Society of Irish Foresters Study Tour to Slovakia

30th September – 4th October 2014

On Tuesday 30th September, 40 members of the Society departed Dublin Airport en route to Slovakia, via Kraków in southern Poland. At Kraków Airport we were met by Professor Ladislav Paule, Faculty of Forestry at the University of Zvolen, Slovakia, who would be our genial host and ever-patient guide and interpreter for the duration of our visit. After a brief stop for lunch, we set out for the famous Wieliczka Salt Mines, a UNESCO cultural and heritage site. Here, we marvelled at the grandeur and scale of the mine which has almost 250 km of galleries. We also learned of the strong interdependence between mining and forestry in Slovakia, the mines being enormous users of timber.

Slovakia is a very mountainous country. Its highest point is 2,655 m above sea level. Only 11% of the country is classified as agricultural land, whereas it has a forest area of 2.17 million ha or 41% of the country. However, the forest cover is unevenly distributed. Most of western Slovakia is an extension of the Great Hungarian Plain and is treeless whereas the mountainous areas, where our tour was based, can boast almost 70% forest cover. There is a long and proud tradition of forestry in Slovakia. The forestry industry here has been regulated since the early 15th century when King Sigismund decreed in 1426 that harvesting areas must be specified and prohibited the practice of "wander cutting". Beech (*Fagus sylvatica* L.) (28%), spruce (*Picea abies* (L.) H.Karst.) (24%) and pedunculate oak (*Quercus robur* L.) (10%) are the principal tree species. The country's total growing stock is 472 million m^3 (2013). The annual increment is 11.95 million m^3 and the annual harvest is 8.23 million m^3. Approximately half the annual harvest is composed of hardwoods, but the proportion is decreasing. There are also five very large national parks which cover approximately 4% of the country.

Slovakia (48,845 km^2) is less than half the size of the island of Ireland and has a population of 5.4 million inhabitants. The Tatra Mountains extend across the north and centre and there are only small areas of lowland in the south west and east of the country. Our tour was based in the town of Poprad, the gateway to the High Tatra Mountains on the first night and in Banská Bystrica in the Low Tatra Mountains for the following two nights. On our final night we were based in Vienna, close to the city's airport, in readiness for our return flight to Dublin.

Pat O'Sullivan, Tour Convenor

Wednesday, 1st October

Our tour began with a visit to the museum at the Tatra Mountains National Park, where we were shown a film on the history of the national park. It was established in 1949 and, at that time, undertook both standard forest operations and nature conservation. However 20 years ago those two functions were separated and henceforth the State Forestry Enterprise (LESY Slovenskej Republiky or LESY SR) looked after forest operations while the National Parks Service had responsibility for nature conservation.

Dr Susana Homosova then gave a very informative lecture on forestry in the High Tatra Mountains with particular reference to the challenges and problems that arose following the major wind-blow of 2004. A similar catastrophic storm had occurred 89 years previously. Normally, the climate in the High Tatra Mountains is relatively warm and dry, with low rainfall but it can become quite windy. Soils in the area are generally poor, shallow and rocky. The bedrock is granite so therefore acidic, however there are occasional calcareous hills.

In February 2004, almost 12,000 ha of forest were blown and flattened in less than 20 minutes during a storm which recorded wind-speeds of up to 200 km/hr. Many of the blown trees remained alive for almost three years afterwards so the European bark beetle (*Ips typographus*) survived and multiplied in the blown material. Subsequently they moved out and began attacking healthy, standing trees nearby, thus causing much additional damage. From 2005 to 2013 almost 7,000 ha of forest were devastated by the beetles. They have now spread into several areas of the natural forests where forest operations have never taken place. This contradicts the claim made by many environmental groups that natural forests would not have problems with insect attack as they are in a healthy equilibrium state because there is no human intervention. In 2013, the extent of bark beetle damage in the forest was assessed using aerial photography and it is currently equivalent to the extent of the original windblown in 2004. It is believed that the warming effect associated with climate change has exacerbated bark beetle problems, a number of years ago it only occurred up to an altitude of 1,200 m but now it is found at elevations of 1,400 m which is the upper tree line. The warmer temperatures have led to increased leader growth and this increases the trees susceptibility to wind damage. The number of years taken to remove the blown material, together with the reduced practice of debarking logs and recently enacted environmental legislation which prohibits debarking of blown material in protected areas, have all combined to make bark beetle damage a very serious problem for the foresters. Even today, 10 years after the storm, almost 73,000 m^3 remains to be harvested.

After our visit to the museum, we separated into two groups, with most of the group ascending the mountains with Professor Paule and others remaining below to visit the local botanic gardens. On the field trip we travelled high into the Tatra

Mountains using cable cars and ski lifts. Unfortunately, visibility was poor due to fog but Professor Paule's commentary and explanations were most interesting and entertaining. We walked through an area which had previously carried a fine crop of Norway spruce but was now being replanted with pine (*Pinus sylvestris* L.) and larch (*Larix decidua* Mill.). He also pointed out an area of mature Norway spruce which had suffered significant bark beetle damage. He stated that the problem of acid rain has declined significantly over the past 20 years as many of those polluting factories had either closed or now had effective pollution control systems installed. We saw circular heaps of brash and he explained that there is a requirement to leave between 10% and 30% brash on site for biodiversity purposes. He said that in Slovakia natural gas had begun to displace firewood for domestic heating in recent years, but now that natural gas was getting more expensive, there is a significant resurgence in firewood sales in the forest.

In the afternoon we travelled to the town of Liptovský Hrádok to visit a seed processing plant which is owned by OZ Semenoles, a state enterprise. This plant has been in production since 1923. Here we met the Managing Director, Martin Honec and the Operations Manager, Jan Sochor. OZ Semenoles buys only certified cones for processing and then sells the seed to forest nurseries throughout Slovakia. In 2014, this plant processed 127 tonnes of cones, although it has a maximum capacity of 250 tonnes. The cones are collected from approved seed-stands only and the resulting planting stock must be planted back in the same seed zone that it was collected in. In the seed processing plant a water flotation system is used to separate seed from waste material

Figure 1: *Listening intently to Professor Paule are Ted Farrell, Kieran Moloney, Gerhardt Gallagher, George Hipwell, Owen O'Neill, Stacey Bradley and Pat O'Sullivan.*

(necessary for larch and spruce) and most dead/unviable seeds sink to the bottom of the container. Each seed-lot has its own unique number, zone of origin and a record of the elevation at which it was collected. Nowadays they process seed from many species including broadleaves. Acorns are immersed in water at 42 ˚C for 2.5 hours to kill any fungi or moulds which may be growing on them. Finally, the seeds are treated with fungicide and can then be stored at -3 ˚C for up to three years. Beech seeds are also treated with fungicide and can be stored for up to five years at -7 ˚C. This facility has the capacity to store up to 50,000 kg of seed in its cold store. In the off-season they operate a profitable business processing rose hips to produce rose hip tea.

Overnight - Banská Bystrica Eugene Griffin

Thursday, 2nd October

Banská Bystrica, on the Hron River, was our base for the next two days. The city's name derives from Banská, meaning a mine in Slovac and Brystrica, meaning a fast-flowing river. In Slovakia, forestry and mining are very closely linked. In the early 19th century the ever increasing demand for mine support timbers led to an over-exploitation of forests and this threatened both the forestry and mining industries. In 1807, the Austro-Hungarian Emperor, Franz Joseph established the country's first college of forestry. It was attached to the Mining Academy in Banská Bystrica, it was later renamed the Academy of Mining and Forestry. In an interesting aside, Professor Paule explained how it was originally planned to locate the forestry college in Prague. However, Empress Maria Theresa, fearing the bohemian charms of Prague would distract the young foresters from their studies, overruled her Minister and opted instead for the more sedate environs of Banská Bystrica. As the mother of 16 children herself, she probably understood all too well the many dangers and pitfalls of exuberant youth. A case of mother knows best!!

Our first stop of the day was at the European yew (*Taxus baccatta* L.) reserve, which is located above the village of Harmanec. This is a Natura 2000 site, as the European yew is an IUCN red listed species. Yew occurs naturally in mixed forests of beech and silver fir (*Abies alba* Mill.), usually on chalk but also on other substrates. At this stop we saw examples of yew growing naturally in mixture with beech and silver fir. This nature reserve was established in 1949 following an inventory undertaken in 1948 by the great Slovakian forester Jozef Dekret Matjovie and Professor Slovad from Prague. In the 1949 inventory they had recorded 180,000 yew trees at this site but the current population has dwindled to fewer than 40,000 trees.

The exploitation of these woods was driven mainly by demands from the mining, metallurgy and glass making industries in the area. The timber was harvested for fencing, pit props and fuelwood. Yew foliage is also harvested to make wreaths to

decorate graves on All Souls feast day (1st November). Red deer (*Cervus elaphus)* browsing is an important factor limiting regeneration of the yew. Since the reserve was established and a deer management plan introduced, the reduction in tree numbers has stabilised. However further management intervention and research is necessary for this unique yew reserve to thrive.

Later we travelled further up the mountain to Rakytovce (altitude of 890 m). In the last century, the timber here had to be harvested manually and extracted using a "gravity propelled" system whereby the logs were slid down the slopes on precarious-looking timber chutes before they were loaded onto boats for transport to the sawmill. The forest roads we travelled along were built in the 1970s to facilitate the extraction of timber from these steep, difficult slopes. Initially, old six-wheel drive army trucks were used to haul the timber to the main road. Slovakia's most famous forester, Josez Dekret Matejovie, was a pioneer of forest regeneration systems and devised a variety of establishment methods. At one stage he experimented with a catapult system, which could sling 'balled seedlings' up to the more inaccessible slopes in an attempt to re-establish forests on these steep sites. He also advocated planting immediately after harvesting rather than waiting for several years, as was the practice then. The forests at Rakytovce were approximately 30 years old now and were regenerated naturally. Across the valley large rectangular plots of approx 5-6 ha were visible. These areas had been re-planted after felling as they failed to regenerate naturally. Slovakian forest law requires that regeneration with an average stocking level of 2,000 stems ha^{-1} must be achieved within seven years of clearfelling. This law dates from the time of Empress Maria Theresa in 1769. It is interesting to note that a felling licence is not required but detailed forest

Figure 2: *The Lord's Valley at Rakytovce*

management plans, drawn up by registered, professional foresters must be approved for each forest area. The earliest record of forest regulatory practices dates back almost 600 years to 1462 when "wander cutting" was banned by King Sigismund. This meant the forester had to prepare very specific details of location, area and the direction for harvesting operations.

After a traditional Slovakian lunch in the village of Staré Hory, we travelled further up to the picturesque former mining village of Špania dolina to learn of its copper and silver mining traditions which date back to prehistoric times. Archaeologists have uncovered mining tools close to this village which date from 2000-1700 BC. Copper from this region was identified in artifacts discovered in the Balkans and as far afield as Lebanon and Syria. In their day these richly endowed valleys have attracted some unusual visitors. For example, the alchemist Paracelsus established a laboratory here during the Middle Ages as he needed to be close to a ready supply of base metal for conversion to gold once he had "cracked the formula". Due to the intensity of mining and sheep grazing in this region, the tree cover began to decline during the 16th century. In 1565, Emperor Maximilian II introduced new forest laws which limited the level of sheep grazing; this marked the beginning of forest management in the area. This valley is also famous as a lace making centre. The ancient tradition of bobbin lace led to a craft school being established in 1883. In the centre of the village there is a unique covered stairway of 160 steps which leads steeply up to a fortified church built in 1294 which incorporates Gothic and Renaissance architectural styles. The church bell called the "Knocker", dates from the late 16th century and served to call the miners to work each morning. The last of the mines in the valley closed in 1888. Nowadays, large numbers of tourists come here to walk the many trails in the valley, for cross country skiing in winter and for mountain biking in summer.

Our next stop was the forest district office in the crater of an extinct volcano at Polana. On arrival we were greeted by a raging thunderstorm and downpour of truly biblical proportions. Our hosts from LESY SR, the Slovakian State Forestry Enterprise welcomed us with strong coffee, tea and local refreshments. Then we were treated to a hugely informative presentation on forest management in Slovakia by Dr. Peter Kováčik with support from Anna Sliacka and Vlastimil Rezek. The area of PEFC certified forests managed by LESY SR is currently 916,253 ha. In addition, two regions in Presov and Trencin District, comprising 86,556 ha, are certified under both the FSC and PEFC. After these presentations a lively and enthusiastic Q&A session ensued which demonstrated how much we have in common with Slovakian foresters. This session was aptly summarised by our Chairman for the day, as "a splendid evening of robust discussion and information exchange".

Forestry in Slovakia – Some basic facts	
Forest cover:	41%
Total growing stock:	472.0 million m^3
Total annual volume increment:	11.95 million m^3
Annual cut:	8.0 million m^3
Average volume increment	6.1 m^3
Annual profit:	**€10 million (2013)**

Brief history of forest regulation in Slovakia

1426 King Sigismund introduced the earliest harvesting regulations.

1550 A "central chamber" of foresters was established to manage the Royal Forests.

1565 Emperor Maximilian II formulated the first forest policy comprising 30 Articles.

1769 Empress Maria Theresa introduced a forest code: *Sylvarum conservadarum et lignicidii ordo*.

1754 A comprehensive inventory of forests was initiated.

Forest laws

1879 The first Forestry Act in Austro-Hungarian Empire. It remained valid until 1960.

1958 Forest Management Decree No. 75 - unified forest management plans introduced.

1960 Act No 166/1960 – The basis of all future Acts (based on shelterwood system).

1977 Act No 61/1977 – Legal protection of critical forest lands.

1977 Act No 100/1977 – LESY Slovenskej Republiky, the state forestry enterprise set up.

2005 Act No 326/2005 – Encouraged environmentally friendly silvicultural systems

Jozef Dekret Matjovie (1774-1841) is regarded as the father of modern forestry in Slovakia. He spearheaded the use of the saw to replace the axe in harvesting operations but is probably best remembered for his pioneering work on forest regeneration. A man ahead of his time in many respects, his motto was: "Preserve the forest for future generations because the forest is the precondition for preserving life on earth".

On cue, the thunder storm cleared and we headed out again up through the tiny village of Kyslinky to a beautiful alpine meadow where the huge scale of this ancient crater became apparent. It measures 11.2 km from east to west and 6.7 km from north to south; its highest point reaches 1,458 m. Formed 12 millions years ago, it is the largest extinct volcano in Slovakia. This area became accessible as recently as the late 1970s when roads were constructed. At the viewing point, Head Forester Jhan Ostrolucky described the management of his 3,800 ha forest. There are five foresters who work in Harvesting,

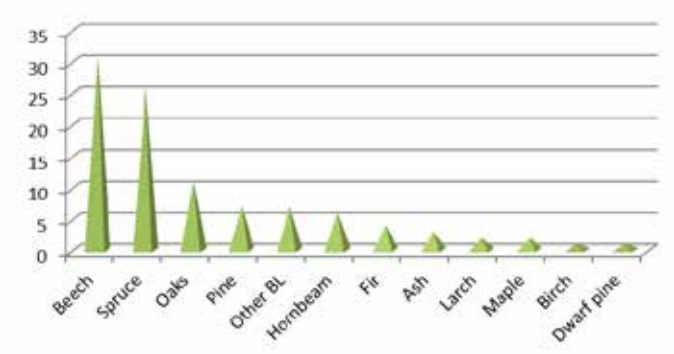

Figure 3: *Species composition of Slovakian forests.*

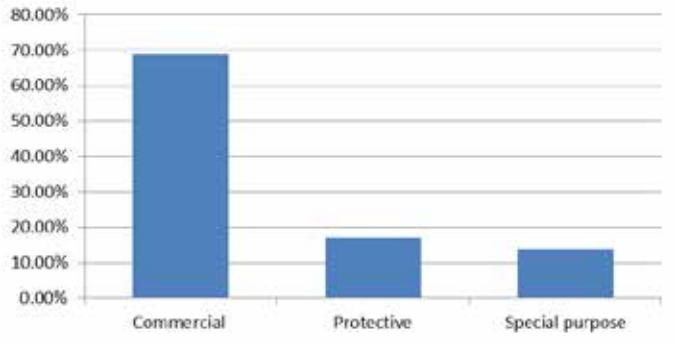

Figure 4: *Main categories of forests in Slovakia.*

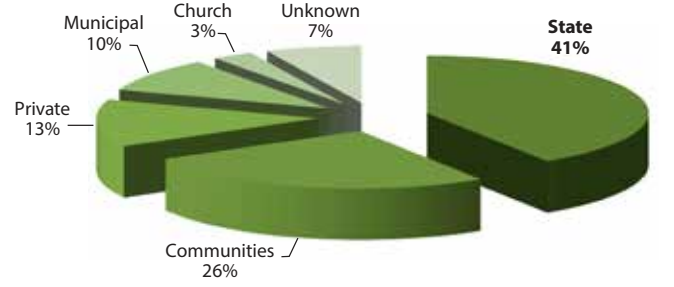

Figure 5: *Forest ownership in Slovakia (2013).*

Establishment and Planning functions and they employ contractors, who are mostly former state forest workers, to carry out all forest operations. On these steep slopes horses are used extensively for extracting thinnings and cable systems for extracting clearfelled timber. Machines are now beginning to play a greater role in harvesting with specialized processors and forwarders used where conditions are suitable.

Figure 6: *Alpine meadows at Polana in the Tatra Mountains.*

Control of poaching is the most difficult and time consuming part of the forester's job. Poachers are classified into the following three categories: food, recreation and business. Those in the latter category are the most difficult and dangerous to control. Forests in Slovakia are home to large populations of red deer (*Cervus elaphus)* which are culled as part of forest management. Red deer meat currently sells for €2.00 per kilo. The state forestry enterprise offers hunting leases to properly organised and accredited hunting clubs. There are 60,000 registered hunters in Slovakia. The brown bear (*Ursus arctos*) is also found here and is hunted under licence. The wolf is present in almost 40% of Slovakia, with the highest concentrations in the mountainous northern, central and eastern areas. It is estimated that the current population of wolves is between 300 and 400. The wolf is a protected species in Slovakia and if it kills domestic or farm animals the state must compensate the farmer. Wolves are hunted from 1st November to 15th January and the annual quota is decided by the Ministry of Agriculture. Packs of wolves can travel up to 20 km per day through their territory. Unlike the Brown bear, wolves are not known to attack humans. The forester's song in this locality is "On Polana Mountain the wolves are calling".

Overnight - Banská Bystrica Kieran Moloney

Friday, 3rd October

We departed our hotel in Banská Bystrica for the open-air forestry museum at Čierny Balog. Here we were welcomed by Dr. Michal Kofira, the museum's General Manager, together with Peter Kováčik, Vlastimil Rezek and Anna Sliacka, our friends from the LESY SR whom we had met the previous day at Kyslinky. The main aim of the museum is to educate the public about forests and their history, the work of the forester and especially,

the many important societal benefits of forests. The museum was established in 2003 and it has since been extended to an area of 150 ha. It is designed to present information on forestry and forest operations in all regions of Slovakia, not just in the Ore Mountains where it is based. In Slovakia every 5,000 ha of forest has a forest officer, five foresters and two forest technicians who are responsible for all silviculture and harvesting operations within their area.

The museum trail features 80 well designed interpretation panels and, while the focus is primarily on educating children, it is nevertheless accessible and interesting to visitors of all ages. Pride of place goes to the vintage "forest railway" which runs throughout the museum. Once used for hauling timber down from the remote and poorly roaded Ore Mountains it has now become a popular attraction for tourists, as it is no longer economical to transport timber by train. Each year, in early July, the foresters organise a special "Day of Trees" at the museum when local dignitaries plant trees and there are also community sports, treasure hunts, orienteering, archery and tree climbing competitions. Most of the day's activities are directed towards children as they hold the future of Slovakia's forests.

The museum also displays an impressive collection of old forestry machines, including a working skyline system; it even has a vintage helicopter which was used for fire fighting duties during the 1970s. There is replica of a beautiful 18th century wooden church which is clad with the bark of European silver fir. The highlight of our visit was undoubtedly a superb display of old-time "horse-extraction" of timber. Here the more "senior" members of our group watched, nostalgic for times past, while the younger members stared in awe at the precise control and skill of men and horses who knew intuitively what to do …… and not a single control panel in sight!

Figure 7: *A display of horse extraction at the open-air forestry museum at Čierny Balog s.*

The museum also features a charcoal making display. In its day, charcoal was as important as oil in today's economy. However, charcoal making was a seven day operation and the charcoal workers had to remain on site for the duration. It was difficult, dirty work and these men usually moved on to easier work when they reached their early fifties. The museum has an original 19th century forester's house. A well-constructed wooden building, it provided comfortable accommodation for the forester and his family and also served as the local forest office. Nearby were stables and barns for the forestry horses and storage of the tools and equipment. An interesting aspect of the museum was a small tree nursery which produced the main species of trees found in Slovakian forests – beech, spruce, oak, European larch and silver fir. It also featured seed beds and lined-out or transplanted seedlings – once again the practical display helping to make the work of the forester more easily understood by the many visitors. Current forestry issues, such as the damage caused by the spruce bark beetle, were displayed along the museum trails. They had examples of pheromone traps on site and information boards with details of the damage the bark beetle can do. All displays were designed to give visitors a greater appreciation and understanding of the foresters' work and the problems they encounter in managing their forests.

An interesting exhibit at the museum is a replica of the largest European silver fir in Slovakia. This tree grew in Dobroč primeval forest which was established as a reserve in 1913. When it died in 1966, the tree was 59 m tall with a diameter at breast height of 192 cm and a volume of 58 m^3. Here the tour leader, Professor Ladislav Paule explained the growth cycles of spruce, silver fir and beech in the primeval forest. On average, silver fir survives for 400 years, beech for 200 years and spruce for 300 years. A light demander, spruce is opportunistic and finds space in forest openings to ensure its survival. Studies

Figure 8: *The foresters' shrine at Čierny Balog.*

undertaken in primeval forests conclude that the minimum extent of the primeval forest is determined by the area in which these developmental phases remain constant. Thus for the mixed primeval forest the minimum area is about 40 ha, for spruce 70-80 ha, for beech 30 ha and for oak 20 ha. Our final stop was at a woodland shrine dedicated to the memory of Slovakians who lost their lives while working as foresters in different parts the world – a poignant moment which served to remind us that forestry is still a dangerous profession.

We then thanked our generous hosts and returned to Banská Bystrica for lunch before setting off on our long journey to Vienna, passing through many densely forested valleys before crossing the broad and treeless agricultural plains of south western Slovakia.

Overnight – Vienna John Mc Loughlin

Saturday, 4th October

We departed our hotel and headed for Vienna's Schwechat airport to begin the final leg of our journey home to Ireland.

Tour Participants:

Stacey Bradley, Pacelli Breathnach, Patrick Carroll, Philip Comer, John Connelly, Robert Dagg, John Dungan, Edward Farrell, PJ. Fitzpatrick, Jerry Fleming, Gerhardt Gallagher, Tony Gallinagh, Sean Galvin, Eugene Griffin, John Guinan, Tomas Hanrahan, George Hipwell, Mark Hogan, Kevin Kenny, Tony Mannion, Pat McCloskey, Tom McDonald, Jim McHugh, Willie McKenna, John Mc Loughlin, Kieran Moloney, Liam Murphy, Frank Nugent, Benny O'Brien, Michael O'Brien, Peter O'Brien, Kieran O'Connell, John O'Connor, Liam O'Flanagan, Maureen O'Flanagan, Paddy O'Kelly, Owen O'Neill, Tim O'Regan, Pat O'Sullivan, Trevor Wilson.

Figure 9: *The forest train at Čierny Balog – one of a series of stamps celebrating Slovakia's forests which was issued in 2005.*