralis*, *Diploaxis tenuifolia*, *Reseda lutea*, *Reseda luteola*, *Verbena officinalis*, *Sisymbrium orientale* and *Sisymbrium loeselii*.

The rare segetal plants are represented by *Adonis aestivalis*, *Ajuga chamaepitys*, *Aphanes arvensis*, *Anagallis femina*, *Bupleurum rotundifolium*, *Caucalis daucoides*, *Centunculus minimus*, *Conringia orientalis*, *Fumaria vaillantii*, *Galeopsis angustifolia*, *Hypericum humifusum*, *Muscari comosum*, *Nigella arvensis*, *Papaver argemone*, *Papaver dubium*, *Radiola linoides*, *Ranunculus arvensis*, *Stachys annua* and *Thlaspi perfoliatum*.

Among the rare xerothermic plants the following were recorded: *Allium oleaceum*, *Anthemis tinctoria*, *Ajuga genevensis*, *Campanula sibirica*, *Campanula glomerata*, *Centaurea scabiosa*, *Clematis recta*, *Eryngium planum*, *Filipendula hexapetala*, *Lavatera thuringiaca*, *Lithospermum officinale*, *Malva*

alcea, *Onobrychis viciaefolia*, *Salvia sylvestris*, *Teucrium chamaedrys*, *Trifolium montanum*, *Vicia tenuifolia*, *Vincetoxicum officinale*.

In old quarries (especially those more than 10 years old), ruderal associations are developed: *Rubo-Calamagrostidetum epigei*, *Echio-Melilotetum*, *Potentillo-Artemisietum absynthii*, *Carduetum acanthoides*, *Resedo-Tussilagietum*, *Bunietum orientalis*, *Salvio verticillatae-Artemisietum*, *Poo-Taraxacetum*, *Lolio-Plantaginetum*, *Lolietum perennis*, *Cichorietum intybi*, *Lolio-Potentilletum anserinae*, *Poo-Coronopetum squamati*, *Chenopodietum ruderalis*, *Erigeroneto-Lactucetum*, *Senecioni-Tussilaginetum* and *Sisymbrietum loeselii* (FIJALKOWSKI 1991).

4.4. "JEZIORO MOSZNE" RESERVE

The "Jezioro Moszne" Reserve was established in 1978 with an area of 205.15 ha (FIJALKOWSKI 1959, 1972a, FIJALKOWSKI and CHOJNACKA-FIJALKOWSKA 1990). It includes a lake (17.5 ha) and its surrounding peat bogs (BALAGA et al. 1992, Figs. 1 and 2, in this volume). The reserve is the central part of the Poleski National Park. The character of the lake is dystrophic, and mainly *Nymphaea candida*, *Nuphar luteum* and *Phragmites communis* grow in its waters. The lake shore is covered by a floating moss lawn with thickets of the *Sphagno-Salicetum pentandro-cinereae* association. Closer to the centre of the peat bog it changes into *Caricetum limosae* and *Sphagno-Caricetum rostratae*. In the S part, associations of the *Scheuchzerio-Caricetea fuscae* change into *Ledo-Sphagnetum* with the domination of dwarf *Pinus sylvestris*, and into *Vaccinio uliginosi-Pinetum*, *Molinio-Pinetum*, *Querco-Betuletum* and *Leucobryo-Pinetum*. The latter communities appear in the transition area between the peat bog, meadows, and farm fields. In the W part of the reserve in the transition area between communities of the *Scheuchzerio-Caricetea fuscae* class and forest communities, thickets and low groves of the *Betulo-Salicetum repentis*, *Betuletum humilis*, *Ribo nigri-Alnetum*, *Betuletum pubescentis*, *Leucobryo-Pinetum*, and fragments of the *Querco-Potentilletum albae* associations occur. In the E part, the reserve merges with a wide belt of fen and with the "Jezioro Dlugie" Reserve. Here, mainly thickets and low groves (*Betuletum pubescentis*, *Betulo-Salicetum repentis* and *Salicetum pentandro-cinereae*) dominate. On the whole, 82 plant associations were recorded in the reserve. Among the associations rare to the Lublin region are especially the following: *Sphagno-Utricularietum*, *Caricetum vesicariae*, *Rhynchosporietum albae*, *Caricetum limosae*, *Ranunculo-Juncetum bulbosi*,

Caricetum diandrae, *Caricetum chordorrhizae*, *Caricetum davallianae*, *Nardo-Juncetum squarrosi*, *Juncetum macri*, *Blysmo-Juncetum compressis* and *Betuletum humilis*.

In the reserve, 382 vascular plants species were recorded. The following are rare to the Lublin region: *Aldrovanda vesiculosa*, *Aquilegia vulgaris*, *Batrachium circinatum*, *Botrychium multifidum*, *Calamagrostis neglecta*, *Campanula glomerata*, *Carex buxbaumii*, *Carex caespitosa*, *Carex chordorrhiza*, *Carex dioica*, *Carex distans*, *Carex divulsa*, *Carex remota*, *Cyperus flavescens*, *Cyperus fuscus*, *Dianthus superbus*, *Drosera anglica*, *Drosera intermedia*, *Dryopteris austriaca*, *Epipactis palustris*, *Equisetum variegatum*, *Eriophorum gracile*, *Gladiolus imbricatus*, *Hydrocotyle vulgaris*, *Iris sibirica*, *Juncus squarrosus*, *Liparis loeselii*, *Ophioglossum vulgatum*, *Pedicularis sceptrum-carolinum*, *Pinguicula vulgaris*, *Radiola linoides*, *Rhynchospora alba*, *Salix lapponum*, *Salix myrtilloides*, *Scheuchzeria palustris*, *Sparganium minimum*, *Tofieldia calyculata* and *Utricularia minor*.

4.5. THE "BRZEZICZNO" RESERVE

The "Brzeziczno" Reserve was established in 1959 with an area of 87.46 ha (FIJALKOWSKI and CHOJNACKA-FIJALKOWSKA 1982). It includes the forest lake, Brzeziczno lake, and transitional and raised peat bogs (Fig. 6). The water in the lake is dystrophic. Single species of *Chara*, *Elodea canadensis*, *Potamogeton natans*, *Phragmites communis* and rarely, other plant species, occur there. The lake is surrounded by a floating moss lawn with *Salicetum pentandro-cinereae*, *Caricetum limosae*, *Caricetum diandrae*, *Caricetum lasiocarpae* associations developed on surface, which change towards the edge of the lake into *Eriophoro-Sphagnetum* and *Ledo-Sphagnetum*, and locally *Betulo-Salicetum repentis*. On the mineral-peaty and sand substratum there occur successively *Molinio-Pinetum* and *Leucobryo-Pinetum* and fragments of *Peucedano-Pinetum*. On the whole, 13 plant associations and some subassociations were recorded in the reserve.

In the reserve, 315 vascular plants species were recorded. The following are rare to the Lublin region: *Aldrovanda vesiculosa*, *Batrachium circinatum*, *Betula humilis*, *Carex chordorrhiza*, *Carex limosa*, *Drosera anglica*, *Drosera intermedia*, *Dryopteris austriaca*, *Epipactis palustris*, *Gentiana pneumonanthe*, *Juncus squarrosus*, *Rhynchospora alba*, *Salix lapponum*, *Scheuchzeria palustris*, *Sparganium minimum*, *Utricularia intermedia*, *Utricularia minor* and *Utricularia neglecta*.

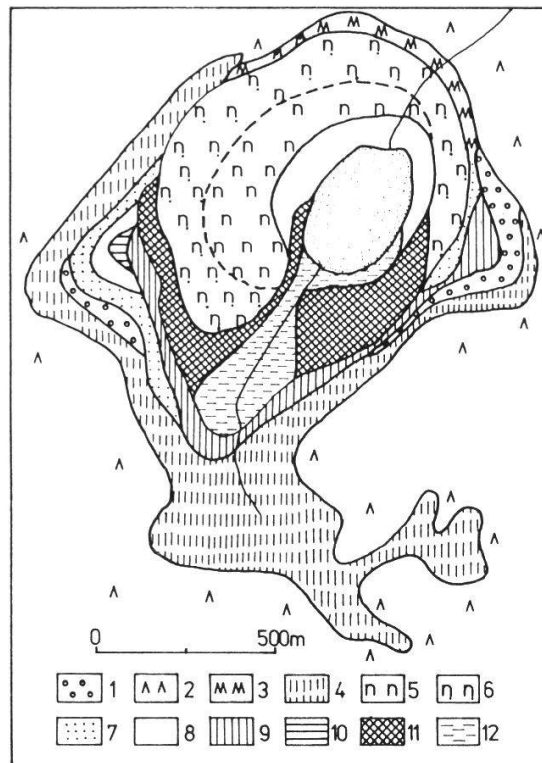


Fig. 6. Distribution of plant communities in the "Jeziro Brzezicno" Reserve. (FIJALKOWSKI and CHOJNACKA-FIJALKOWSKA 1982, modified).

1 - *Quercus-Piceetum*, 2 - *Vaccinio myrtilli-Pinetum*, 3 - *Vaccinio uliginosi-Pinetum*, 4 - *Molinio-Pinetum*, 5 - *Sphagnetum medii*, 6 - *Sphagnetum medii betuletosum* with *Phragmites communis*, 7 - *Salici-Franguletum*, 8 - *Caricetum limosae*, *Caricetum lasiocarpae* and *Carici-Agrostidetum*, 9 - *Juncetum effusi*, 10 - *Molinietum coeruleae*, 11 - *Caricetum strictae*, 12 - *Scirpo-Phragmitetum*.

SUMMARY

The Lublin Region (E. Poland), its physiography, flora and vegetation and their changes are briefly characterized. Also, brief information is presented on the following sites visited by the 19th IPE: the "Czartowe Pole", "Brzezno", "Jeziro Moszne" and "Jeziro Brzezicno" Nature Reserves, and chalk quarries in Chelm.

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