

## Appendix A: Python script to create HABITAT model

The Python script below can be run in HABITAT to create the structure of the HABITAT models for Salmon and Macrophytes. It includes the main models, the submodels and the HSI models, but does not include the input maps. These input maps should be generated with the Delwaq2Raster tool.

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# This HABITAT model was setup for the TKI project  
# "Development of process-based tools for assessing reservoir sediment management"  
# It is a test-case to test the integrated DFM morphology - Water Quality and HABITAT setup  
# within DeltaShell  
  
# Mijke van Oorschot, May 2020p  
  
# Disclaimer:  
# It is a hypothetical model comprised of 2 species: Macrophytes and Salmon and contains  
# unvalidated  
# response curves to test the calculation of statistics and the integration between the  
# models.  
# These models are not meant to be used other than for testing purposes.  
  
#region imports for habitat functions  
from Libraries.StandardFunctions import *  
from Libraries.HabitatFunctions import *  
import os # for reading paths  
import csv # for reading and writing *.csv files  
  
InputDir = "C:\\Users\\oorschot\\OneDrive - Stichting Deltares\\Documents\\Sediment management  
Japan\\TKI projects\\2020\\Modellen\\HabitatInput\\"  
  
#region setup model structure  
compositeModel1 = CreateModel(HabitatModelType.CompositeModel)  
compositeModel1.Name = "Macrophytes"  
  
# Create composite model for fetch  
compositeModel2 = CreateModel(HabitatModelType.CompositeModel)  
compositeModel2.Name = "Salmon"  
  
mainCompositeModel = CreateModel(HabitatModelType.CompositeModel)  
mainCompositeModel.Name = "Integrated Habitat Model Test"  
  
# Add sub models (Activities) to main composite model  
mainCompositeModel.Activities.Add(compositeModel1)  
mainCompositeModel.Activities.Add(compositeModel2)  
  
AddToProject(mainCompositeModel)  
  
# create HSI model for Macrophytes  
WaterDepthMeanMac = CreateModel(HabitatModelType.BrokenLinearReclassification)  
WaterDepthMeanMac.Name = "WaterDepthMeanMac"  
WaterDepthMinMac = CreateModel(HabitatModelType.MultiTableReclassification)  
WaterDepthMinMac.Name = "WaterDepthMinMac"  
FlowVelocityMaxMac = CreateModel(HabitatModelType.MultiTableReclassification)  
FlowVelocityMaxMac.Name = "FlowVelocityMaxMac"  
HGI_Macrophytes = CreateModel(HabitatModelType.FormuleBased)  
HGI_Macrophytes.Name = "HGI_Macrophytes"  
HGI_Macrophytes.Formulas.Clear() # remove output grid  
  
# add models to composite model  
compositeModel1.Activities.Add(WaterDepthMeanMac)  
compositeModel1.Activities.Add(WaterDepthMinMac)  
compositeModel1.Activities.Add(FlowVelocityMaxMac)  
compositeModel1.Activities.Add(HGI_Macrophytes)  
  
# create HSI model for Salmon  
WaterDepthMeanSal = CreateModel(HabitatModelType.BrokenLinearReclassification)  
WaterDepthMeanSal.Name = "WaterDepthMeanSal"  
WaterDepthMinSal = CreateModel(HabitatModelType.MultiTableReclassification)
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WaterDepthMinSal.Name = "WaterDepthMinSal"
WaterDepthMaxSal = CreateModel(HabitatModelType.MultiTableReclassification)
WaterDepthMaxSal.Name = "WaterDepthMaxSal"

FlowVelocityMeanSal = CreateModel(HabitatModelType.BrokenLinearReclassification)
FlowVelocityMeanSal.Name = "FlowVelocityMeanSal"
FlowVelocityMinSal = CreateModel(HabitatModelType.MultiTableReclassification)
FlowVelocityMinSal.Name = "FlowVelocityMinSal"
FlowVelocityMaxSal = CreateModel(HabitatModelType.MultiTableReclassification)
FlowVelocityMaxSal.Name = "FlowVelocityMaxSal"
OxygenMinSal = CreateModel(HabitatModelType.BrokenLinearReclassification)
OxygenMinSal.Name = "OxygenMinSal"

HGI_Salmon = CreateModel(HabitatModelType.FormuleBased)
HGI_Salmon.Name = "HGI_Salmon"
HGI_Salmon.Formulas.Clear() # remove output grid

# add models to composite model
compositeModel2.Activities.Add(WaterDepthMeanSal)
compositeModel2.Activities.Add(WaterDepthMinSal)
compositeModel2.Activities.Add(WaterDepthMaxSal)
compositeModel2.Activities.Add(FlowVelocityMeanSal)
compositeModel2.Activities.Add(FlowVelocityMinSal)
compositeModel2.Activities.Add(FlowVelocityMaxSal)
compositeModel2.Activities.Add(OxygenMinSal)
compositeModel2.Activities.Add(HGI_Salmon)
#endregion

# region add response curves (within script)
# Macrophytes response curves
AddBrokenLinearReclassificationRow(WaterDepthMeanMac, 0,0)
AddBrokenLinearReclassificationRow(WaterDepthMeanMac, 0.5,1)
AddBrokenLinearReclassificationRow(WaterDepthMeanMac, 1.5,1)
AddBrokenLinearReclassificationRow(WaterDepthMeanMac, 1.9,0)
AddBrokenLinearReclassificationRow(WaterDepthMeanMac, 10,0)

AddMultiTableReclassificationRow(WaterDepthMinMac, ["[0,0.1]"] , 0, " ")
AddMultiTableReclassificationRow(WaterDepthMinMac, ["<0.1,>"] , 1, " ")

AddMultiTableReclassificationRow(FlowVelocityMaxMac, ["[0,0.35]"] , 1, " ")
AddMultiTableReclassificationRow(FlowVelocityMaxMac, ["<0.35,>"] , 0, " ")

# Salmon response curves
AddBrokenLinearReclassificationRow(FlowVelocityMeanSal, 0,0)
AddBrokenLinearReclassificationRow(FlowVelocityMeanSal, 0.08,0)
AddBrokenLinearReclassificationRow(FlowVelocityMeanSal, 0.13,1)
AddBrokenLinearReclassificationRow(FlowVelocityMeanSal, 0.45,1)
AddBrokenLinearReclassificationRow(FlowVelocityMeanSal, 1,0)
AddBrokenLinearReclassificationRow(FlowVelocityMeanSal, 10,0)

AddMultiTableReclassificationRow(FlowVelocityMaxSal, ["[0,1.0]"] , 1, " ")
AddMultiTableReclassificationRow(FlowVelocityMaxSal, ["<1.0,>"] , 0, " ")

AddMultiTableReclassificationRow(FlowVelocityMinSal, ["[0,0.1]"] , 0, " ")
AddMultiTableReclassificationRow(FlowVelocityMinSal, ["<0.1,>"] , 1, " ")

AddBrokenLinearReclassificationRow(WaterDepthMeanSal, 0,0)
AddBrokenLinearReclassificationRow(WaterDepthMeanSal, 0.15,0)
AddBrokenLinearReclassificationRow(WaterDepthMeanSal, 0.35,1)
AddBrokenLinearReclassificationRow(WaterDepthMeanSal, 0.7,0)
AddBrokenLinearReclassificationRow(WaterDepthMeanSal, 10,0)

AddMultiTableReclassificationRow(WaterDepthMinSal, ["[0,0.15]"] , 0, " ")
AddMultiTableReclassificationRow(WaterDepthMinSal, ["<0.15,>"] , 1, " ")

AddMultiTableReclassificationRow(WaterDepthMaxSal, ["[0,1.5]"] , 1, " ")
AddMultiTableReclassificationRow(WaterDepthMaxSal, ["<1.5,>"] , 0, " ")

AddBrokenLinearReclassificationRow(OxygenMinSal, 0,0)
AddBrokenLinearReclassificationRow(OxygenMinSal, 6,0)

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AddBrokenLinearReclassificationRow(OxygenMinSal, 8,1)
AddBrokenLinearReclassificationRow(OxygenMinSal, 10,1)
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