

## **Society of Irish Foresters**

### **Study Tour to Croatia 9 - 16 September 2009**

On Wednesday, 9 September, 30 of the Society of Irish Foresters departed for Zadar, Croatia to begin the 66<sup>th</sup> Annual Study Tour. The group was welcomed at Zadar airport by our tour-leader, Ratko Matošević, of the Croatian Forest Service.

The total area of Croatia is 5.6 million (ha), of which 2.4 million ha (43%) are under forest. The State and its agencies manage 81% of the resource while 19% is privately owned. Total roundwood production in 2006 was 3.5 million m<sup>3</sup>, with exports of 361,000 m<sup>3</sup>. Exports of hardwood lumber typically include 50% beech, 30% oak, and 6% ash. Panels and veneer are also exported and Croatia is starting to increase its output of value-added products via foreign private joint ventures. Over 35% of timber products are exported to Italy.

Forest certification is now a major issue in Croatia. This was discussed during our visit especially in Hervatska Suma where FSC was introduced in 1991. By early 2002 approximately two million ha of Croatia's forests were FSC certified and in 2007 Croatia's certificate was renewed for a further five years.

Croatia's widespread practice of "Close to Nature Forest management" helped in securing FSC certification. Initially there was some resistance to the introduction of FSC certification from some forest districts but forest certification is less controversial now. The key driver for Croatia was its valuable export market for good quality hardwood timber, mainly to Italy with re-exports to the "IKEA" market in the UK and Benelux<sup>1</sup>.

Under Croatia's certification scheme, 15% of the forest area must be set aside for biodiversity. Implementing these biodiversity requirements has been a problem at times e.g. in the Deluice region with mortality spreading among the fir trees, it had not been normal practice to retain decaying trees as "Dead Wood", as they became breeding sites for bark beetles.

#### **Thursday, 10 September**

The 40,000 ha Musapstan forest was planted during the Italian occupation in the early 1940s. The local forester Mislav Maršić explained that the main species are: umbrella or stone pine (*Pinus pinea* L. -34%), aleppo pine (*Pinus halepensis* Mill. -24%), Italian cypress (*Cupressus sempervirens* L. -22%), and holm oak (*Quercus ilex* L. -20%). The forest is classified as "borderline" Mediterranean. The area is very prone to forest fires and forest management regimes are dictated by forest fire protection requirements. The forest has 30 employees and a further 35 seasonal employees. An important aspect of their work is fire prevention and control.

There is very little timber harvesting – approximately 60% of the forest area is classified as degraded and no harvesting is carried out here. The remaining 40% is

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<sup>1</sup> The Benelux is an economic union in western-Europe comprised of three neighbouring countries, Belgium, the Netherlands and Luxembourg.

harvested. There the primary forest management objective is to remove the introduced species and plant native species under high forest. Coupes of 4–5 ha are harvested and planted with pioneer species such as Aleppo pine and Crimean pine (*Pinus nigra* subsp. *palasiensis* (Lamb.) Holmb.) with a view to improving conditions for native tree species. Silvicultural practice includes the removal of the pioneer species to allow native climax species to establish either through natural or artificial regeneration.

Forest fires are a major problem in this part of Mediterranean Croatia. The intensive forest roading system serves the dual purpose of facilitating speedy access and preventing the spread of forest fires. The main objective of the fire fighters is to act quickly before the fire spreads to the tree canopy where it is virtually unstoppable. Volunteer fire-fighting brigades are located in each village and are assisted by the army when tackling very large fires. In the Zadar Forest District and other regions, the spread of fires is assisted by the *bora*, a very strong, cold, north-easterly wind which can reach hurricane strength. Following severe fires, there is an increased danger of soil erosion. Normally this region receives an average of 700 mm of rainfall per annum, most of which falls in winter and there is a period of three to four months of very dry weather during the summer when forests are most at risk from careless forest users.

Approximately 60% of the forests in this region are classified as “degraded” and are typified by a very fragile ecosystem. The process of degradation is a gradual progression from high forest to scrub and seedlings, due to intense grazing, mainly by cattle and goats. With the exception of juniper (*Juniperus communis* L.) all the tree species are susceptible to grazing. Degradation is quickly followed by soil erosion and eventually only bare rocks remain. In recent years, there has been a significant drift of the local population into the towns so the extent of forest degradation is reducing. However, there are plans to build and develop recreational facilities here e.g. walking trails and mountain bicycle tracks, which will place further pressure on soil and emerging fauna, if not carefully managed.

Approximately 75% of the forests are owned by the state and the remaining 25% are privately owned. The average size of privately owned forest holdings is 0.4 ha. The land is very valuable for development because of its proximity to the city of Zadar and the Adriatic Sea. Forest land owned by the Republic of Croatia is managed by Hrvatske Šume, the state forest service. During the period 1945–1947, the communist government nationalised the land and now descendants of the original owners are entitled to the return of their land or to receive compensation in lieu. To date, approximately 5% of the land area has been returned to its original owners, including almost 7,000 ha returned to the Catholic Church.

The private owner’s main sources of revenue are from the sale of fire-wood and hunting – mostly small game. The wolf population is increasing in Croatia and as the wolf is a protected species, the forest owner is fully compensated for all damage caused by wolves.

An interesting aspect of the Croatian economy is that 0.07% of all company revenues (not just profits) are “ring fenced” to finance the forest budget. This amounts to €35 million annually. In the Zadar Forest District most of it is spent on forest fire prevention measures and the restitution of unproductive forests.

## Friday, 11 September

We headed north through the Karlovac area to the Slunj Forest office where we were welcomed by District Officer Zelsko Roddulie. He briefed us on aspects of forestry in this part of Croatia. While beech is the most common tree, oak (both sessile and pedunculate) is a more valuable species. Conifers make up about 15% of the forest area, comprising mainly common silver fir (*Abies alba* Mill.), Norway spruce (*Picea abies* (L.) Karst.) and Austrian pine (*Pinus nigra* Arnold.). Most of the forests are natural or semi-natural.

The State Forest Company, Hrvatske Sume, has 9,000 employees and is divided into 16 Regions and 173 Forest Offices. The forest sector has an annual turnover of €300m but recently, because of the global economic downturn, has become unprofitable.

Oliver Vlawic, who is Vice President of the Society of Croatian Foresters, informed us about the Slunj forest and the surrounding area. Apparently, the population has declined from 15,000 about 100 years ago to 6,000 today. However, people have been drifting back to the area after the War of Independence (1991–1995). We then toured the nearby village of Rastoke which had mills powered by the many waterfalls in this limestone area. Our guide, Maria Jazbec, told us that the village architecture was protected and that any alterations or repairs to houses must be approved in advance by the local Council. Many of the houses and the nearby bridge were damaged during the war.



**Figure 1:** *The village of Rastoke.*

Having left Rastoke behind us, we visited an area that has regenerated naturally. The foresters, Zelio Simunovic and Dejan Toljan, outlined the plans for the region. An area of 133 ha was clearfelled, which is very large by Croatian standards, but the area was not worked on for some time as it was feared that there were land mines on the site. The crop removed was 160-year-old oak which was much older than the normal rotation. The regeneration period allowed was 10 years. A preparatory cut was first carried out in which 30-40% of the stems were removed, allowing more light onto the forest floor to encourage further regeneration. This thinning also resulted in a better yield of acorns. The better trees were left and when a good seed year occurred, the clearfell was completed. Where regeneration was poor acorns were imported and spread manually. On this site 80 tonnes of acorns were used.

Tending takes place for the first few years and species such as hornbeam (*Carpinus betulus* L.) are removed as they tend to suppress the oaks. In Croatia, hornbeam is rarely allowed to grow to maturity. When the young oak reach a height of approximately one metre, there is little further intervention for the next 10-15 years. Then the more poorly formed oaks are gradually removed. A small number of hornbeam are retained as an understory which helps to keep the lower boles of oak free of epicormic shoots. In Croatia, beech is generally kept separate from oak as it is too aggressive a competitor.

We then visited a beech forest and were welcomed by foresters Zvonho Piužic and Krundoslav Biscan. The beech stand was 42 ha in extent and was 110-years-old. It had already received a thinning in 2008 when 3,100 m<sup>3</sup> were removed. Over the next seven years there will be up to three further thinnings. The final felling is carried out with great care to avoid damage to the regeneration; skidders are restricted to existing tracks. Following an excellent lunch we travelled east to Zagreb.

### **Saturday, 12 September**

We visited the headquarters of the Society of Croatian Foresters in Zagreb where we were welcomed by the Secretary, Damir Delac. Founded in 1846, the Society is very proud of its long tradition. It is the third oldest society in Europe – only those in Baden-Württemberg in Germany and Switzerland are older. The building is owned by the Society and used to house the university's faculty of forestry for many years. The faculty has a renowned school of forest management which is based on natural regeneration. It has been publishing a scientific journal for 133 years, as well as many books and literature on forestry in recent times. It has 3,000 members in four sections:

- Pro-Sylva;
- Biomass;
- Ecology;
- Forest Protection.

We then proceeded to the Medvednica Mountains to the north of the city. These mountains overlook and dominate the city of Zagreb. There we were welcomed by

Hubert Krauthacker who told us that they have the same problems in Zagreb as in any city forest; mainly people-pressure and vandalism! The most contentious management issue is always harvesting. However, the park is highly regarded by the public as it is a very people-friendly forest/nature park with good signage and pathways, including some trails designed for wheelchair users.

The total area of this forest is 22,500 ha, of which 16,500 ha are forest and the remainder comprises meadows and ski slopes. The state owns 8,500 ha of the forest and the balance is privately owned, mainly by the Catholic Church. Over half the forest is composed of beech while oak, silver fir and Spanish chestnut (*Castanea sativa* Mill.) are also prominent. We visited a sawmill which was closed in 1972 but has been skilfully converted to a museum and coffee shop. This sawmill used to produce wooden wheel-barrows for the Russian market after World War II!

The Medvednica mountains rise to a little over 1,000 m in altitude. The forest is formed of a sessile oak/hornbeam mixture in the lower slopes (up to 400 m), from 400 to 700 m, beech followed by a beech/silver fir mixture becomes prominent while ash (*Fraxinus excelsior* L.), maple, Norway spruce and sycamore (*Acer pseudoplatanus* L.) mixtures dominate the forest above 700 m, with pure stands of silver fir closer to the summit.

Our final stop was at a small mountain-top church which is dedicated to Our Lady of Sljeme. Here we were welcomed by Fr Joseph who ministers in the area. The church was built in 1932 to commemorate two jubilees - 1,000 years of Croatian nationality and 1,300 years of Croatia's conversion to Christianity.

### **Sunday, 13 September**

We headed west to Delnice, a mountainous area close to the Slovenian border. The average elevation there is 730 m. This area has 75% forest cover, the highest in Croatia. Forestry is the most important industry with 50 small sawmills in the region with an annual throughput of 40,000 m<sup>3</sup> of roundwood.

We were welcomed by Vlado Cure at the Golubinjal Forest Park, who told us that the region's forests comprise a mix of conifers (60%) and beech with some maple (40%). The rainfall is very high, averaging 2,000 mm per annum. The main conifers here are silver fir and Norway spruce. The silvicultural system employed here is the Selective Forest Management System, with the aim of having a continuous-cover system. Conifers are harvested throughout the year, though broadleaves only in winter. Because of the mountainous terrain, forest road density tends to be high in this region – over 23 m/ha. In this region, forest decline has been an issue for the past 15 to 20 years and consequently much of the harvesting is for sanitary purposes. Forest decline has been less severe in recent years and this is probably as a result of the demise of many heavy industries which were located in the south.

The main forest activities are:

- Harvesting;
- Hunting (brown bear, red and roe deer, wild boar);
- Nurseries;
- Tourism.

A lot of resources have been employed in developing infrastructure for tourists. We visited a nearby tree trail in the 51 ha Golubinjal Forest Park, a limestone landscape with caves and excellent examples of silver fir and beech. One of these silver firs was 226-years-old, with a height of 42 m, diameter of 1.42 m and a volume of 32 m<sup>3</sup>. The area was designated a Forest Park in 1955 but it has been a favourite resort since the beginning of the 20<sup>th</sup> century.

We then headed west to the Istrian peninsula for the remainder of our tour.

### **Monday, 14 September**

The tour party left Opatija early on Monday morning to begin the long journey to catch the ferry to the Brijuni Island National Park. On the journey we observed extensive excavation for road construction and bridge building. The soil, known locally as “*terra rosa*”, has a pronounced red colour due to its high iron content.

There were numerous small groves of olive trees (*Olea europaea* L.) growing throughout the countryside. A noticeable feature of the locality were the small, circular, stone-roofed houses which were used by shepherds in the past when sheep-farming was an important farm industry. Animals once played an important role in the economy and in the lives of the Istrian people. The donkey was used mainly for transport of goods and people. Because of the Karst terrain with poor paths, fragmented cultivable areas and a lack of food, the donkey made a reliable working animal.

The arrival of the Romans on the archipelago of Brijuni led to significant economic, social and cultural changes and eventually, to a new way of life on the islands. Today, there are many excavated villas and temples to be seen. Venetian rule commenced in 1337. During the next four and a half centuries, Brijuni was subjected to repeated exploitation of natural resources - mainly stone and firewood. When Venetian rule came to an end in 1797 the islands were totally devastated and were abandoned.

In the eighteenth and nineteenth centuries the area was infested with plague. Paul Kupelwieser, an Austrian industrialist bought the island in 1893. Kupelwieser, with the help of experts in the fields of health and estate management, began to restore the island to its former splendour. World Wars I and II impacted severely on the island and led to renewed decline. From 1947 to 1980, President Tito of Yugoslavia had a residence on Brijuni, where he entertained many world leaders. In 1983, Brijuni was designated a national park and now attracts more than two million visitors annually.

The park superintendent, Milos Uarad, informed us that because of its economic, cultural, religious and mythological significance, the olive tree is the most important tree on the island. Milos then brought the party to the “old olive tree”, which is the oldest tree on the island and probably one of the oldest olive trees in the entire Mediterranean area. It is about 1,600-years-old according to carbon-14 dating analysis, though it still produces about 30 kg fruit every year (which is pressed to produce the finest quality oil!).

The party then boarded the ferry for the mainland and then on to Poreč.

**Tuesday, 15 September**

The day commenced with a guided tour of Poreč, a popular tourist location, which has a population of 12,000. The town was established around 100 BC and contains many fine remains of Roman buildings. Poreč had many rulers from medieval times to the present. Some residents, like the grandfather of our guide, Cedomir Krizmanic, have over the course of their lifetimes been citizens of four different states while remaining in the same house.

The party proceeded to a holm oak forest, developed from a stand which was coppiced 30 years ago. Forests in the area are intensively managed and after 60 – 80 years are left to regenerate naturally. The abundant light that has been allowed in by the thinning assists the regeneration. The absence of rain for up to two months during the summer and the risk of fire are the main problems encountered when trying to regenerate an area.

Black pine (*Pinus nigra* Arnold.) is considered a suitable species in this location as it can survive periods of drought. Approximately 46% of the forests are state owned with the balance in private ownership. Private ownership has increased in recent years and a free forestry advisory service is now available to growers. When planning and designing forest plantations here, it appears that greater emphasis is put on soil protection and shelter than on securing direct economic benefits.

The party then visited the Boredine cave, which contains distinctive reddish coloured stalagmites and stalactites due to the presence of iron oxide. The caves descend to a depth of 120 m. where a miniature and transparent crayfish (*Prateus anguinus*) can be found.

Our next stop was at a mixed oak and ash forest in the vicinity of the hill-top town of Motovun. This is a very untypical plantation in a Mediterranean region. The species selection was influenced by the soil of the Mirna river valley which is very fertile. The area has always been a state forest and in the past it was used to provide timber for shipyards.

The forest is extensively used during the truffle hunting season, which begins in September and continues into late autumn. It is regarded as one of the best truffle sites in the world. The truffle is a highly prized delicacy and locals use specially trained dogs to sniff out the truffles which look like small tubers and are found at the roots of oak trees. Truffles are an important source of income for the local population and the truffle hunting season has been compared to an annual gold rush over the 1,200 ha forest.

The party returned to Poreč for the final night of the tour.

**Wednesday, 16 September**

Krasno was the first Forest District in Croatia and was established in 1765, it was instituted as the Royal Inspectorate for the Afforestation of Karst land in 1878. Most of this district is classified as “Nature Park”. However, it has a low level of protection so some economic activity is permitted, but all forest operations must secure prior

approval. The main species are beech, silver fir and juniper. The average elevation is 1,100 m.

The Forestry Museum at Krasno occupies a 130 m<sup>2</sup> building and contains 360 exhibits and a library of 560 books. It houses documents relating to forest management practices in the 18<sup>th</sup> and 19<sup>th</sup> centuries, old land-surveying instruments and maps, log marking stamps, nursery production and silvicultural tools and chain saws. It provides a fascinating glimpse of early forestry in Croatia. The records of forest harvesting, dating to the 13<sup>th</sup> century, along with other documents and memorabilia demonstrate the rich tradition of forestry in this beautiful country which will serve it well as it grows and develops its forest industry.

<i>Date</i>	<i>Recorder</i>	<i>Accommodation</i>
<b>Wednesday, 9 September</b>	Travel to Croatia.	Hotel Porto, Zagreb
<b>Thursday, 10 September</b>	Pat O'Sullivan	Hotel Jezero, Plitvice
<b>Friday, 11 September</b>	John McLoughlin	Hotel Jadran, Zagreb
<b>Saturday, 12 September</b>	John McLoughlin	Hotel Jadran, Zagreb
<b>Sunday, 13 September</b>	John McLoughlin	Hotel Opatija, Opatija
<b>Monday, 14 September</b>	Frank Nugent	Hotel Neptune, Poreč
<b>Tuesday, 15 September</b>	Frank Nugent	Hotel Neptune, Poreč
<b>Wednesday, 16 September</b>	Tour end. Return to Dublin	

### **Tour Participants**

Marie Aherne, P.J. Bruton, Richard Clear, John Conneff, John Connolly, Jim Crowley, Ken Ellis, Pat Farrington, Jerry Fleming, Brigid Flynn, Tony Gallinagh, Eugene Griffin, Kevin Kenny, P.J. Morrissey, Liam Murphy, Tom McDonald, P.J. McElroy, Willie McKenna, Jim McHugh, John McLoughlin, Jim Neilan, Frank Nugent, Benny O'Brien, Michael O'Brien, Liam O'Flanagan, Paddy O'Kelly, Denis O'Sullivan, Pat O'Sullivan, Tim O'Regan, Trevor Wilson.



**Figure 2:** *The tour group at Plitvice Waterfall.*