Appendix 1 – R code for fitting applying the UVMU estimator to other Callery pear stands

## Code is based on Appendix A of Clifford et al. (2013).

## Download and install R from http://cran.r-project.org. Copy and paste the

## following commands into R to run this example.

## To access functions for evaluating the hypergeometric 0F1 function for UMVU

## (Universal Minimum Variance Unbiased) estimate

library(gsl)

## Load data

trees<-read.table("Pear Regression Data.txt",sep="\t",header=T)

## “Attach” the dataset so you can refer directly to the variables in it

attach(trees)

## Look at the top of the dataset

head(trees)

## Run the regression for total biomass

obj <- lm(log(Total.biomass)~1+log(dsh),data=trees)

## summary of the regression model

summary(obj)

## Extract model information including model matrix X, response y (i.e.,

## log(Total.biomass)), number of observations n, etc.

X <- model.matrix(obj)

y <- model.response(model.frame(obj))

n <- length(y)

s <- summary(obj)$sigma

betaHat <- coef(obj) ## estimate for beta

XtX <- crossprod(X) ## transpose of X multiplied by X

XtXi <- solve(XtX) ## XtX inverse

## Make predictions for trees with their covariate information saved in X0.

## X0 should be a .csv file (in this example, “St. Anne Convent.csv”).

## The model.matrix() statement takes the log of diameter and formats it

dsh<-as.data.frame(read.csv("St. Anne Convent.csv",header = T))

X0 <- model.matrix(~ 1 + log(dsh), dsh)

## Where we will store the results and the name of the associated correction

## factor

ret <- NULL

names <- NULL

## UMVU

m <- n - length(betaHat)

v0 <- X0 %\*% XtXi %\*% t(X0)

v0 <- diag(v0)

names <- c(names,"UMVU")

ret <- cbind(ret,exp(X0 %\*% betaHat) \* hyperg\_0F1(m/2,m\*(1-v0)/4\*s^2))

colnames(ret) <- names

ret

#Calculate the total biomass in X0

sum(ret[,"UMVU"])

Appendix 2 – Data files

Pear Regression Data.txt

dsh height branch leaves fruit bark wood dbh Total biomass

6 3.57 2157.9 1258 425.99 299.58 2181.7 3.4 6323.1

2.8 2.28 156.32 218.77 48.36 286.52 1.3 709.97

12.2 5.5 23769 7122.4 5673.4 1591 9580.5 9.2 47736

10.7 5.05 16004 5356.8 3935.9 1264 6872.1 8 33433

19.3 8.7 51405 2593.3 12336 53628 18.3 1.23E+05

8.1 4.69 3583.2 1783.9 1138.8 631.38 4308.9 5.9 11446

5.3 4.7 2095.7 1295.2 9.1 370.61 1759.9 3.6 5530.4

7.1 4.96 3226.9 1712 1249 775.58 5702.4 6 12666

1.1 1.72 9.86 33.47 11.27 47.83 0.4 102.43

0.1 0.3 0 1.51 0.44 0.44 2.39

0.6 0.79 1.72 7.84 2.38 9.67 21.61

1.4 1.68 26.76 30.24 26.96 59.27 0.4 143.23

0.3 0.41 0.47 0.74 0.59 1.46 3.26

St. Anne Convent.csv

dsh

0.7

0.8

1

1.2

1.2

1.3

1.5

1.7

2.1

2.2

2.4

2.7

3.2

3.3

4.6

5.8

13.7