Pacific Crabapple Metadata and Quality Assessment Standard

Roxan Chicalo

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Pacific Crabapple

#SHM Planning step - related to section 2.1 in Standard.

Table 1: SHM Planning

|  |  |
| --- | --- |
| Project\_area | Pacific crabapple range in British Columbia |
| Area\_size | 233839.5 km2 |
| Model\_scale | 25 x 25m |
| Current\_scientific\_name | Malus fusca |
| Common\_names | Pacific Crabapple |
| Species\_code | MALUFUS |
| Provincial\_ranking | S5 (2019) |
| Global\_ranking | G2 (2013) |
| Distribution\_status | N/A |
| Life\_requisite | N/A |
| Life\_stage | N/A |
| SHM\_objective | Initial environmental screening |
| Funding\_source | BC Conservation Data Centre via Ministry of Forests |
| Model\_creators | Borthwick R |
| Model\_creation\_date | 03-10-2023 |
| Model\_reviewer | Tripp T |
| Model\_review\_date | 03-13-2023 |
| Disclaimer | This model has not been reviewed in detail, and multiple iterations are out of scope, use its outputs extreme caution and to simply consider the mechanisms for populating the draft standard. Model outputs should not be used in a management context. Model inputs included a wide variety of environmental predictors, some of which are tested and reliable in the literature others are less robust. For the region of interest we have no confirmation about the applicability of the SAGA data which was less reliable in steep elevation changes, we have selected the best available climatological predictors. A Random Forest model was used. This a reasonably robust model framework. |

#SHM Species Presence and Absence Data - related to section 2.2 in Standard

Table 2: Species Data Inputs

| Source | Access\_date | Number\_of\_records | Collection\_method | Spatial\_format | Preparation |
| --- | --- | --- | --- | --- | --- |
| Global Biodiversity Information Facility (GBIF) | 03-08-2023 | 1113 | Various | points | Filtered by scientific species name and range in BC range was extracted from provincial range map extent |
| Conservation Data Centre (CDC) | 01-01-2023 | 224 | Various | polygons | EO data were not filtered |
| Vegetation and Environment Nexus Professional (VPro) | 01-11-2023 | 392 | Indirect survey | points | Filtered by scientific species name |

Table 3: Species Presence & Absence Dataset

|  |  |
| --- | --- |
| Total\_records\_preclean | 1729 |
| Date\_range\_min | 26-07-1965 |
| Date\_range\_max | 08-08-2022 |
| record\_cleaning | I take the intersections of points and polygons to reduce duplicated data. I rasterize the data so that presence is based on grid size. Only presence data is used for this model. |
| Autocorrelation\_threshold | NA |
| Precision\_threshold | NA |
| Final\_records\_postclean | 687 |
| Absence\_data\_type | Pseudoabsences |
| Total\_absence\_records | 1500 |
| Absence\_extent | Area of Interest |

#SHM Enviromental Predictors- related to section 2.3

Table 4: Enviromental Data Inputs

| Predictor short name | Predictor class | Predictor full name | Description | Predictor type | Predictor Source | Original Scale | Year represented | Data collection method | Accuracy |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| admin\_dist\_noNA.tif | landcover | Towns and cities | Distance to nearest town or city | Continuous | Administration Areas; DataBC | NA | Unknown | Field-verified | U |
| bec\_noNA.tif | landcover | Biogeoclimatic\_zones | Category codes | Categorical | BECWeb version 12; DataBC | 1:20,000 | Unknown | VA of satellite imagery and Field verified | U |
| bedrock\_pct\_intrusive\_rocks\_noNA.tif | substrate | Bedrock\_intrusive\_rock | percent area within 100m radius | Continuous | BC-DigitalGeo; DataBC | 1:50,000 | Unknown | VA of satellite imagery and Field verified | U |
| bedrock\_pct\_metamorphic\_rocks\_noNA.tif | substrate | Bedrock\_metamorphic\_rock | percent area within 100m radius | Continuous | BC-DigitalGeo; DataBC | 1:50,000 | Unknown | VA of satellite imagery and Field verified | U |
| bedrock\_pct\_sedimentary\_rocks\_noNA.tif | substrate | Bedrock\_sedimentary\_and\_volcanic\_rocks | percent area within 100m radius | Continuous | BC-DigitalGeo; DataBC | 1:50,000 | Unknown | VA of satellite imagery and Field verified | U |
| bedrock\_pct\_volcanic\_and\_sedimentary\_rocks\_noNA.tif | substrate | Bedrock\_sedimentary\_rocks | percent area within 100m radius | Continuous | BC-DigitalGeo;DataBC | 1:50,000 | Unknown | VA of satellite imagery and Field verified | U |
| bedrock\_pct\_volcanic\_rocks\_noNA.tif | substrate | Bedrock\_volcanic\_rock | percent area within 100m radius | Continuous | BC-DigitalGeo; DataBC | 1:50,000 | Unknown | VA of satellite imagery and Field verified | U |
| ccl\_dist\_noNA.tif | landcover | Cutblock\_features | Distance to nearest cutblock age <30yrs of 2005 | Continuous | Consolidated Cutblocks; DataBC | 1:20,000 | 2022 | Field-verified | U |
| clim\_map\_noNA.tif | climate | Annual\_mean\_precitpitation | Climate normal 1991-2020 | Continuous | Climate BC | 800x800m | 1991-2020 | Field-verified | U |
| clim\_mat\_noNA.tif | climate | Annual\_mean\_temperature | Climate normal 1991-2020 | Continuous | Climate BC | 800x800m | 1991-2020 | Field-verified | U |
| clim\_rh\_noNA.tif | climate | Mean\_annual\_relative\_humidity | Climate normal 1991-2020 | Continuous | Climate BC | 800x800m | 1991-2020 | Field-verified | U |
| clim\_shm\_noNA.tif | climate | Summer\_heat\_moisture\_index | Climate normal 1991-2020 | Continuous | Climate BC | 800x800m | 1991-2020 | Field-verified | U |
| clim\_tave\_at\_noNA.tif | climate | Fall\_mean\_temperature | Climate normal 1991-2020 | Continuous | Climate BC | 800x800m | 1991-2020 | Field-verified | U |
| clim\_tave\_sm\_noNA.tif | climate | Summer\_mean\_temperature | Climate normal 1991-2020 | Continuous | Climate BC | 800x800m | 1991-2020 | Field-verified | U |
| clim\_tave\_sp\_noNA.tif | climate | Spring\_mean\_temperature | Climate normal 1991-2020 | Continuous | Climate BC | 800x800m | 1991-2020 | Field-verified | U |
| clim\_tave\_wt\_noNA.tif | climate | Winter\_mean\_temperature | Climate normal 1991-2020 | Continuous | Climate BC | 800x800m | 1991-2020 | Field-verified | U |
| dem\_noNA.tif | topography | Elevation | Average elevation within grid cell | Continuous | Digital Elevation Model; DataBC | 25x25m | Unknown | Remote-sensed | U |
| dra\_dist\_noNA.tif | landcover | Road\_features | Distance to nearest road | Continuous | Digital Road Atlas; DataBC | 1:20,000 | Unknown | VA of satellite imagery | U |
| fwa\_dist\_noNA.tif | landcover | Water\_features | Distance to stream, river, lake, wetland | Continuous | Fresh Water Atlas; DataBC | 1:20,000 | Unknown | VA of satellite imagery | U |
| ntems\_fire\_dist\_noNA.tif | landcover | Fire\_features | Distance to nearest 1995-2005 fire | Continuous | CA\_Forest\_Fire\_1985-2020; National Terrestrial Ecosystem Monitoring System | 30x30m | 1985-2020 | Remote-sensed | U |
| ntems\_lc2005\_pct\_100\_herbs\_noNA.tif | landcover | Herbaceous | percent area within 100m radius | Continuous | CA\_forest\_VLCE2\_2009; National Terrestrial Ecosystem Monitoring System | 30x30m | 2009 | Remote-sensed | U |
| ntems\_lc2005\_pct\_210\_coniferous\_noNA.tif | landcover | Coniferous | percent area within 100m radius | Continuous | CA\_forest\_VLCE2\_2009;National Terrestrial Ecosystem Monitoring System | 30x30m | 2009 | Remote-sensed | U |
| ntems\_lc2005\_pct\_220\_broadleaf\_noNA.tif | landcover | Broadleaf | percent area within 100m radius | Continuous | CA\_forest\_VLCE2\_2009; National Terrestrial Ecosystem Monitoring System | 30x30m | 2009 | Remote-sensed | U |
| ntems\_lc2005\_pct\_230\_mixedwood\_noNA.tif | landcover | Mixedwood | percent area within 100m radius | Continuous | CA\_forest\_VLCE2\_2009; National Terrestrial Ecosystem Monitoring System | 30x30m | 2009 | Remote-sensed | U |
| ntems\_lc2005\_pct\_31\_snow\_ice\_noNA.tif | landcover | Snow\_ice | percent area within 100m radius | Continuous | CA\_forest\_VLCE2\_2009; National Terrestrial Ecosystem Monitoring System | 30x30m | 2009 | Remote-sensed | U |
| ntems\_lc2005\_pct\_32\_rock\_rubble\_noNA.tif | substrate | Rock\_rubble | percent area within 100m radius | Continuous | CA\_forest\_VLCE2\_2009; National Terrestrial Ecosystem Monitoring System | 30x30m | 2009 | Remote-sensed | U |
| ntems\_lc2005\_pct\_33\_exposed\_barren\_land\_noNA.tif | landcover | Exposed\_barren | percent area within 100m radius | Continuous | CA\_forest\_VLCE2\_2009; National Terrestrial Ecosystem Monitoring System | 30x30m | 2009 | Remote-sensed | U |
| ntems\_lc2005\_pct\_50\_shrubs\_noNA.tif | landcover | Shrubs | percent area within 100m radius | Continuous | CA\_forest\_VLCE2\_2009; National Terrestrial Ecosystem Monitoring System | 30x30m | 2009 | Remote-sensed | U |
| ntems\_lc2005\_pct\_80\_wetland\_noNA.tif | landcover | Wetlands | percent area within 100m radius | Continuous | CA\_forest\_VLCE2\_2009; National Terrestrial Ecosystem Monitoring System | 30x30m | 2009 | Remote-sensed | U |
| ntems\_lc2005\_pct\_81\_wetland\_treed\_noNA.tif | landcover | Wetland\_treed | percent area within 100m radius | Continuous | CA\_forest\_VLCE2\_2009; National Terrestrial Ecosystem Monitoring System | 30x30m | 2009 | Remote-sensed | U |
| ntems\_tree\_pct\_0\_none\_noNA.tif | landcover | None | percent area within 100m radius | Continuous | CA\_forest\_VLCE2\_2009; National Terrestrial Ecosystem Monitoring System | 30x30m | 2009 | Remote-sensed | U |
| ntems\_tree\_pct\_1\_Abies\_amabilis\_noNA.tif | landcover | Abies\_amabilis | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_11\_Chamaecyparis\_nootkatensis\_noNA.tif | landcover | Chamaecyparis\_nootkatensis | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_16\_Picea\_engelmannii\_noNA.tif | landcover | Picea\_engelmannii | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_17\_Picea\_glauca\_noNA.tif | landcover | Picea\_glauca | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_18\_Picea\_mariana\_noNA.tif | landcover | Picea\_mariana | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_20\_Picea\_sitchensis\_noNA.tif | landcover | Picea\_sitchensis | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_23\_Pinus\_contorta\_noNA.tif | landcover | Pinus\_contorta | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_29\_Populus\_tremuloides\_noNA.tif | landcover | Populus\_tremuloides | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_3\_Abies\_lasiocarpa\_noNA.tif | landcover | Abies\_lasiocarpa | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_30\_Pseudotsuga\_menziesii\_noNA.tif | landcover | Pseudotsuga\_menziesii | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_33\_Thuja\_plicata\_noNA.tif | landcover | Thuja\_plicata | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_35\_Tsuga\_heterophylla\_noNA.tif | landcover | Tsuga\_heterophylla | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_36\_Tsuga\_mertensiana\_noNA.tif | landcover | Tsuga\_mertensiana | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_4\_Acer\_macrophyllum\_noNA.tif | landcover | Acer\_macrophyllum | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| ntems\_tree\_pct\_8\_Alnus\_rubra\_noNA.tif | landcover | Alnus\_rubra | percent area within 100m radius | Continuous | CA\_forest\_lead\_tree\_species; National Terrestrial Ecosystem Monitoring System | 30x30m | 2015 | Remote-sensed | U |
| saga\_dah\_noNA.tif | topography | Diurnal\_anisotropic\_heat | Function of aspect and slope; |  |  |  |  |  |  |
| sun exposure | Continuous | SAGA derivative of Digital Elevation Model | 25x25m | Unknown | Remote-sensed | U |  |  |  |
| saga\_tri\_noNA.tif | topography | Terrain\_ruggedness\_index | Function of elevation | Continuous | SAGA derivative of Digital Elevation Model | 25x25m | Unknown | Remote-sensed | U |
| slp\_noNA.tif | topography | Slope | Average slope within grid cell | Continuous | Digital Elevation Model; DataBC | 25x25m | Unknown | Remote-sensed | U |
| soilpm\_pct\_11\_Till\_noNA.tif | substrate | Soil\_till | percent area within 100m radius | Continuous | Soil Parent Materials; TEI Group | 100x100m | Unknown | VA of satellite imagery and Field verified | U |
| soilpm\_pct\_13\_Rock\_noNA.tif | substrate | Soil\_rock | percent area within 100m radius | Continuous | Soil Parent Materials; TEI Group | 100x100m | Unknown | VA of satellite imagery and Field verified | U |
| soilpm\_pct\_3\_Colluvium\_noNA.tif | substrate | Soil\_colluvium | percent area within 100m radius | Continuous | Soil Parent Materials; TEI Group | 100x100m | Unknown | VA of satellite imagery and Field verified | U |
| soilpm\_pct\_6\_Fluvial\_noNA.tif | substrate | Soild\_fluvial | percent area within 100m radius | Continuous | Soil Parent Materials; TEI Group | 100x100m | Unknown | VA of satellite imagery and Field verified | U |
| soilpm\_pct\_7\_Glaciofluvial\_noNA.tif | substrate | Soil\_glaciofluvial | percent area within 100m radius | Continuous | Soil Parent Materials; TEI Group | 100x100m | Unknown | VA of satellite imagery and Field verified | U |
| vri\_age\_noNA.tif | landcover | Forest\_age | Average age within grid cell | Continuous | Vegetation Resources Inventories | 1:20,000 | 2005 | VA of satellite imagery | U |
| vri\_crown\_noNA.tif | landcover | Forest\_crown\_closure | Average percent cover within grid cell | Continuous | Vegetation Resources Inventories | V1:20,000 | 2005 | VA of satellite imagery | U |
| vri\_herb\_noNA.tif | landcover | Herb\_cover | Average percent cover within grid cell | Continuous | Vegetation Resources Inventories | 1:20,000 | 2005 | VA of satellite imagery | U |
| vri\_shrub\_noNA.tif | landcover | Shrub\_cover | Average percent cover within grid cell | Continuous | Vegetation Resources Inventories | 1:20,000 | 2005 | VA of satellite imagery | U |

#SHM Model Algorithm and Validation - related to section 2.4 and 2.5

Table 5: Model Algorithm and Validation

|  |  |
| --- | --- |
| Model\_algorithm | Random Forest |
| Model\_threshold\_categories | high, moderate, low |
| Model\_thresholds | 85,65,5 |
| Validation\_methods | Single random sample |
| Statistical\_test | Area under the curve |
| Statistical\_test\_score | .69 |

#SHM Model Quality Assessment - related to section 3

Table 6: Model Quality Assessment

|  |  |
| --- | --- |
| Presence\_data | Interpret with caution |
| Presence\_data\_justification | Spatial bias of samples is unacknowledged or unaddressed; records provide unknown representation of environmental variability across the species’ range |
| Absence\_data | Interpret with caution |
| Absence\_data\_justification | Background samples do not reflect sampling bias in presence locations; sampling biases have not been addressed. |
| Ecological\_predictive\_relevance | Interpret with caution |
| Ecological\_predictive\_relevance\_justification | Predictors have not been tuned to remove correlated predictors or predictors of low statistical importance; the global model is used here. |
| Spatial\_Temporal\_alignment | Interpret with Caution |
| Spatial\_Temporal\_alignment\_justification | Time-varying predictor variables reflect conditions at a single point in time that does not necessarily match the time at which species observations were made; however, predictor time period selection was made to accommodate modal year of observations. |
| Algorithm\_choice\_statistical\_rigor | Acceptable |
| Algorithm\_choice\_statistical\_rigor\_justification | Random forest is appropriate for inputs; model assumptions are accounted for |
| Sensitivity | Interpret with caution |
| Sensitivity\_justification | A single algorithm is used with default settings. No sensitivity analysis is conducted. |
| Model\_inputs\_methods\_score | Data deficient |
| Statistical\_performance | Low |
| Statistical\_performance\_just | Only a single metric was used, and AUC score was .69 which is considered below ‘Low’… therefore not good. |
| Expert\_review | Low |
| Expert\_review\_just | Model was released without review |
| Overall\_confidence | Invalid input |
| Model\_end\_uses | Requires further iterations before interpretations are made |

#SHM Gap Identification - Presence and Absence data - related to section 4.1

Table 7: Species Presence & Absence Data Gaps

|  |  |
| --- | --- |
| Insufficient\_species\_data | N |
| Insufficient\_species\_data\_rationale | There appears to be a high number of points distributed throughout range. |
| Spatial\_biases\_species\_data | N |
| Spatial\_biases\_species\_data\_description | No known biases observed, yet no formal tests done |
| Absence\_data\_gaps | Lack of observed absences, Unable to model detection biases, Unable to mimic sampling biases |

##SHM Gap Identification #SHM Gap Identification - Environmental Predictors - related to section 4.2

Table 8: Enviromental Data Gaps

| Predictor\_source\_layer | Associated\_variable | Issue | Gap\_description |
| --- | --- | --- | --- |
| Terrestrial Ecosystem Mapping | First decile ecosystem label | Imcomplete coverage, Poor Temporal Alignment | TEM mapping only avaialbe for 46.8% of AOI. |
| Terrestrial Ecosystem Mapping | Stand compostion | Imcomplete coverage, Poor Temporal Alignment | TEM mapping only avaialbe for 46.8% of AOI. |
| Terrestrial Ecosystem Mapping | R/G/C | Imcomplete coverage, Poor Temporal Alignment | TEM mapping only avaialbe for 46.8% of AOI. |
| Terrestrial Ecosystem Mapping | Bioterrain codes | Imcomplete coverage, Poor Temporal Alignment | TEM mapping only avaialbe for 46.8% of AOI. |
| Terrestrial Ecosystem Mapping | Site modifiers | Imcomplete coverage, Poor Temporal Alignment | TEM mapping only avaialbe for 46.8% of AOI. |
| Terrestrial Ecosystem Mapping | Drainage | Imcomplete coverage, Poor Temporal Alignment | TEM mapping only avaialbe for 46.8% of AOI. |
| Terrestrial Ecosystem Mapping | Structural stage | Imcomplete coverage, Poor Temporal Alignment | TEM mapping only avaialbe for 46.8% of AOI. |
| Vegetation Resources Inventories | Leading tree species | Imcomplete coverage, Accuracy concerns | VRI polygons covers almost 90% of AOI yet most of the attributes interested in are not available (only 42% of VRI polygons in AOI are attributed for variables of interest); experts say that VRI vintages prior to 2008 are not very accurate |
| Vegetation Resources Inventories | Forest Age | Imcomplete coverage, Accuracy concerns | VRI polygons covers almost 90% of AOI yet most of the attributes interested in are not available (only 42% of VRI polygons in AOI are attributed for variables of interest); experts say that VRI vintages prior to 2008 are not very accurate |
| Vegetation Resources Inventories | Crown closure | Imcomplete coverage, Accuracy concerns | VRI polygons covers almost 90% of AOI yet most of the attributes interested in are not available (only 42% of VRI polygons in AOI are attributed for variables of interest); experts say that VRI vintages prior to 2008 are not very accurate |
| Broad Ecosystem Inventory | Ecosection | Poor resolution | There is little variation in ecosection within Crabapple range |
| BC-DigitalGeo | Rock classes | Poor resolution | 1:50:000 scale is too large grain for grain of model, will likely result in little variation among training data |