# Central Yukon Rapid Ecoregional Assessment

Detailed Modeling Guide Document

# Abiotic Change Agents

*2017-11-15*

## Background

The purpose of this document, and all REA detailed modeling guide documents, is to provide a GIS person with the background necessary to understand, answer questions, re-run and modify models used within this REA. All known information and experience related to performing quality control and re-running the models for this section of this REA are documented here. BLM contact information is below.

## Toolbox Title: Climate

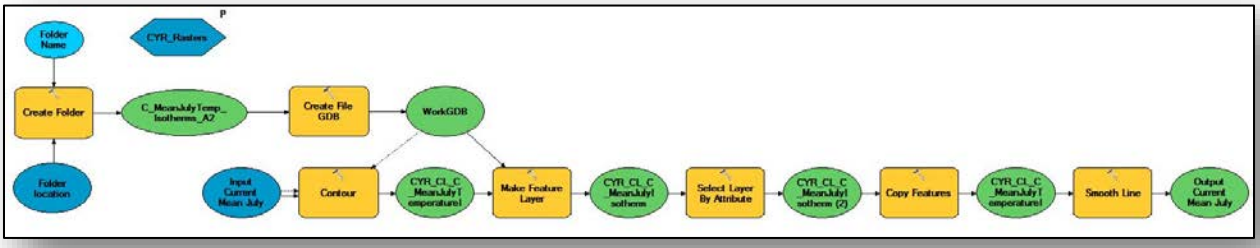
**Model Package Description:** Esri 10.3.1 geoprocessing models and documentation relating to the Abiotic Change Agents: Climate Toolbox within the BLM 2013 Central Yukon (CYR) Rapid Ecoregional Assessment (REA). This model package contains 10 models.

## Overview

A series of spatial models that assess the relationships between temperature and precipitation; calculating summer warmth index, snow day fraction, date of freeze, date of thaw and climate clusters (cliomes). These parameters are used to derive length of growing season and mean seasonal changes for temperature and precipitation. The analysis employed simulation models to assess current, near-term future, and long-term future climate change.

## Toolbox Contents

## Model: CYR_CL_C_Geo_MeanJulyTemperatureIsotherms_A2



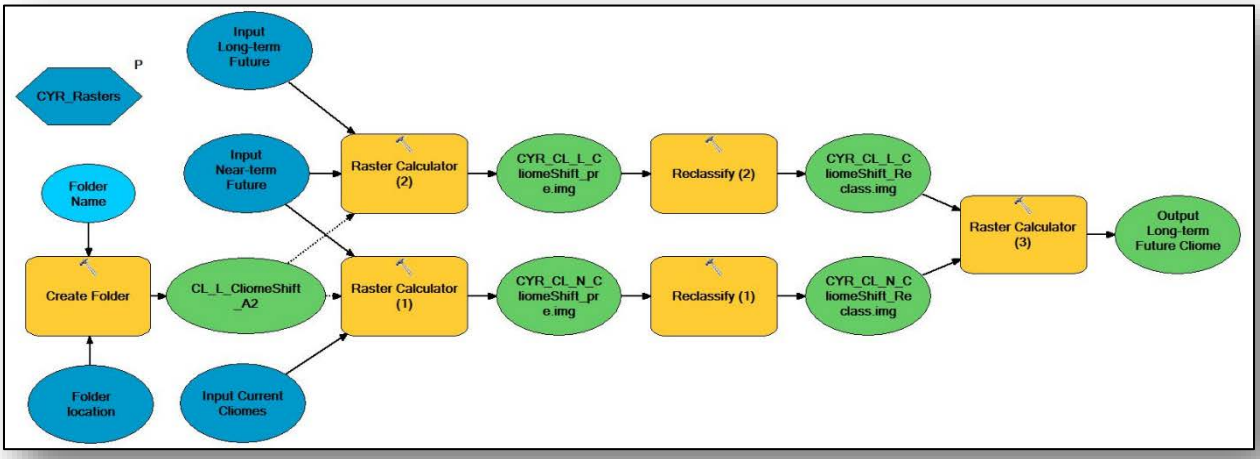

### *Description*

A geoprocessing model that calculates July isotherms of 12°C and 18°C, the projected northern and southern limit of the boreal forest, for the current condition (2010s).

### *Model Details/Notes:*

- Temporal Reference: Current
- Associated Management Questions: B1
- Custom scripting used within this model: No
- Sensitive data involved in the model: No
- Dependencies: This model does not depend on any derived intermediates to run.
- Modeling Environment: Esri Modelbuilder
- This model utilizes variables (replace the path shortcuts to input/intermediate/output datasets using the hexagon variables.) This model has been re-run, edited, and verified by the BLM NOC REA data team.

## Model: CYR_CL_L_Geo_CliomeShift_A2



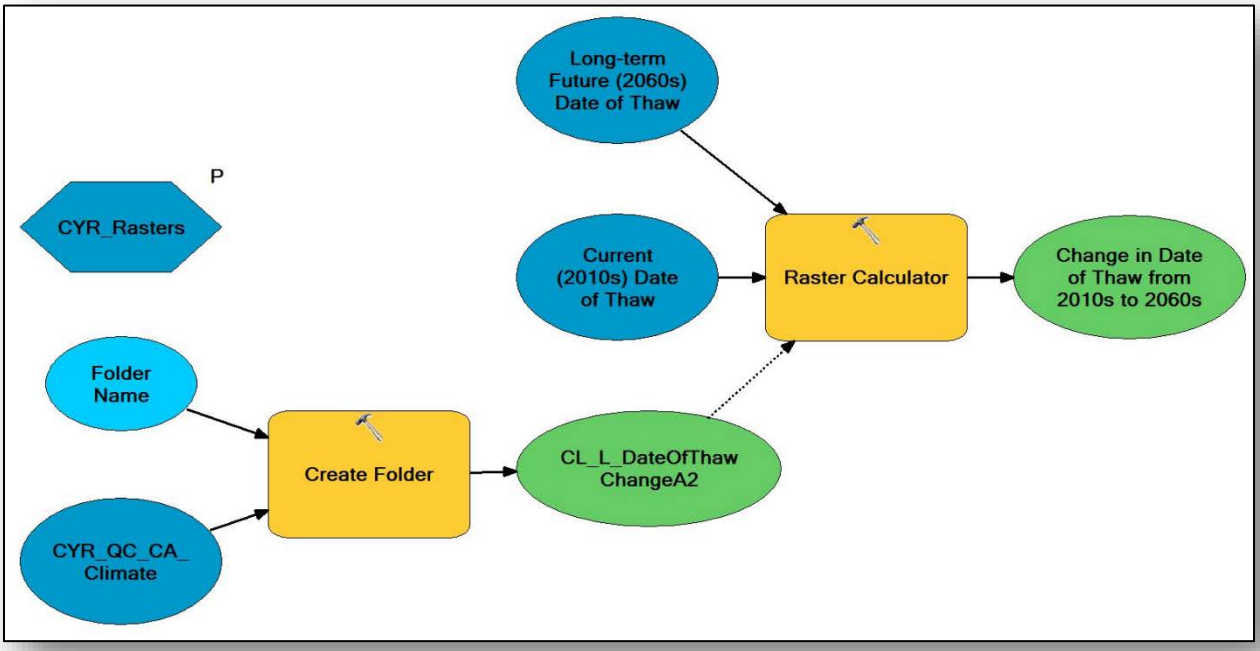

### *Description*

A geoprocessing model that calculates cliomes shift from 2010s to 2060s. Cliomes are clusters of similar climatic conditions based on decadal mean monthly temperatures and decadal mean monthly total precipitations, with a total of 24 variables. Cliomes used in this project were identified using the combined Random Forests™ and Partitioning around Medoids (PAM) clustering algorithms. The shift from current to long-term future shows pixels that are expected to shift from current to near-term future, from current to long-term future, or from current to near-term future and near-term future to long-term future.

### *Model Details/Notes:*

- Temporal Reference: Long-Term
- Associated Management Questions: B1
- Custom scripting used within this model: No
- Sensitive data involved in the model: No
- Dependencies: This model does not depend on any derived intermediates to run.
- Modeling Environment: Esri Modelbuilder
- This model utilizes variables (replace the path shortcuts to input/intermediate/output datasets using the hexagon variables.) This model has been re-run, edited, and verified by the BLM NOC REA data team.

## Model: CYR_CL_L_Geo_DateOfThawChange_A2



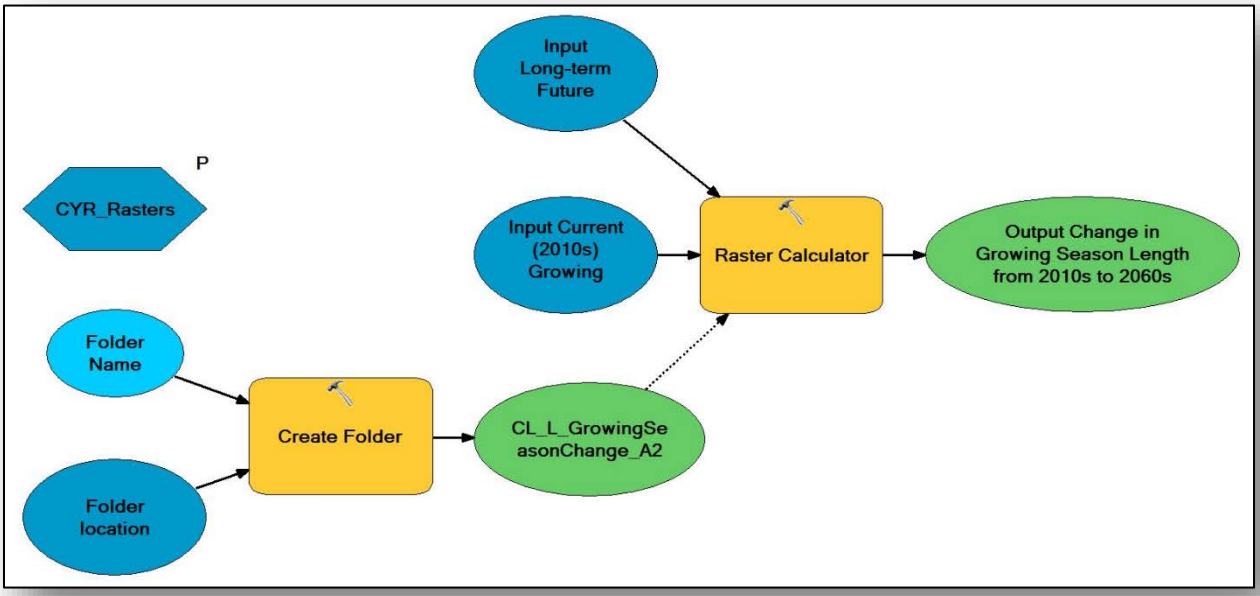

### *Description*

A geoprocessing model that calculates decrease in date of thaw from the 2010s to 2060s.

### *Model Details/Notes:*

- Temporal Reference: Long-Term
- Associated Management Questions: E1
- Custom scripting used within this model: No
- Sensitive data involved in the model: No
- Dependencies: This model does not depend on any derived intermediates to run. This model creates intermediates necessary for other models to be able to run.
- Modeling Environment: Esri Modelbuilder
- This model utilizes variables (replace the path shortcuts to input/intermediate/output datasets using the hexagon variables.) This model has been re-run, edited, and verified by the BLM NOC REA data team.

## Model: CYR_CL_L_Geo_GrowingSeasonChange_A2



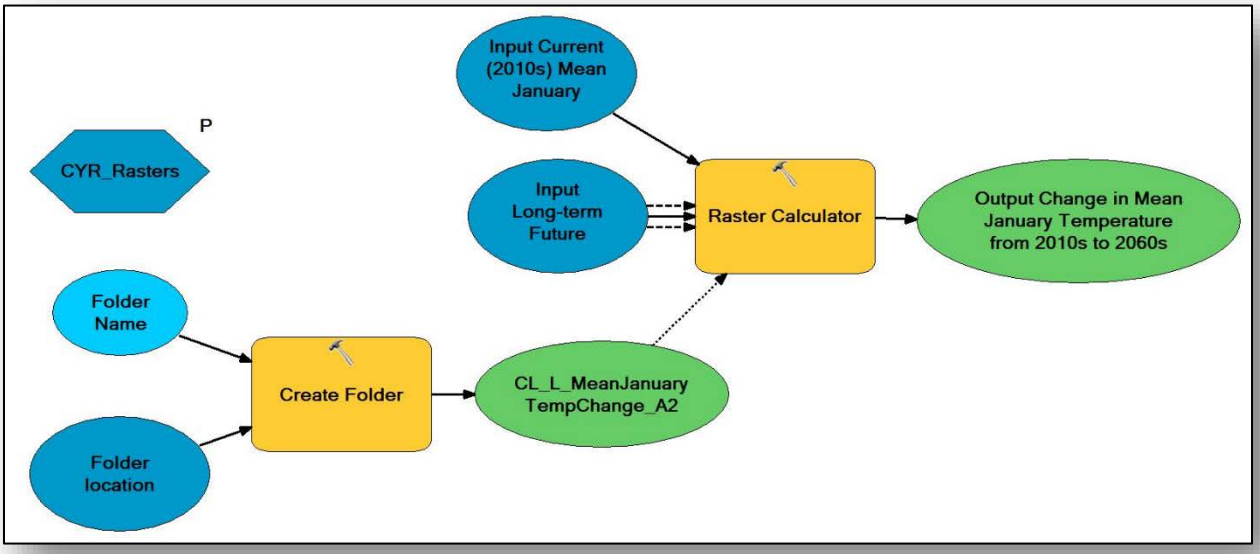

### *Description*

A geoprocessing model that calculates change in growing season length from 2010s to 2060s. Growing season length is defined as the number of days between the Date of Thaw and the Date of Freeze. It is the length of the season during which the mean daily temperature is above 0°C. The long-term future change in length of growing season is the difference between the current (2010s) growing season length and the long-term future (2060s) growing season length.

### *Model Details/Notes:*

- Temporal Reference: Long-Term
- Associated Management Questions: E1
- Custom scripting used within this model: No
- Sensitive data involved in the model: No
- Dependencies: This model does not depend on any derived intermediates to run. This model creates intermediates necessary for other models to be able to run.
- Modeling Environment: Esri Modelbuilder
- This model utilizes variables (replace the path shortcuts to input/intermediate/output datasets using the hexagon variables.) This model has been re-run, edited, and verified by the BLM NOC REA data team.

## Model: CYR_CL_L_Geo_MeanJanuaryTemperatureChange_A2



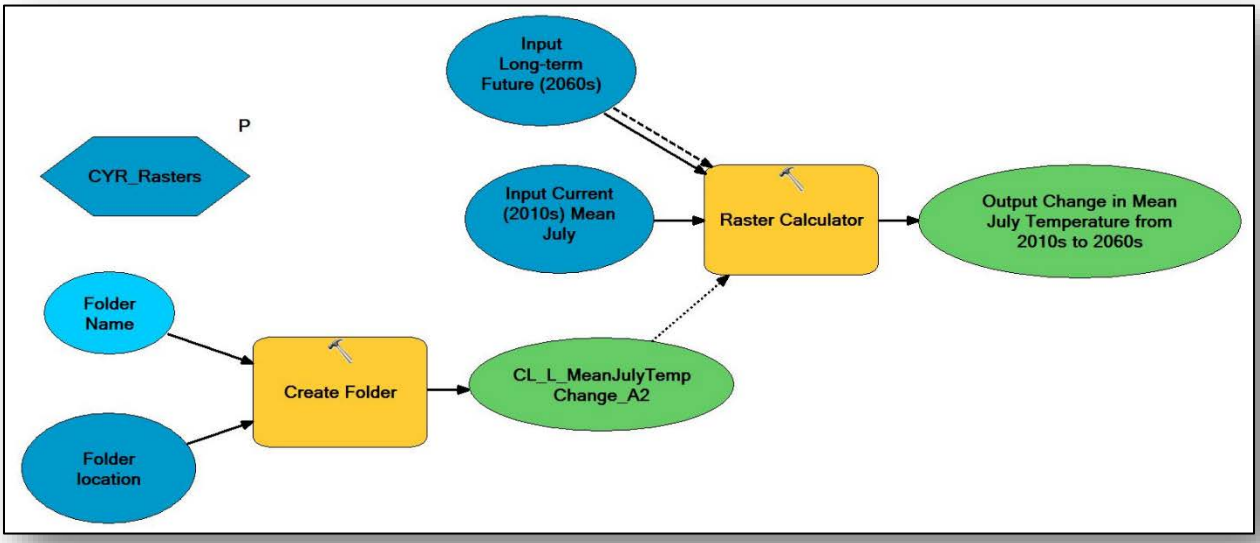

### *Description*

A geoprocessing model that calculates change in Mean January Temperature from 2010s to 2060s.

### *Model Details/Notes:*

- Temporal Reference: Long-Term
- Associated Management Questions: B1
- Custom scripting used within this model: No
- Sensitive data involved in the model: No
- Dependencies: This model does not depend on any derived intermediates to run. This model creates intermediates necessary for other models to be able to run.
- Modeling Environment: Esri Modelbuilder
- This model utilizes variables (replace the path shortcuts to input/intermediate/output datasets using the hexagon variables.) This model has been re-run, edited, and verified by the BLM NOC REA data team. Model: CYR_CL_L_Geo_MeanJulyTemperatureChange_A2

## Model: CYR_CL_L_Geo_MeanJulyTemperatureChange_A2



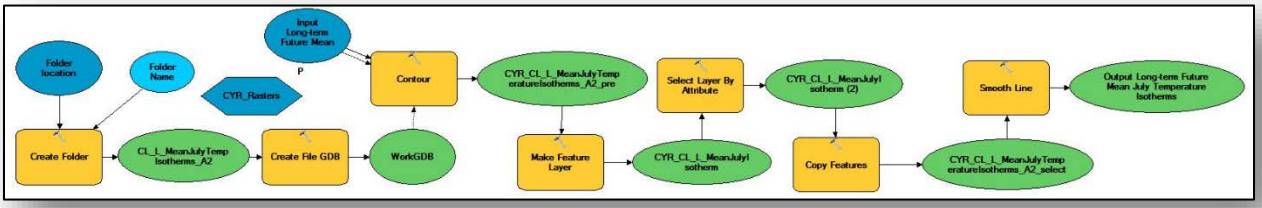

### *Description*

A geoprocessing model that calculates change in Mean July Temperature from 2010s to 2060s.

### *Model Details/Notes:*

- Temporal Reference: Long-Term
- Associated Management Questions: B1
- Custom scripting used within this model: No
- Sensitive data involved in the model: No
- Dependencies: This model does not depend on any derived intermediates to run. This model creates intermediates necessary for other models to be able to run.
- Modeling Environment: Esri Modelbuilder
- This model utilizes variables (replace the path shortcuts to input/intermediate/output datasets using the hexagon variables.) This model has been re-run, edited, and verified by the BLM NOC REA data team.

## Model: CYR_CL_L_Geo_MeanJulyTemperatureIsotherms_A2



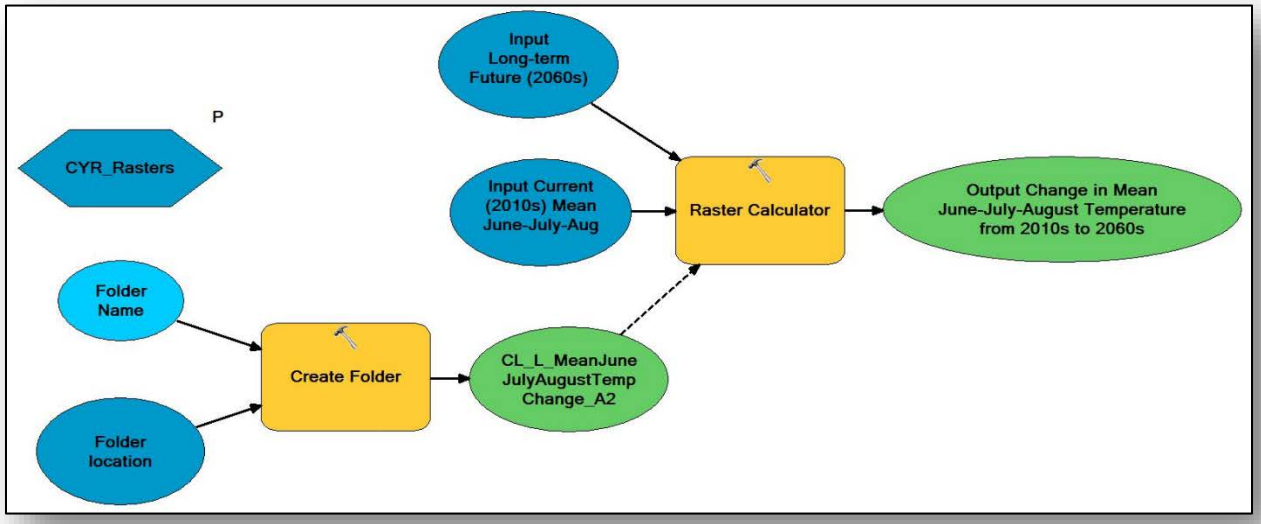

### *Description*

A geoprocessing model that calculates July isotherms of 12°C and 18°C, the projected northern and southern limit of the boreal forest, for the long-term future (2060s).

### *Model Details/Notes:*

- Temporal Reference: Long-Term
- Associated Management Questions: B1
- Custom scripting used within this model: No
- Sensitive data involved in the model: No
- Dependencies: This model does not depend on any derived intermediates to run. This model creates intermediates necessary for other models to be able to run.
- Modeling Environment: Esri Modelbuilder
- This model utilizes variables (replace the path shortcuts to input/intermediate/output datasets using the hexagon variables.) This model has been re-run, edited, and verified by the BLM NOC REA data team.

## Model: CYR_CL_L_Geo_MeanJuneJulyAugustTemperatureChange_A2



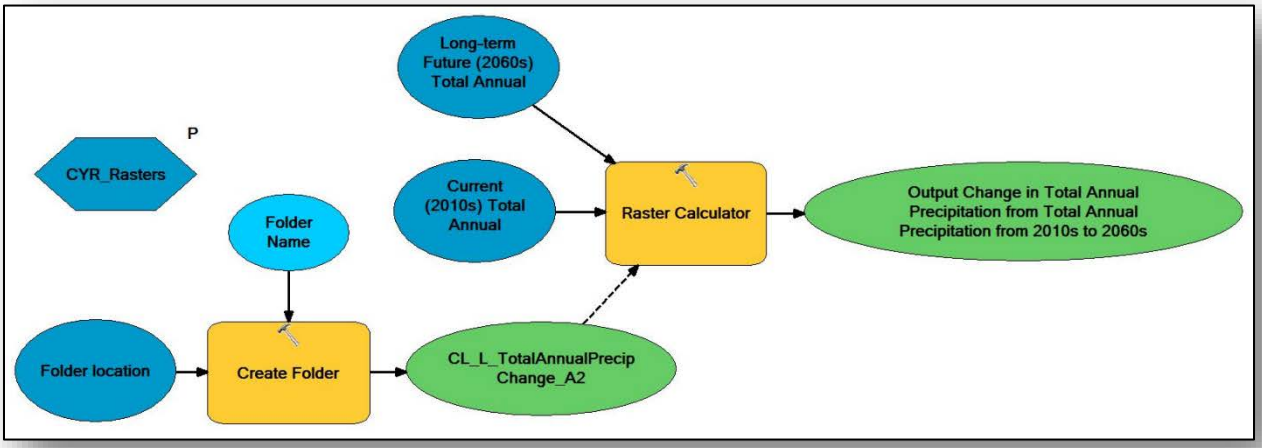

### *Description*

A geoprocessing model that calculates change in June-July-August temperature, representative of change in average summer temperature.

### *Model Details/Notes:*

- Temporal Reference: Long-Term
- Associated Management Questions: B1
- Custom scripting used within this model: No
- Sensitive data involved in the model: No
- Dependencies: This model does not depend on any derived intermediates to run. This model creates intermediates necessary for other models to be able to run.
- Modeling Environment: Esri Modelbuilder
- This model utilizes variables (replace the path shortcuts to input/intermediate/output datasets using the hexagon variables.) This model has been re-run, edited, and verified by the BLM NOC REA data team.

## Model: CYR_CL_L_Geo_TotalAnnualPrecipitationChange_A2



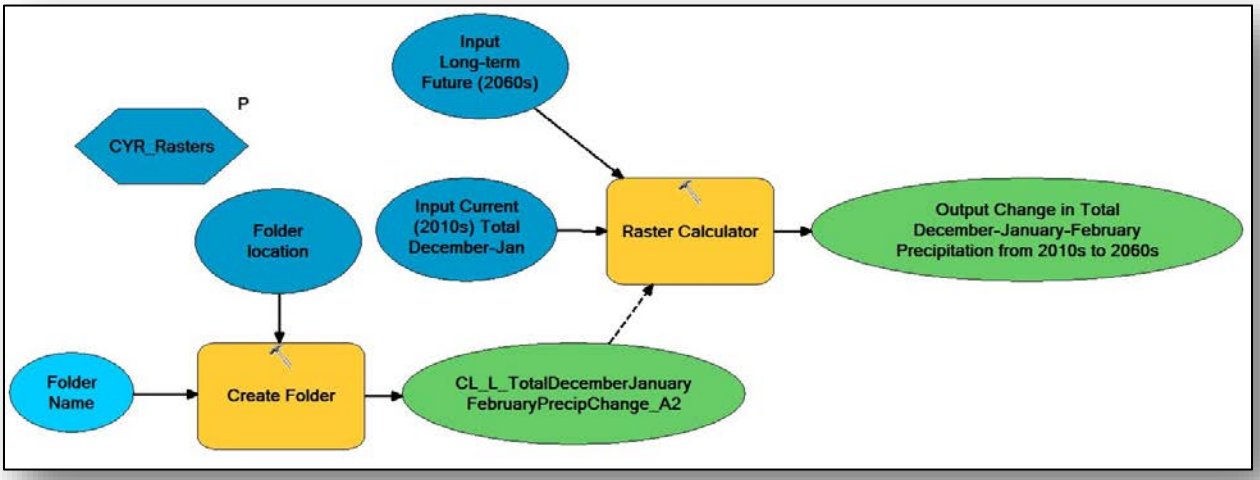

### *Description*

A geoprocessing model that calculates change in total annual precipitation from 2010s to 2060s in mm.

### *Model Details/Notes:*

- Temporal Reference: Long-Term
- Associated Management Questions: B1
- Custom scripting used within this model: No
- Sensitive data involved in the model: No
- Dependencies: This model does not depend on any derived intermediates to run. This model creates intermediates necessary for other models to be able to run.
- Modeling Environment: Esri Modelbuilder
- This model utilizes variables (replace the path shortcuts to input/intermediate/output datasets using the hexagon variables.) This model has been re-run, edited, and verified by the BLM NOC REA data team.

## Model: CYR_CL_L_Geo_TotalDecemberJanuaryFebruaryPrecipitationChange_A2




### *Description*

A geoprocessing model that calculates mean decadal total winter precipitation is the sum of monthly total precipitations for December, January, and February.

### *Model Details/Notes:*

- Temporal Reference: Long-Term
- Associated Management Questions: B1
- Custom scripting used within this model: No
- Sensitive data involved in the model:  No
- Dependencies: This model does not depend on any derived intermediates to run. This model creates intermediates necessary for other models to be able to run.
- Modeling Environment: Esri Modelbuilder
- This model utilizes variables (replace the path shortcuts to input/intermediate/output datasets using the hexagon variables.) This model has been re-run, edited, and verified by the BLM NOC REA data team.

# Toolbox Title: Permafrost

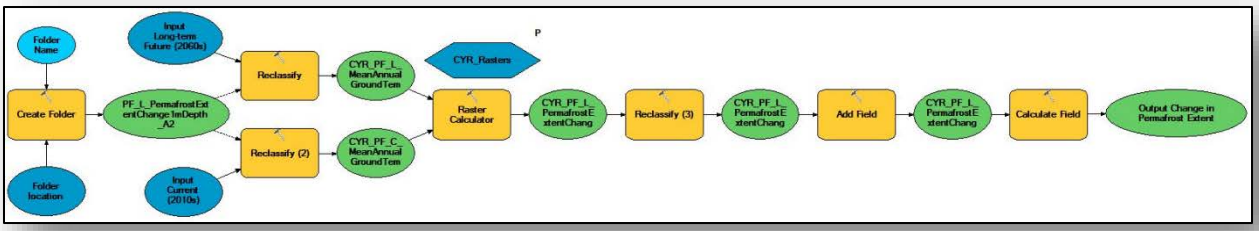
**Model Package Description:** ESRI 10.3.1 geoprocessing models and documentation relating to the Abiotic Change Agents: Permafrost Toolbox within the BLM 2013 Central Yukon (CYR) Rapid Ecoregional Assessment (REA). This model package contains 3 models.

## Overview

This toolbox addresses soil thermal dynamics modeling, specifically permafrost modeling and secondary modeling of potential thermokarst. The thermokarst model is based on outputs from the core permafrost model, as well as data on soils and ice content.

# Toolbox Contents

### Model: CYR_PF_L_Geo_PermafrostExtentChange1mDepth_A2



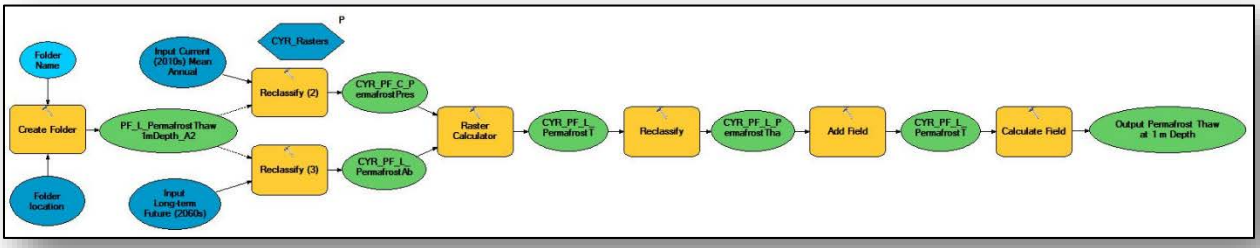

### *Description*

Permafrost at 1 m depth is present in both the 2010s and the 2060s, is absent in both the 2010s and the 2060s, or shifts from present in the 2010s to absent in the 2060s. Permafrost presence is defined as mean annual ground temperature less than or equal to 0°C at 1 m depth.

### *Model Details/Notes:*

- Temporal Reference: Long-Term
- Associated Management Questions: B1
- Custom scripting used within this model: No
- Sensitive data involved in the model: No
- Dependencies: This model does not depend on any derived intermediates to run.
- Modeling Environment: Esri Modelbuilder
- This model utilizes variables (replace the path shortcuts to input/intermediate/output datasets using the hexagon variables.) This model has been re-run, edited, and verified by the BLM NOC REA data team.

## Model: CYR_PF_L_Geo_PermafrostThaw1mDepth_A2



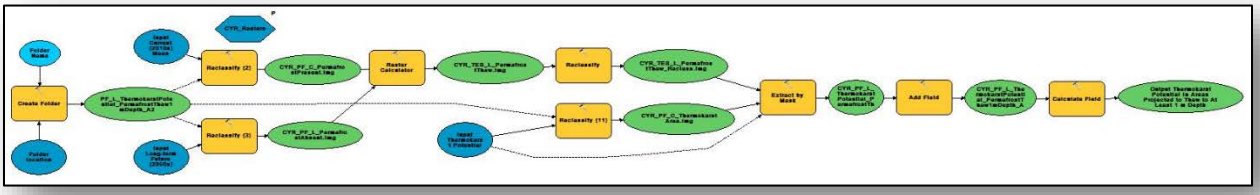

### *Description*

Permafrost thaw at 1 m depth is calculated as areas where mean annual ground temperature at 1 m depth is less than or equal to 0°C in the 2010s and greater than 0°C in the 2060s.

### *Model Details/Notes:*

- Temporal Reference: Long-Term
- Associated Management Questions: B1
- Custom scripting used within this model: No
- Sensitive data involved in the model: No
- Dependencies: This model does not depend on any derived intermediates to run.
- Modeling Environment: Esri Modelbuilder
- This model utilizes variables (replace the path shortcuts to input/intermediate/output datasets using the hexagon variables.) This model has been re-run, edited, and verified by the BLM NOC REA data team.

## Model: CYR_PF_L_Geo_ThermokarstPotential_PermafrostThaw1mDepth_A2




### *Description*

Thermokarst potential in areas where the mean annual ground temperature is projected to be less than or equal to 0°C for the 2010s but is projected to be greater than 0°C by the 2060s at 1 m depth.

### *Model Details/Notes:*

- Temporal Reference: Long-Term
- Associated Management Questions: C1
- Custom scripting used within this model: No
- Sensitive data involved in the model: No
- Dependencies: This model does not depend on any derived intermediates to run.
- Modeling Environment: Esri Modelbuilder
- This model utilizes variables (replace the path shortcuts to input/intermediate/output datasets using the hexagon variables.) This model has been re-run, edited, and verified by the BLM NOC REA data team.

## Contacts:

Bureau of Land Management, Resource Programs Data Coordinator, OC-530;
blm_oc_rea_data_portal_feedback_team@blm.gov