Educational Video Script

SCRIPT: Dialogue for Educational Video – borrowed and translated verbatim from the television series, *le Code Chastenany*, which aired on Télé Québec in January 2008

Narrator:
31:48 The forest occupies almost half the territory of Quebec. It constitutes one of the principle engines of the economy. The forest industry is seeking a way to be more productive. What it wants is two by fours that are straight, resistant and dense in fibre. This is possible because all of these characteristics exist naturally in certain trees.

Narrator:
32:18 Over decades, scientists have been trying to improve the forest by selecting the best trees, and crossing them with one another.

Jean Beaulieu:
32:26 We take the best trees. The best trees that we have found in the natural forest or from the plantations that we have established, and then we cross them, to obtain the offspring, with the purpose that these trees are on average better than the previous generation.

Narrator:
32:46 Jean Beaulieu works for the Canadian Forest Service. In the field of forest genomics, he is one of the pioneers.

Jean Beaulieu:
32:53 White spruce trees for example, have both sexes on the same tree. So, the male sex is the pollen. That yellow pollen that we find on our cars in the spring; that is the male sex part of the tree. There are also small flowers that become cones. That flower is female. Once we have obtained those seeds, then we have a set of parents. And we'll cross a mother and father seed, and we use those seeds to establish a new plantation.

Narrator:
33:24 We hope that this new plantation is better than the previous. But this traditional method of breeding to improve the forest is also very limiting. The problem is the time.

Jean Beaulieu
33:35 So what we want to evaluate is the quality of the wood, the density of the wood, the length of the fibres-- It requires that the tree has reached a certain dimension which takes decades to develop before we can see what it is able to do. For certain characteristics, it requires that we wait 20 or 30 years before we are actually capable to evaluate the tree.

Narrator:
33:51 Twenty years is long. Too long. So in comes into play 'genomics'.

Narrator:
33:58 Thanks to genomics, we are able to determine which descendants are the most promising, even as a small seedling. The improvement of the forest will be able to occur at record speed.

Jean Bousquet:
34:07 Twenty years is a chunk of time too long to wait. With the use of genetic markers that allows us to predict 50% of the genetic value in just a couple days, there is an enormous gain to be had.

Narrator:
34:19 Jean Bousquet is a co-director of the Arborea Project at the University of Laval. His objective is to improve white spruce trees.

Jean Bousquet:
34:27 We are able to tell with fast diagnostic tests, in the span of just a couple days, you can evaluate the genetic lineages on their adaptation, their growth, the formation of the wood-- So that we can better identify the natural diversity so that you have the power to better identify the trees that satisfy the needs of man and the needs of our forests.

Narrator:
34:49 Arborea is one of the most important research projects in the world on forest genomics.

Jean Bousequet:
34:54 The Arborea project's final goal is to accelerate the identification of a variety of trees so that we can provide tools for tree planters and tree breeders, and to dedicate a certain percentage of the plantation territory to improvements.

Narrator:
35:12 The other co-director of the project is Jean Mackay, forest geneticist. He has the difficult task of cataloging the genome of the white spruce.

John Mackay
35:23 The genome essentially compares to that of a dictionary or a catalogue. It is a vast document with a lot of information.

Narrator:
35:33 The genome in fact is an assembly of genes of a species. In 2007, John Mackay attained his objective.

John Mackay:
35:40 We estimate that we have done the inventory on approximately 26 thousand genes of the spruce genome. Obviously there are always some that are missing in the inventory, and maybe those are genes that are important, so we continue to do gene research.

Jean Bousquet:
35:58 We can't see if there are patterns or see tendencies with 20 thousand genes. We have to have more powerful informative tools and more powerful statistical tools to help us sort these thousands of genes.

Narrator:
36:14 This glass slide contains a good portion of the 26 thousand genes of the white spruce. Each of these small boxes contains hundreds of genes. For John Mackay, this glass slide represents five years of work.

John Mackay:
36:28 With genomic tools today, we have overcome barriers and have knocked down doors that were closed until now.

Narrator:
36:36 The researcher can now focus on what these genes do and identify what contributes to makes these trees perform better.

John Mackay:
36:43 The goal is to have trees that are better adapted to our conditions of growth, and that can also respond to the demands of our forest industry; for example by delivering wood of the best quality.

Jean Bousquet:
36:56 For example these three right here are very specific to the population of the Gaspésie

John Mackay:
37:01 We did a large number of samples, of tissues, of cells, of trees in different physiological conditions to recover all of the genes that are found there.

Narrator:
37:11 The genes are essentially the same from one tree to the next, except in some very small sections. These tiny differences are called genetic markers.

Jean Bousquet:
37:21 My role, with my team, is to go and identify the fine variations that exist among trees. Those that differ one tree from another.

Narrator:
37:32 It is these markers that interest the researchers. These markers will tell if the spruces have the researched characteristics.

John Mackay:
37:40 So, certain forms of a gene will be present in the trees in low densities, while other forms will be present in high densities.

Narrator:
37:50 Other markers can identify those trees that are resistant to the cold or against certain insects. Researchers of the Aborea project have undergone several experiments in the Valcartier forest which is found a few kilometers away from the laboratory. At the center of their research, with the aim to improve spruce trees, they complete progeny tests. In this greenhouse there are a thousand trees that were all obtained from the same two parents. By comparing their markers, their fine genetic differences, researchers try to identify those that grow straight, strong and fast. But reforestation is more than the production of two by fours-- let's think of the urban forest or where the tree plays an ecological role.

Jean Bousquet:
38:33 For example an ecologist could tell you what's the CO2 or the carbon fixation. And we are always currently talking about it, about the level of climatic heating and capturing of carbon, because this is also important.

Narrator:
38:45 Eventually the researchers will be able to provide genetic material kits that will respond to the diverse demands of the industry

Jean Bousquet:
38:52 We are talking about kits, small kits of markers that we will be able to deliver to the tree planters or tree breeders, and they will be able to use those to accelerate the rate of selection

Narrator:
39:02 Do these tools give them a recipe to super spruces? Would we prefer to re-plant forests with clones?

Jean Bousquet:
39:09 Since the beginning we established certain values that are linked to the Arborea project and linked to the results that we have found. One of those values was genetic diversity of future plantations, because the diversity here is the basis of adaptation. What we are trying to avoid is to plant a tree that we have cloned into tens of thousands of samples, and then this tree be sensitive to climatic factors or to insects, at which point we would then lose everything. We would lose everything all at once. We can't allow this to happen in Quebec-- within the forests or with plantations that take 30-50 years to grow

Narrator:
39:47 With the genetic markers of Arborea it will be possible to know in the first year if the young seedling will be a tree that is big, straight, and strong.

John Mackay:
39:57 In twenty years we are expecting that the large majority of re-planted trees in Quebec will be in a selection process and production of seedlings. A large majority of these seedlings could be selected with the tools that we develop today.

Jean Beaulieu
40:20 It's a dream that all young geneticists have had over the years to accelerate the cycles of improvement. Listen, since I have worked in the industry we have achieved two cycles of improvement. In 30 years I could have done 10 cycles, and increased the value of the forests that we constitute, maybe the industry today wouldn't be in such bad shape.

----------40:48 ENDS----------

[Table-top discussion between Chastenay and Veronique]

Chastenay
40:55 Veronique, in this case we are talking about trees that have been genetically modified. Are these the trees that we call GMOs?

Veronique:
41:02 No, we shouldn't mix up the two. There has been experiments conducted where we have created GMO trees in Canada--

Chastenay
41:09 --So we have taken a gene from one species and inserted it into the gene of another tree and let it grow

Veronique
41:14 Yes, but in the case of Aborea, the researchers really wanted to distinguish this type of research. Here they identify the best genes of white spruce to create a spruce that is better; that is improved.

Chastenay
41:25 Do we think that we can apply this technique to other trees than the spruce?

Veronique:
41:29 Yes, presently the Aborea project is part of an international consortium on forest genetics. For example, in BC we are trying to do the same kind of work on black spruce, which is a species that is very important to Quebec. We think of doing the same work with larch, white pine, and in fact, all the species that are important to the industry.

Chastenay:
41:47 And these identification kits of the best trees will be available for the people in the field when?

Veronique:
41:54 First, we are currently testing and we think that within a few years, maybe three or four--

Chastenay:
42:00 --Yes we are still in the middle of research

Veronique:
42:02 Yes, in three/four years we will have the kits ready for the improvers of the forest. Here for us, in Quebec, it is the people of the ministry of natural resources that do the replanting.

Chastenay:
42:11 Let's simply hope that they have the same concern to conserve the biodiversity that the researchers, who said it best in their reports, we have to conserve different types of trees in our forest.

---------- 42:21 ENDS ----------