Forest Management and Conservation in Romania

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The majority of our gratitude is owed to Lucian Curtu who took time away from his family to show us around Romania. Lucian planned and executed everything in our trip perfectly and without difficulty. He acted as our translator, guide, and interpreter throughout the entire journey and for that we are immensely grateful. Lucian’s goal was to show us the best of Romania and he did that and more. Lucien will be bringing a group of his students to Alberta and British Columbia this summer and I can only hope we can match the experience that we had in their country. It will be a difficult task, but I believe we are up to the challenge.

We would also like to thank all of our hosts in Romania, your hospitality was superb and you went out of your way for us to make our trip so much more special.
Romania is located at the intersection of central and southeast Europe. The terrain is evenly divided between forest, mountains and plains. Forests make up approximately 6 380 000 ha of the Romanian landscape. Forests are dominated by beech and Norway spruce with an abundance of oak and other conifer species. One of Romania’s most famous features is the Danube Delta which is the second largest river in Europe and a UNESCO Natural World Heritage Site.

An important aspect of Romania’s history is the fact that it has changed hands and political structure many times and this has greatly affected social, economic and environmental policies. Romania went from being one of the richest countries in Europe to being stripped of resources and jobs during the communist era. During this time the environment suffered due to poor industrial and agricultural practices. Today, a critical component of forest management plans is the conservation of forests for the protection of different ecosystems and watersheds from soil erosion, pollution and further disturbance.

13 students and two professors from Canada embarked on a trip to Romania to learn about forest management and conservation. Our plane landed in Bucharest, from this point the group visited the Faculty of Forestry in Brasov, Bran (Dracula’s) Castle and the Brasov Forest Service. The Forest Service took the group on a gondola ride, to a plantation, nursery and fed us lunch. The group was instantly overwhelmed with the kindness and generosity of our Romanian hosts and the people. From Brasov we visited Valley of the Beautiful Girl, Schweighofer sawmill, the Semenic Mountains, Baia Mare, Vaser Valley, Sighisoara, Tulcea, Macin National Park and finished in Bucharest. We toured wooden churches, road a narrow gauge train, river boated on the Danube Delta, swam in the Black Sea, 4X4 through forests, hiked, and ate. The group learned about Romania’s forest management practices, forestry’s history, and current state. Hosts explained forestry regulations, conservation measures and environmental concerns. Presentations were given on wildlife, GIS, scientific research, and individual Forest Service management and initiatives. As students, we left Romania enlightened and with a better understanding of environmental and forestry activities in Europe and how they relate to Canada’s forestry industry. As individuals, everyone was sad to leave because of our Romanian hosts generous hospitality and the friendships we built along the way.
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1.0 INTRODUCTION

Romania is best-known for its medieval fortresses, the Carpathian Mountains, and Dracula. However, this relatively small country is divided by mountain ranges that promote a naturally rich biodiversity. Approximately 27% of Romania is covered in conifer and deciduous forest. In April, 2013 six students from the University of Alberta, three from the Université Laval, four from Vancouver Island University and two professors embarked on a journey to Romania to learn about forest management and conservation in an international setting. During the tour we visited different Forest Districts, each individually managed. Each district was able to share their areas history, past and present management practices, social, economic and environmental concerns and strategies. By understanding how other countries manage their forests, students can better understand how different forest types affect management as well as how the legislative environment can have a huge impact on forestry operations.
1.1 Destination Map

A: Bucharest Otopeni International Airport
B: (seen as F on Map) Brasov, Romania
C: Semenic - CheileCarașului National Park, Caraș-Severin, Romania
D: Baia Mare, Maramureș, Romania
E: Mocanita, Mocanita, StradaCerbului 5, Vișeu de Sus, Romania
F: Brașov, Brașov, Romania
G: Tulcea, Romania
H: Bucharest, Romania
<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
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<tbody>
<tr>
<td>April 28, 2013</td>
<td>Arrival at Otopeni Bucharest International Airport: Drive to Brasov</td>
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<td>April 29, 2013</td>
<td>Faculty of Forestry in Brasov (University of Transilvania), Dracula’s Castle, short hike</td>
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<td>April 30, 2013</td>
<td>Forest Service of Brasov: nursery, plantations, wildlife sighting, traditional Romanian lunch</td>
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<td>Natural Oak forest, Valley of the Beautiful girl</td>
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<td>May 3, 2013</td>
<td>Schweighofer sawmill, Simeria Arboretum</td>
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<td>Semenic Mountains</td>
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<td>May 5, 2013</td>
<td>Beech Forests</td>
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<td>May 6, 2013</td>
<td>Drive to Baia Mare, Forest Service</td>
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<td>May 7, 2013</td>
<td>Forest Service of Baia Mare, wooden churches</td>
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<td>May 8, 2013</td>
<td>Vaser Valley train ride, lunch by the river</td>
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<td>May 9, 2013</td>
<td>Sighisoara Medieval town, trip to Brasov</td>
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<td>May 10, 2013</td>
<td>Drive from Brasov to Tulcea</td>
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<td>May 11, 2013</td>
<td>River boat down Danube Delta, hybrid poplar plantations, bird watching on river boats</td>
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<td>May 12, 2013</td>
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<td>Romanian Forest Research Institute (ICAS), Palace of the Parliament</td>
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<td>May 15, 2013</td>
<td>Departure Home</td>
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Figure 2. Table of trip itinerary
2.0 BACKGROUND

2.1 Biophysical Conditions

Romania is 238 391 km² in size and is the 12th largest country in Europe. Approximately 231 231 km² is land and 7160 km² is water. It is located at the intersection of Central and Southeastern Europe and borders Bulgaria, Hungary, Moldova, Serbia, Ukraine and the Black Sea. The Romanian landscape is approximately one-third mountainous and one-third forested, with the remainder made up of hills and plains. Romania has generally fertile soils. About one-fifth of the country is covered with chernozems. These and reddish brown forest soils are found on the plains to the south and east of the Carpathians, gray-brown podzolic or leached soils are found at higher elevations. A broad expanse of alluvial soils covers the Danube floodplains.

Climate

Romania’s climate is transitional between temperate and continental. In general summers are hot and winters are very cold with lots of snow. The Carpathian Mountains greatly affect the climate in Romania; they restrict Atlantic air masses to the west and center of Romania creating milder winters and heavier rainfall. The mountain range also blocks the frosty winters and reduces rain in the south and southeast. The far southeast offers a milder, maritime climate due to the Mediterranean. Rainfall is adequate throughout the country, however it decreases from west to east and from the mountains to the plains. Winter is generally from November to March. Summer usually lasts from May to August. Romania has prolonged winters with a short spring, which the group experienced firsthand as for most of the trip the temperatures averaged 30° C.

Hydrogeology

All rivers in the Romania are direct or indirect tributaries to the Danube. Almost 40 % of the Danube’s total length travels through or along Romanian territory. Rivers primarily flow east, west and south from the Carpathian Mountains. Important rivers in Romania include the Mures, Olt, Prut, Siret, Ialomita, Somes and Arges Rivers. The most important river is the Danube, which it is crucial for domestic shipping and international trade. The Danube is also
used for hydroelectric power. Iron Gates is one of Europe’s largest hydroelectric stations and is located where the Danube surges through gorges in the Carpathian Mountains. River volume comes from rainfall and snow melt and fluctuates considerably causing occasional catastrophic flooding. Romania has approximately 3500 lakes, most of which are small to medium in size.

**Biodiversity**

Romania has the largest population of large carnivores in Europe including the brown bear, wolf and lynx. There are approximately 6600 brown bears and 3000 wolves. There are 89 mammal species in Romania including the red deer, wild boar and fox. Birds are abundant in the beech forest and include species such as the grouse, large pigeon hawk, owl, and falcon. It is estimated that Romania has 33 802 faunal species and 3700 flora species.

**Tree Species**

Forests make up approximately 6 380 000 ha of the Romanian landscape. This can be further broken down by topography with 66% of the forest being located in the mountains, 24% in hilly regions and 10% on the plains. Forest composition includes around 30% conifer species, 30% beech stands (pure and mixed), 19% oak species, 14% various hard broad-leaves and 6% soft broad-leaves. Natural and naturalized tree species that the group saw on the tour include *Fagus sylvatica* (beech), *Abies alba* (silver fir), *Carpinus betulus* (hornbeam), *Picea abies* (Norway spruce), *Larix decidua* (European larch), *Quercus rubra* (red oak), *Thuja plicata* (western red cedar), *Sorbus aucuparia* (European mountain ash), *Quercus alba* (white oak), *Quercus robur* (pedunculate oak), *Quercus petraea* (Sessile oak), *Pinus cembra* (Swiss stone pine), *Pinus strobus*, and *Castanea* (chestnut).

**Forest Management**

Romania suffered from the planting of inappropriate native and introduced conifer species from 1960-1985 resulting in low quality wood and artificial forest stands that were established during this period. Forest management plans must be renewed every 10 years and all share similar elements. Privately owned Forest Districts hire third party companies to draft their management plans. In general, 44% of forests are dedicated to the protection of local
ecosystems from soil erosion and pollution, and are designed to promote watershed protection. In 1990 the National System of Natural Parks and Reservations was also initiated, protecting 397 400 ha and with each park or reservation having a goal of 80% forest cover. The other 56% of the forest is used for biomass production.

Figure 3 illustrates the breakdown of forest ownership in Romania. The majority of forested lands are owned by the state. Most of our tour was dedicated to visiting privately owned forests which were usually owned and managed by cities such as Brasov and Baia Mare.

The present-day method used to calculate allowable cut is based on a traditional sustained yield approach in order to maximize forest increments. The algorithm used to determine the allowable cut accounts for rotation length, average species composition, forest structure according to site indices, and the existing distribution of age classes (Borlea, 1998). Rotation length is determined by the maximum rent principle and is set according to the average increment of target dimensional class reflecting a conservative policy with an environmental dimension. The average growing stock is 217 m³/ha (Borlea, 1998).

**Disturbances**

Romania faces soil erosion and degradation issues, as well as water pollution and air pollution in the south from industrial activity including mining, agriculture, and urban development. The Danube River and Delta also faces contamination issues. Humans have
caused organic matter and nutrient depletion, pollution by pesticides, soil crusting, riverbed clogging and silting, and water erosion. Ill-advised cultivation methods during the communist period and inefficient use of pesticides and industrial pollution since 1990 resulted in a legacy of significant soil erosion. Moreover, irrigation systems that had been installed during the communist era, especially on the southern and western plains, fell into disrepair by 2000. Restoration efforts have been under way with aid from the World Bank since 2003 and continue today.

2.2 Social and Economic Conditions

An important aspect to Romania is the fact that it has moved from many different hands. This makes their political state quite uneasy and has serious impacts on the socio-economic nature of their nation. The turmoil of economic transition is especially hard on those in the resource extraction industry with the restitution from state owned land to privately owned (Lawrence, 2005). The recovery from the communist regime has been stressful on social and economic aspects of Romania and although slightly secluded, the forestry sector has not escaped the stress of these changes.

During communist rule all land was taken from the hands of peasants and placed under state control. Restitution came with rapid change for all members of the former Soviet Union block as the national economy experienced a transition from an old, centralized socialist system, to a new, free market-based system.

In 1991, one hectare of forest was returned to each pre World War 2 legal heir and by 2000, 50% of forest areas had been returned to individuals, churches and communities (Lawrence, 2005). Turmoil and corruption shadowed the times of restitution due to economic and political uncertainty. Ethnic nationalism remained the driver of politics and the suppression of pluralization lingered with a civil society shaped by the distrust of Soviet rule (Hopkins, 2012). After being criticized for their rapid transition and subsequent issues with deforestation, beginning in 2000 the state required owners to commission management plans and forest administration to a professional forester (Lawrence, 2005).
With the switch to capitalism, many critics thought this could potentially lead to deforestation in an effort by land owners to make money quickly, now that owners were free to do so. Although after returning previously owned land to its rightful heirs in 1991 there was a surge of illegal felling, many peasants claimed they were merely trying to fight hunger and desperate times called for desperate measures.

Restitution challenged the values and work ethic of many foresters as it disturbed the old way of doing things. Foresters were no longer answerable to state but now to the forest owners (Lawrence, 2005). In the end, there remained a respect for the 'silviculture' regime and conservation of nature which is still visible in Romania today. In addition to government regulations requiring management plans, the widespread adoption of certification throughout much of Romania in order to support access to markets, as well as good practices has had substantial influence on the widespread adoption of sustainable forest management practices.

3.0 FOREST MANAGEMENT AND OUR EXPERIENCE IN ROMANIA

3.1 Transylvania University

April 28, 2013

The Transylvania University of Brasov was established in 1948 and is a state-run post-secondary institution composed of eighteen faculties. The University is home to 20,000 students and 800 faculty members. The University has recently committed approximately 10 million Euros to development of new research facilities. The Forestry program does not have its own forest, but it does have access to state and private forest for research and education purposes. The school does however have a trout and a pheasant farm. The first post-secondary institution in Brasov was the Academy of Commercial and Industrial Studies in 1940, with the Institute of Forestry being founded in 1948, and the Institute of Mechanics in 1949. After a series of mergers in 1971, all the post-secondary institutes became the University of Brasov and it acquired its current name after the Romanian Revolution of 1989.
School of Forestry

Forestry has been an important part of the history of the school, and maintains its importance today. Transylvania University has two faculties devoted to forest-related studies, the Faculty of Forestry and the Faculty of Wood Processing. The director of the University is a forester by trade and gave the students an excellent description and perspective on some of the forest policies in Romania. Historically, all land was owned by the state as Romania was a Communist country. During this time there was a great deal of forest exploitation and very little silviculture was practiced. After the revolution and the fall of the Communist regime, the country began a restitution program where land would be returned to the local communities and families who owned it before Communism was established. Some land was returned to private families, but many of the smaller towns and cities owned land as well. Much of the forest was in poor shape, and as such, strict forest management policies were implemented in an attempt to regulate the use of the resource. Each land owner must pay to have a forest management plan written for their parcel of land and if they want to remove timber the management plan must be followed to the letter. While effective in dissuading forest exploitation, there are some operational issues with this system. Due to the political turmoil in its past, Romania is not a wealthy country and the majority of private homes use wood for heating. With the current system of land management, private landowners are not permitted
to take wood off of their land to heat their homes unless approved by a forester, which is a point of much contention.

Figure 5. Tree cookie samples

Figure 6. Aging tree cores with WinDENDRO

3.2 Brasov Forest Service

April 29, 2013

In Brașov the Kronstadt Forest District is responsible for managing the forest land for the entire town, which is an area of 15,000 hectares that provides 53,000 cubic meters annual
allowable cut. There are two types of foresters in the Romanian system, the Forest Engineers and the Forest Rangers of which the Kronstadt District employs 31 and 17 respectively. The Engineers are each assigned a subdivision of the forest that they are responsible for and each Engineer has Rangers who work under them in different sub-units. The Rangers do the majority of the field work, such as cutblock layout and supervision. One major issue that forest managers in Romania have to combat is illegal logging. Due to the fact that people cannot harvest on their own land, some less than reputable individuals cut trees out of blocks that are scheduled to be harvested. Forest Rangers carry with them a stamp that is placed on the roots of trees that are approved for harvest, and once the block is cut any trees that are missing the stamp have been cut illegally. Should the Forest Ranger neglect to find the illegal harvest, the cost of the missing timber is charged to the forester. It seems to be a harsh system, but the illegal logging problem is quite out of hand and extreme measures need to be taken to get it under control. The Forest Service also manages a 1.1 hectare seedling nursery where silver fir, European larch, red oak, and many other species are grown. The main species is Norway spruce as this is the tree used for the majority of conifer plantations. 120,000 Norway spruce seedlings were grown in the greenhouse for one year and then transplanted into the outdoor plots. There are no fertilizers or other growth enhancements applied to the seedlings, they grow naturally until they are planted in-block.
Figure 7. Nursery

It was an enlightening experience to see how forestry operations work in a different country and how approaches to similar issues can be very different. Romania also has problem bears, but the manner in which they deal with them is very innovative. The bear population is around 3500 individuals, which is astronomical for such a small country and the highest in all of Europe. Due to this high population, bears were turning to the cities and towns as a food source. Officials attempted to relocate the problem bears, but with such a high population there would always be more. The Forest District had to come up with a better way of keeping the bears out of the cities, and the method they chose was one of the highlights of the trip. They set up a feeding station where they would hide meat and chocolate to draw the bears out of the city. They then set up an observation point where they could watch and see if the bears were interested in the food. The project was an enormous success and the students were able to spend a few hours in the observatory for feeding time. The key is to be absolutely silent, which was a task that proved too difficult for the group, so unfortunately there were no bear sightings. District employees who accompanied the group were certain there was a bear in the area; he was just too timid to come to the feeding station. We did get to watch a wild boar however, which was exciting. This is a very different wildlife management approach than what is used in North America, but it offers a neat solution to a unique problem. The District is proud
that they were able to solve their problem bear issue without destroying any animals, and they have every right to be.

3.3 Oak and Pine Forest Management

May 2, 2013

The Oak forest presented 100 ha of sessile oak, *Quercus petraea*, as well as pedunculate oak, *Quercus robur*, and stood at an elevation of 525 meters. Within this stand the trees had been infected by a parasitic wasp that results in the absence of hairs on the leaves. This has made these trees less adapted to drought. However, pest and disease has not been a significant problem in this area within the last twenty-five years.

![Figure 8. Young Oak Stand](image1.png)  ![Figure 9. Mature Oak Stand](image2.png)

This section of old forest as well as a newly harvested stand. We saw an example of application of a shelterwood method for regenerating these stands. The three entries were made in the mid 1990’s, 2005 and 2013 using a shelterwood system. This system was providing effective natural regeneration of oak and other hardwood species. Oak trees are harvested at the age of 130 years in Romania, however thinning of the stand takes place until the approximate age of 60 years. At 110 years the forest undergoes sanitation cutting to remove damaged and unhealthy trees. Commercial wood consists of trees that are ten centimetres in diameter whereas firewood is made from trees that are five centimetres in
diameter. This particular stand was of a poor quality since the existing stand had regenerated largely from stump sprouts. The understory of the old growth also consisted of some wild cherry, *Prunus*, and *Fraxinus*.

**Hybrid Pine Trials**

Ioan Blada Ph.D introduced the “Nice Valley Hybrid Trial”. This trial consisted of hybridizing Carpathian Stone Pine with Western and Eastern White Pine and with Blue Pine to create a blister rust resistant species as well as a fast growing pine species. Eastern White Pine was introduced into Romania and although it did well, it brought blister rust. Native Romanian pine species were susceptible to the blister rust. Many people from across the world worked together in the blister rust research.

Ioan also wished to inform us on politics and the history of Romania feeling that it was an important in understanding current issues Romania is dealing with. Until WWII, Romania was one of the richest countries in Europe. Red Army invaded, bringing with it communism. As a result, no one was able to work and Sowiet Union exploited many resources of Romania.

![Figure 10. Ioan Blada explaining hybrid pine studies.](image)
3.4 Holzindustrie Schweighofer Sawmill  

May 3, 2013

Holzindustrie Schweighofer is an Austrian company that established a sawmill in Sebes, Romania in 2002. Currently it employs 670 people and uses 16,000 ha of forest. Spruce, silver fir and pine that is used in the process is also brought from Ukraine. The mill aims to be a self-sustaining operation. The power used to generate the mill is produced from wood chips that are produced in the milling process. Holzindustrie Schweighofer currently has four mills operating in Romania, the first of which being established in Sebes. By being located in Romania, the mills are able to take advantage of the high quality raw material from sustainable forests. Exports to countries all around the world account for more than 80% of Holzindustrie Schweighofer’s production.

3.5 Banat Region  

May 4, 2013

On May 4th the students we travelled to the Semenic Mountains, in the Banat region of Romania, en route to the village of Garana. This region contains a popular ski resort and there is a cabin for a rescue team on the mountain range. After arriving at the ski resort, we took a
gondola up to the top of the ski hill in order to oversee the surrounding large tracts of forest found within this mountain range.

This mountain range is important to the hydrology of the area, and reaches an altitude of 1,447 meters at the highest peak, Piatra Goznei Peak, and 1445 meters at the Semenic Peak (Caransebes, 2005). There is a long period of snow here compared to other ski resorts within Romania, and snow can last for up to 6 months on these hills, which allows this region to be important for the Romanian economy (Caransebes, 2005). There is a man-made lake within the ski resort complex which was meant to collect water for use on the resort, but due to design problems, this intended use did not occur. The rescue team stays at the rescue cabin during skiing season, and snowmobiles are used when necessary. The wooden cabin contains all that is necessary to be comfortable during the winter months, and is located at the bottom of the ski hill.

3.6 Old Growth Beech Forest

May 5, 2013

On May 5th an old growth beech forest was explored after leaving the village of Garana. This forest was comprised primarily of European beech trees.

The large tracts of old-growth beech (Fagus sylvatica) forests in the Romanian Carpathians are one of the few remaining old-growth forests within the world, and the need to identify and protect these forests is becoming even more important as the disappearance of old-growth forests continues throughout the world (Knorn et al. 2013). Beech is an important hardwood for the timber industry within Europe as it is strong, hard, wear-resistant, and has very good bending capabilities (Meier, 2013). This tree grows quite large, has an upright oval growth habit, has a slow growth rate, and provides shade for the forest floor and understory below, which causes it to be an important species for the structure of the entire ecosystem (The Ohio State University, 2012). This species which is native to Europe prefers full to partial sun as an adult, although it tolerates shade when young. Disease and pests are not a major concern for European beech stands which increases its value in the forestry sector, and increasing its value to the Romanian economy.
The old-growth forest classification is determined based on not only the large size and old age of the trees, but also the composition of native trees within the forest, along with the quantity of dead wood that can be found within the area, the size of the forest, and the lack of human disturbance in the recent past (Knorn et al. 2013). Human induced disturbances within Romania are currently seen to be most prevalent within the beech forests found within the mountains compared to all other forest types, and 72% of the disturbances within old-growth forests take place within protected areas, potentially due to changes in management over time (Knorn et al. 2013). Following an initial inventory of these forests, a goal has been created to preserve 80% of the old-growth forests within Romania, as well of portions that are remaining in other countries such as Bulgaria, which has a conservation goal of 97% (Goldstein, 2010).

Romania contains approximately 218,494 hectares of old-growth forests, which are divided into 3402 forest sites (Goldstein, 2010). These forests contain primarily European beech (Goldstein, 2010). Romania was one of the first to promote the responsible management of forests within the Carpathian region, and has approximately two million hectares of forests which is well on the way to being certified by the Forest Stewardship Council due to the sustainable management practices observed within the nation (Environmental News Service, 2011). They also have timber tracking tools which aid in the implementation of the Forestry Protocol and EU legislation (Environment News Service, 2011). These Carpathian old-growth forests are protected under a variety of legislation including a Protocol on Sustainable Forest Management, the Carpathian Convention, which is signed by the ministers of the seven countries involved: the Czech Republic, Hungary, Poland, Romania, Serbia, Slovakia, and Ukraine (Environment News Service, 2011).

3.7 Baia Mare Forest Service (Municipal Forest District of Baia Mare)  

May 6, 2013  

The management of the Baia Mare forest is heavily linked to mining and mine development because for centuries and even today, mining is the dominate industry in the area. The forest was once owned by royalty before being given to Baia Mare. The forest consists of 10 000 ha, mostly broad leaf species. The last forest management plan was created
in 2005. The cost to create the plan was $3000-$4000 Euros. 80% of the forest is under protected status however, it is still cut. The community forest also has ten tree nurseries and two greenhouses. Recently the forest service planted large seedlings 18 cm tall at a rate of 2000 seedlings per hectare. The Director of the community forest stated that the seedlings have a good chance of survival due to > 1000 mm of precipitation the area received after planting. Illegally, the forest service is cutting less than their annual allowable cut due to pressure from the surrounding community. It is an economic forest that makes money. However, the price of wood has declined 11% since the management plan was created. At this time, Beech is sold at 20-90 euros per cubic meter.

**Forestry Management in Baia Mare**

Once the area surrounding Baia Mare was 80% deciduous forest including beech, hornbeam and oak however most of the area was cleared and converted to agricultural land. Then in the 1960’s and 1970’s there was a trend to introduce conifers across Romania. This was supported by the Forest Act created in 1971, which promoted fast growing tree species. Today, the trend is to promote native species and working with nature. It used to be practice to plant 100 ha at a time, now they plant 20 ha and leave the rest for natural regeneration. Pure beech stands can be found throughout the forest however the Forest Service does not feel that this is beneficial to the forest as a whole because these pure beech stands lack diversity in forest structure. They now stress the importance of forest structure and do not implement uniform cutting. The district sees the value of forest structure as a protective function for the ecosystem including lakes and watersheds, and erosion control. The forest engineer presented a map of forest activity that including thinning (in pink on the map below), conservation cutting, uniform cutting and group shelterwood cutting. Across Romania clear cuts are limited to 3 ha. The group had the opportunity to visit a beech and Norway spruce stand within the Baia Mare forest. The standing volume was around 400 m³/ ha. The forest also has 1% chestnut trees.
Mining in Baia Mare

Mining plays a pivotal role in Baia Mare's history and current state. It directly influences forestry practices and the environment in the area. Mining in the Baia Mare area started during the 14\textsuperscript{th} and 15\textsuperscript{th} century. In 1445, under the possession of the Huniazilor family, experts in mining and coining gold and silver where brought to the area. This made it one of the most developed mining centers in Transylvania. During the 15\textsuperscript{th} and 16\textsuperscript{th} centuries Baia Mare was one of the most important centers for gold and silver smiths. Today, there is still mining in the area, mostly for andesite from the volcanic mountain material surrounding Baia Mare. Andesite is a fine granite, which is mostly used for road bricks.
Environmental Concerns

Water bodies and groundwater surrounding Baia Mare have been heavily impacted by mining and urban populations. Most notably, the Sasar River, which runs through Baia Mare. The river has been polluted with untreated sewage, agricultural fertilizers and toxic chemicals from mining, including cyanide, arsenic, lead and cadmium. On January 30, 2000, one of the Baia Mare mine tailings impoundment burst. 50 to 100 tons of cyanide and heavy metals were released into the Sasar River. This incident eventually led to contamination of the Danube and reached Hungary, Serbia and Bulgaria. The World Health Organization considers Baia Mare a “health risk hotspot” and the locals call Sasar River the “dead river” unsuitable for bathing, washing or fishing. During our visit with the Forest Service the group asked if anything was being done to remediate or reclaim the polluted river. To our surprise little progress has been made to remediate the contaminants and the local population and environment are still coping with the effects today.

History of the City of Baia Mare

The city of Baia Mare is located in the northwestern section of Romania. In a lowland area where the Oas and Gutii mountain ranges meet. Baia Mare was first mentioned in written documents dated 1327 and 1329. In 1329 King Carol Robert licensed the mayor of Baia Mare to
clear cut the forest between Baia Mare and Baia Sprie and to populate the clearing. This granted autonomy to the city to manage it businesses due to its special status of a “kingly town”. This created strong economic development through mining. The city progressed through the ages with periods of cessation, regress and prosperity depending on the times political and economic condition. In this time Baia Mare name changed from civitas, castrum or castellumRivuliDominarum to Nagybanya or Frauenbach.

3.8 Wooden Churches of Maramures

*May 7, 2013*

The Wooden Churches of the Maramures have a gothic style and are characterized by their tall narrow, pointed steeples. There is a rich history of building wooden churches across Eastern Europe, however Maramures’s churches are distinctive in shape and ornamentation. There are eight churches in the region that are recognized by UNESCO as World Heritage Sites. The building material is mostly oak from surrounding areas, with the interiors of the churches being painted by local artists to depict biblical scenes. Most of the churches were built in the 17th and 18th century. However, Church on the Hill in Ieud was built in 1364 (and is constructed of silver fir), making it the oldest wooden church in the area.

3.9 Narrow Gauge Railway

*May 8, 2013*

The railway and steam powered locomotive in Viseu de Sus is the only remaining narrow gauge forestry railway still in use from its time. It was constructed in 1932 and still transports timber from the remote Carpathian Mountains and foothills to the small logging town. The local
people and train operators were extremely friendly and some of the students were able to ride in the engine. From Viseu de Sus the railway climbs up into the beautiful Vaser Valley, through the forests of the Maramures Mountains and ends in the tiny hamlet of Coman. The only way into Vaser Valley is by train or foot.

![Figure 14. Narrow Gauge Railway](image)

**3.10 Town of Sighisoara**  
*May 9, 2013*

Sighișoara is considered to be the most beautiful and well preserved inhabited citadels in Europe, with authentic medieval architecture. The town is in central Romania, more specifically, Transylvania and has a population of approximately 26,370 people. The town is made up of two parts. The medieval stronghold was built on top of a hill and is known as the "Citadel" (Cetate). The lower town lies in the valley of Târnava Mare river. One of the main landmarks of this small town is the 64m clock tower that dates back to the 13th century. Today, it is a tourist destination and a museum. The well preserved tower gives you a spectacular view of the entire town including another popular tourist destination, the covered stairs from 1642 that lead up to the town’s Church on the Hill which is built on the location of a Roman fort. Sighisoara was a beautiful and quiet town that allowed us to see another reason
why Romania has such a vast history. After one night back in Brasov, our group headed southeast towards the Danube Delta.

![Figure 15. Clock Tower](image)

**3.11 Danube Delta**

*May 11, 2013*

The whole day was spent on a river boat floating down the beautiful Danube with a few stops along the way. After heading east for around an hour, we stopped at a hybrid poplar plantation a short walk away from the delta. The Danube Delta is a favorable growing spot for hybrid poplar because the soil is rich in nutrients and the high water table provides enough moisture for the poplar to have optimum growing conditions. This part of the delta also receives on average more sunlight per year than any other region in Romania. The Danube
Delta is the largest continuous marshland in all of Europe and is host to around 1688 species including reeds, alder, willow, poplar and oak. It also has the third largest biodiversity in the world due to the rich flora and fauna, with approximately 5500 different species present.

While in the Danube Delta we travelled through some river inlets of the delta. These small but complicated inlets are only accessible by smaller boats and we were able to see many water snakes, bird species and wildlife on the land. The river inlets can be compared to the feeling of the Florida Everglades in that there were no banks of land that made up the river path. There were submerged trees that created the winding paths and were home to thousands of birds. Various bird species had nests and were roosting in the trees just above the water level. There were pelicans, cranes and several other species of birds. Some of these species included dalmatian pelicans, small egret, the pygmy cormorant, and the glossy ibis. Many of these species of birds thrive in water dominated landscapes which is why they flock in the thousands to the Danube Delta. The Danube Delta is one of the most well-known water bodies in the world and even after 10,000 years of formation it continues to grow as a result of 67 million tons of alluvia deposited each year by the Danube River.
3.12 Macin National Park

May 12, 2013

Macin National park was nothing short of astounding. The scenery was breath-taking. We even got to wave hello to Ukraine. We learned about conservation practices in Romania and we were able to see first-hand how they define a National Park. The park itself was host to 1700 plants, 1200 insects, 15 mammals and even 6 wolves. Compared to Jasper National Park alone these numbers seem quite small, but by European standards the Macin National park certainly has something to boast about. Although we were not able to spot any of the larger wild animals, we did see a few turtles!

The biodiversity of Macin comes mainly from its remote location surrounded by the Black Sea as well as Mediterranean and Stepic mountain ranges. One side of the mountain does endure mining of granite and other minerals but the opposite side of the mountain is a protected region of 161 ha of beech, 1100 trees, boasts of natural regeneration. This area with beech is considered the “core zone to be protected”. Although the rangers were not sure where the beech population came from, they are able to do genetic testing to see if the beech population is endemic or if it had come from the Carpathian populations.

We finished our hike with a tasty lunch provided by our generous hosts. The hospitality of the Romanians we have encountered has been humbling and I believe it gives some insight into the customs and traditions of this Romania.
3.13 Black Sea and Bucharest

May 13, 2013

After another lovely drive through the Romanian country side, the group arrived at the Greek ruins at Histria, near the shore of the Black Sea. The ruins were fascinating to see. Although the connection between Greek ruins and forestry may not be obvious at first, there is something so powerful in visiting such an old site. You really get a grasp on how ancient the society is which can be awe-inspiring for a group coming from Canada where we rarely get the chance to view such ancient artifacts. Forestry had to have been directly related to this society as it is guaranteed that trees were a valuable commodity. It really makes you think about how much older traditions and cultures are influencing the practices of today. In Canada we have a fairly new constitution and thereby new practices due to settler’s complete disregard for First Nations tradition. Since our practices are newer some may say we are more flexible to change, whereas we have seen here in Romania time and time again that even the older policies that are now considered outdated are still used at the present.

Once we had sufficiently saturated ourselves with Greek history, we headed out for a dip in the Black Sea. The beach side was quite luxurious compared to other places we have
visited in Romania, and it was obvious that the tourism industry was key for this town. The Sea was superb. Its colossal vastness was breath-taking and although the stop was quick, it was well worth our time. I think many people disregard Romania as a destination for site seeing but they are deeply mistaken. We have been given the chance to see Romania’s brilliant mountain sides, rolling hills and now the vast sea. This trip has been perspective altering to say the least.

With bellies full of sea side lunch we carried onward into Bucharest for a completely new look at Romania. Walking around the city we noted a stark contrast to the countryside we had now gotten used to. Although poverty is much more prevalent in the rural areas, the decrepit soviet style apartments and stray dogs stuck out in the city more so than in the country side. The disparity between grand old buildings and broken down concrete structures highlighted the political and social turmoil of the Romanian state. Once again we were taken aback by Romania’s diverse culture and class structure. This visit was punctuated with dinner at one of the fancier restaurants in town which was full of tourists and business people.

3.14 Forest Research and Management Institute

May 14, 2013

In Bucharest, we visited the Forest Research and Management Institute. Founded in 1933 and connected to the EU, the ministry is run by the Ministry of Environment and Forests. Primarily they work on research, development, and administration of forest experimental patrimony. The institute houses 807 employees and the majority of their money comes from the Ministry of research and development. During 2007-2011, 3.2 million Euros were invested in research and construction as part of Romania’s induction into the EU.

The ICAS previously had no inventory system whilst under communist control but has since introduced management and inventory plans. Romania’s forest plan is currently affiliated with the European National Forest Inventory Network. The inventory includes understory, ground vegetation and forest growth, edge, site (topography), type, soil and regeneration. These are further broken into land classes: forestland, cropland, grassland, water/humid areas, settlement land and other land. The inventory as well as the forest management plan use GIS for plans. The forest management plan incorporates 7 198 851 ha +/- 2% of forest area, 120 334
ha (25%) other wooded landed, 336 954 +/- 11% of trees outside the forest and the total area of forest in Romania is 7 656 139 ha.

Under communist rule the forests were state owned and during restitution were returned to former owners. Currently there is a mix of private ownership, state and forest associations (which have many land owners, but are still private). The restitution created much disorder and confusion and as a result, deforestation was prevalent after state owned forests were turned over to private owners. Since this problem became rampant, the government has put in efforts to promote conservation in privately owned lands.

4.0 CONCLUSION

When asked where we were travelling many people in the group were greeted with confusion when we said Romania. Not many people would think about going there and that is a shame. We were introduced to a beautiful country that had a new surprise around every corner. One of the things that stands out is when one of the forest engineers asked us if Romania was what we thought it would be. We told her than it was more beautiful than we could have imagined and the gratitude that she expressed will stay with us forever. If anyone is looking for a new place to spend a holiday or to learn about a new culture, Romania should be near the top of the list. It is a somewhat overlooked country that has so much to offer. One of the most enlightening parts about seeing Romania’s culture is that it is a country that is still trying to find itself. Abandoned factories and other buildings show a people moving out of a darker time in their history and trying to carve a new path for themselves. While it is a country with a long and eventful history, the future is bright for Romania and its people and our group was greatly privileged that we were able to experience it.
5.0 REFERENCES


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