

Society of Irish Foresters 74th Annual Study Tour to Western Poland

11th – 14th September 2017

On Monday, 11th September, forty-three members of the Society of Irish Foresters departed Dublin Airport to begin the 2017 Study Tour to Western Poland. This was the Society's second study tour to Poland, the first being in 1995 when we visited Eastern Poland.

We were met at Poznań airport by Tomasz Maćkowiak, our host and guide for the duration of the trip, who brought us to our accommodation near the town of Puszczykowo about 12 km south of Poznań. We were based at Lesny Osrodek Szkoleniowy, a centre owned and managed by Lasy Państwowe, the State Forest Service of Poland. Tomasz proved to be an excellent guide and had compiled a top class programme for our study tour. After settling in, we were invited to attend an introductory lecture on forestry in Poland which was presented by Tomasz Markiewicz, Region Director, Tomasz Maćkowiak and Monica Kubiak.

Poland is a democratic parliamentary republic. It has been a member of the European Union since 2005, though it is not a member of the Euro zone. Poland is 312,679 km² in extent, making it almost four times larger than the island of Ireland. It is a mainly flat country. The centre and north of the country lie within the North European Plain while to the south lie the Carpathian Mountains with the highest peaks of the Tatra Mountains massed along Poland's southern border. With a population of more than 38.5 million people, it is the sixth most populous state in the EU. Forests cover 29.5% of its land area making Poland the fourth most forested country in Europe – and its forest cover has been increasing steadily since the end of World War II.

The state owns and manages 77% of Poland's forests (almost 7.6 million ha) which are spread over 430 districts and 17 regional directorates. The state forests are the responsibility of the Minister of the Environment who nominates the Director General. State forestry in Poland is self-financing and receives no state funding. If they make a profit it is invested in the National Forestry Fund which is a ring-fenced, rainy-day fund for catastrophic events like the recent storm which felled more than 8.1 million m³ of timber in a single night. State forests also provide recreation facilities, nature conservation and fund forest research. Since the end of World War II Poland's forest area has increased by 2.5 million ha. Timber supply has increased by 100% in the last 20 years alone. Today, timber production is almost 40 million m³ per annum. Around 83% of all timber produced by the state forests is sold online; any unsold

lots are auctioned later, also online, however the most valuable timber, such as oak, is auctioned in the forest. Poland's state forests employ almost 25,000 foresters in addition to 50,000 contract workers who carry out planting, timber harvesting and forest protection operations. Overall 300,000 people are employed in the wider forest industry in sawmilling, paper-mills and the furniture industry.

The remaining 23% of Poland's forests are privately owned; 18% are designated National Parks, 2% as "other" state forests and 3% private. The main tree species are Scots pine (*Pinus sylvestris* L.; 60%), oak (*Quercus* spp.; 8%), birch (*Betula* spp.; 7%), spruce (*Picea abies* (L.) H. Karst.; 6%), beech (*Fagus sylvatica* L.; 6%) and alder (*Alnus* spp.; 5%). It is planned to increase the area under oak, mainly through replacing unthrifty¹ pine stands, which were often planted on inappropriate sites in the past.

Throughout our study tour we were treated royally and received wonderful hospitality from our hosts who had prepared a comprehensive programme covering all aspects of the forest cycle. We are most grateful to our hosts in the State Forest Service for their professionalism and attention to detail at all stages of our visit.

Pat O'Sullivan, Tour Convenor

Day Two: Tuesday, 12th September

On the first day of the tour we visited the Jarocin Forest District for a tour of its impressive forest nursery where we met with the nursery manager, Gregor Musicla, the Nursery Specialist and Jacob Wojdecki, the Ecological Education Specialist. Mr. Musicla explained that their three main functions here are seed extraction, nursery production and quality control, all of which are done on this site. The seed extraction unit was built in 1993 and currently extracts seed from 180 tonnes of cones (mainly Scots pine) per annum. In recent years they have begun working with oak and other broadleaved species. 90% of the cones they harvest come from selected seed stands in State forests, 80% of the cones are collected from felled trees and 20% are collected by climbing. Cones are harvested from November onwards and they are delivered to the seed extraction unit during the following February and March. The local forester has responsibility for collecting the cones and the supervision of contractors/local workers. Poland is divided into different "seed areas" and the plants that go back to a particular region of the country would have been grown from seed which originated in that region. The seed unit likes to maintain a three to four-year supply of cones to ensure a reliable annual supply of seedlings.

The first operation in the process is a mechanical cleaning which separates the needles and other debris from the cones; damaged cones are removed manually. The cones are then stored at 6 °C and 75% humidity in large black metal boxes which

¹A stand of low vigour or productivity.

contain 300 kg of cones. Each box is individually labelled to record its area of origin. The cones are then opened by spreading them in grey metal boxes (to a maximum depth of 12 cm) and these boxes are stacked in a heated chamber at a temperature of 35 – 45 °C depending on the species being treated. Once the seeds have been extracted from the cones they are placed in water and then in a machine which causes the wings to break off by centrifugal force. The seeds are then dried for 50 minutes to prevent premature germination and finally they go through an airflow separator which separates the bad seeds from the good by differential weight. The seeds are then stored at -10 °C until they are required for sowing. They do not store the seed for more than three winters.

We then visited the forest nursery. It produces 3.5 million containerised plants per year, of which 3 million are oak. The production cycle for oak is one year. Prior to sowing, the acorns are stored in 80 kg barrels at -3 °C and each barrel has a central pipe to allow the carbon dioxide produced to escape. The containers are filled with planting medium by machine and the acorns are also sown mechanically, however the smaller seeds of beech and maple are sown manually. The medium in each container is 25% perlite and 75% peat moss with some added fertiliser. The nursery's production line, which is operated by six staff, has a capacity of 100,000 containers per day but it normally runs at 60,000 per day. The machine makes a slight cut in the acorn and a camera checks for disease or damage before sowing them. The containers are then stored in large polytunnels at a temperature of *at least* 0 °C; below 0 °C oak produces roots and at 0 °C it is capable of shoot development. In late April or early May the containerised plants are moved outside.

We were shown the root system of some containerised seedlings. They had very good taproot development with little lateral rooting and an excellent root/shoot ratio. There is a very high strike rate for these seedlings when planted in the forests. The main threat to them comes from wild boar so fencing of reforestation areas is essential. The rotation lengths for oak, beech and Scots pine are 150, 140-160, and 100 years, respectively. A general concern is that in Poland the springs are becoming progressively drier. While bidding us farewell Gregor said that the Irish soccer fans were the best in the world and did our country proud in their recent visits to nearby Poznań!

Jacub Wojdecki accompanied us for the rest of the day. As we travelled to our next stop at Czeszewo we saw some of the damage caused by the recent wind storms. Almost 1,500 ha of forest were damaged (total District area is 24,000 ha) and they estimate that 200,000 m³ of timber were blown. The District normally harvests 60,000 m³ per annum so they intend to harvest 100,000 m³ of blown material during each of the next two years. This was the first severe storm in the history of Jarocin Forest District.

When we arrived at the Forest Education Centre at Czeszewo we were met by two



Figure 1: *Root system of a containerised beech seedling.*

foresters, Marek and Huber, who welcomed us with a rendition of Polish folk tunes on the French horn. In the past, each forest district in this part of Poland boasted its own “forestry band” and it is hoped to revive this tradition. This education centre receives 10,000 visitors annually, comprising retired people, students and many school groups. This ornate building was constructed at the end of the 19th century and because it is on the banks of the Warta River, it was originally used to store salt which was transported down the river on barges. When the Germans invaded Poland in September 1939 it saw service as a base for German foresters. After World War II it served as headquarters of the Czeszewo District until 1972 when that district was amalgamated with two other districts to form the Jarocin District. The Education Centre was established in 2004 and it also houses the local forest office. It is now a protected heritage building so no structural changes are allowed. Upstairs in the Environment Room is a magnificent 3-D scale model of the 220 ha reserve area which features a system of coloured lights indicating the location of the habitats of different species of flora and fauna. A major challenge for the reserve is to maintain water levels and in 2011 they had to construct



Figure 2: Head Forester Piotr Huber greeted us on arrival at the Forest Education Centre at Czeszewo.

a retention dam around the perimeter to ensure the integrity of the reserve. It is a Natura 2000 site and is one of the most important in Poland as it is home to many protected species such as the White Tailed Eagle and Black Stork. The reserve is home to 75 different species of nesting birds including six of the ten species of woodpeckers found in Poland. In 2005 the Forest Education Centre at Czeszewo began publishing an educational newsletter of which 10,000 copies are circulated each month.

After a hearty lunch we travelled across the River Warta on an ingenious, 50-year-old ferry which is water-powered and operated by a system of wire ropes and pulleys. Jacub explained there are three educational trails in the reserve and there is no charge for visiting here. We saw some very impressive 250-year-old oaks which are protected; ironically, a wood boring beetle which is causing severe damage to them is also a protected species. Some years ago the nearby town of Czeszewo built a new reservoir and this has significantly reduced the amount of water coming into the reserve. In 2009 the foresters constructed additional dams along the river which allow the water to flow, via a non-return valve system, into the reserve to boost water levels, however the annual operating and maintenance costs are quite high and they may not be able to fund it in the future. They may just let nature take its course with the result that water levels will drop and species such as willow and poplar will be replaced by oak and ash.

Eugene Griffin

Day Three: Wednesday 13th September

On our second day, we headed for Krotoszyn, which is located 92 km to the south east of Poznań, accompanied by our hosts, Tomasz Maćkowiak and Monika Kubiak. On arrival at the forest office in Krotoszyn, we were welcomed by Stawomir Trawinski, Forest Manager of the Krotoszyn Forest District.

In the meeting room of the impressive new district office complex (860 m²), over lavish refreshments, Mr. Trawinski presented details of Krotoszyn Forest District which extends over an area of 19,328 ha, of which 18,135 ha is forested. The remaining 1,193 ha is farmland that is leased to farmers. Formerly there were three districts here, but these have been amalgamated to create Krotoszyn District which is part of the Region Directorate of Poznań. Krotoszyn District comprises 13 forests which range in size from 1,200 ha to 1,700 ha. There are 70 employees in the district - 50 professional foresters and 20 support staff. All forest operations are carried out by contractors. In addition to managing the forests, the district also provides an advisory service to farm foresters in the district.

The soil in this area is a fertile, heavy loam and 77% of the area can carry broadleaved plantations. However, despite this fertility, the principal tree species are Scots pine (48%), oak (*Quercus robur* 30%) and other broadleaves (22%), mainly ash, hornbeam (*Carpinus betulus* L.), poplar (*Populus* spp.) and birch. Changing climatic conditions, particularly a reduction in annual precipitation, are beginning to impact adversely on oak production. During the past 60 years, annual precipitation has reduced from 600 ml to 400 ml. As a result, many of the oak are dying. Windstorms are not generally a problem. The district is quite heavily used for recreation and education purposes. Much of it lies within a Natura 2000 programme (Bird Directive). This presents challenges in the planning of work since impact assessments must be carried out in advance. The district also manages two high quality hunting areas, so the foresters must also try to balance forest management and the needs of the hunters. It is especially popular with foreign hunters (mainly German and Italian) because of the quality of the hunting. Last year 300 wild boar, 140 fallow deer, 60 stags and 250 roe deer were shot.

An important event in the district's calendar is the annual auction of oak which always takes place on the third Thursday of January. The Krotoszyn oak is highly prized for its quality and buyers come from Poland, Estonia, Germany and Austria. Trees for the auction are selected during the year and felling takes place from September onwards. The number of trees offered for sale is governed by the district's 10-year Management Plan and supply is strictly regulated to ensure that only the best stems are offered for sale each year. Extraction is by tractor, skidder and forwarder. The auction takes place in the forest where each log is marked and numbered and laid out sequentially. In addition, details of each log such as mid diameter and length are

recorded. This makes it easier for customers to assess each log. Top quality veneer logs are sold individually while lower quality logs are sold in lots of four to five logs. Between 1,000 m³ and 1,200 m³ of oak is auctioned at each year. Approximately 700 m³ comes from the Krotoszyn Forest District and the rest comes from adjoining districts. Prices range from €585 to €820 per m³ while top quality veneer logs can achieve a price of €1,200 per m³.

Following the presentation, we set off to visit the oak forest which is located approximately 20 km north east of Krotoszyn. Our guides were Mr Jan Galezki, Mr Przemyslaw Swierblewski and Mr Marek Szymaivski. This forest, which now covers an area of 4,800 ha, was established in the 1890s when the acorns were sown directly into the ground. Our first stop was in a mature area of the forest. Approximately 50 m³ of veneer quality oak logs are produced per hectare and the logs average 1.1 m³ each. The average length of clear stem is 5 m and the maximum length is 10 m. Both clearfelling and shelterwood regeneration systems are used. Clearfelling is used in areas of pure oak and the coup size is capped at 3 ha. The shelterwood system is used in areas of the forest where the crop is being restructured. Small “regeneration gaps” are created in the canopy and then natural regeneration or planting is used to reforest these areas. The stocking level of the oak at clearfelling stage is 100-120 stems per hectare. In the past the rotation length was 180 years for veneer quality oak, however



Figure 3: Oak logs presented for the annual auction which is always held on the third Thursday of January.

this has recently been reduced to 160 years as the oak is suffering from a reduction in precipitation which has fallen from 600 to ≤ 400 ml per year and this is beginning to exert an adverse impact on the health of the stands.

Since 1997 the foresters have closely monitored the health of the oak in the district using eight plots of 50 trees each. Only trees more than 100 years old were selected for monitoring and the plots are assessed twice a year. The monitoring system is based on a “five-point” health scale where a score of 0 represents the healthiest trees and 5 the poorest trees. Since 1997, 20% of the monitored trees have died and the overall health rating has declined by one point on the five-point health scale. The criteria assessed are defoliation, straightness of stem and condition of the stems. Hornbeam is regenerating naturally as an understory species.

Our second stop was at a soil profile pit in a seed stand in the forest. To our surprise it was a heavy clay soil overlain by a humus layer. The A horizon showed typical leaching of nutrients with deposition lower down the profile, the distribution was quite diffuse and mottled and there was no evidence of iron pan formation. However, the leached clay forms an impervious layer at a depth of about 0.7 m which severely restricts rooting. As a result, the oak tends to have a shallow, palmate rooting structure. Despite this, stability is not an issue here and trees can reach a height of 40 m because the close crowns and absence of leaves in winter ensure stability. Water from rainfall



Figure 4: Gerry Murphy and Mark Hogan admiring the premium quality oak trees at Krotoszyn.

and snowmelt accumulates on the surface but with summer temperatures of 25 °C to 30 °C, the water evaporates, and the soils dry out. There is no ground water supply and the scarcity of water in summer is severely retarding the growth of the oak. In this area the oak has 6-7 rings cm⁻¹. Even though the ground is quite fertile (pH 4) natural regeneration is failing due to lack of water. The acorns do germinate but the seedlings die after about two years. As a result, this area of the forest will be clearfelled and replanted manually.

On our way back to the bus, we were shown an ingenious, traditional method of protecting young oak from waterlogging and deer damage. A large mound was created and 21 oak were planted on the mound. The raised level of the mound afforded protection from waterlogging and the outer ring of oak seedlings protected the oak in the centre from deer browsing. This method has now been replaced by deer fencing and modern ground preparation methods. At our next stop we saw natural regeneration of oak in a 30-year-old stand. To avoid soil compaction by machines no ground preparation is allowed. The acorns were allowed to fall and grow naturally. When the forester is satisfied there is a sufficient stocking of oak seedlings, the “parent trees” are removed and young oak are planted in their place. However, natural regeneration of oak is now a minority practice. Our next stop was a more typical regeneration site where the oak was planted on mounds in 2006. Herbicide is applied before planting only and subsequent cleanings are done manually at 4 to 5-year intervals. Up to age 20, several pre-commercial thinnings are carried out. These entail the removal of competing woody vegetation such as birch and unhealthy or very crooked oak stems. This allows improved access for selection of final crop trees. At an adjacent, recently planted site where one row of Scots pine was planted between every two rows of oak, it was stressed that the critical factor is not to let the pine grow taller than the oak. When the pine begins to compete for light with the oak the top of the pine is cut back. The oak also benefits from the side competition of the pine. After three or four such treatments, any remaining pine is then removed, leaving a pure stand of oak.

Our sixth stop was at a site which was being scarified in preparation for planting. This model of scarifier leaves the soil in small ridges so the site consists of a series of ribbons and furrows. The scarifier itself has a row of knives on a rotating hub. Scarification takes 20 machine hours per hectare and the knives need to be replaced every 2 ha on average. A mulcher is used if there is a lot of branch-wood on the site. The raised planting medium provides both aeration and protection from water logging in the spring. Despite the ribbon pattern of ground preparation, the foresters expect to get a normal rooting pattern.

Our final stop of the day was at a 17-year-old oak plantation. The planting density here was 4,000 Scots pine plus 4,000 oak per hectare and the Scots pine was cut back



Figure 5: Scarification of the site in preparation for planting.

whenever it began to out-grow the oak. At this stop, the Scots pine has been completely removed leaving a stocking rate of approximately 3,500 oak per hectare. The cost of removing the pine was €175 to €200 per hectare. Pre-commercial thinnings were carried out at age 5, 10 and 15 years. Thinning will commence at 20 years and will continue on a 10-year cycle. Final crop trees are selected when the crop is 25-30 years old and all subsequent thinnings will favour these trees. Approximately 50% to 60% of the mean annual increment will be removed in each thinning. The cardinal rule is to always serve the silvicultural needs of the crop.

Thus, we came to the end of a most interesting and informative day. Demonstrated by a series of well-selected stops and explained in a simple and practical fashion by confident professional foresters, it removed the mystery of growing top quality oak. The management of oak/pine mixtures was very relevant to many of the young broadleaved plantations in Ireland.

Pacelli Breathnach



Figure 6: *At Krotoszyn the Forest Service provided a lavish lunch at a well-maintained picnic area.*

Day Four: Thursday 14th September

We headed to Poznań airport to begin our journey back to Dublin.

Tour Participants: Marie Aherne, Chris Barnett, Pacelli Breathnach, Neil Browne, Ken Bucke, Dermot Cantwell, Philip Comer, John Connelly, Robert Dagg, Padraig Dolan, Katharine Duff, Clodagh Duffy, P.J. Fitzpatrick, Jerry Fleming, Gerhardt Gallagher, Tony Gallinagh, Eoin Glavey, Eugene Griffin, George Hipwell, Mark Hogan, Tim Hynes, Joss Lowry, Tony Mannion, Gerry Mawn, John Mc Loughlin, Tom McDonald, Jim McHugh, Gerard Moroney, Gerry Murphy, Liam Murphy, Frank Nugent, Benny O'Brien, Michael O'Brien, Peter O'Brien, P.J. O'Callaghan, Kieran O'Connell, Mark O'Loughlin, Owen O'Neill, Tim O'Regan, Pat O'Sullivan, Gerry Riordan, Richard Whelan, Trevor Wilson.