AVI VALIDATION RULES

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Abstract
Documents the GOA rules used to validate AVI polygons

Forest Stewardship and Trade Branch

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1   Initial Classification

Each AVI polygon has potentially two layers associated with it, primary and secondary. The validation process begins by determining the land cover type for the each layer and then runs the appropriate methods to evaluate attribute content of the layer. If a polygon contains two layers then additional validation is performed to validate the relationship between the layers. Each layer can be classified as one of the following land cover types. Specific field values are evaluated to determine the land cover for the layer:

1.1   Treed

If any of SP1 to SP5 contains a value then the layer is considered treed and will be evaluated using rules for this land cover type.

1.2   Non-forest Vegetated

If the NFL field is populated then the layer is evaluated using rules for non-forest vegetated.

1.3   Naturally Non-vegetated

If the NAT_NON field is populated then the layer is evaluated as naturally non-vegetated.

1.4   Anthropogenic Vegetated

If the ANTH_VEG field is populated then the layer is evaluated as anthropogenic vegetated.

1.5   Anthropogenic Non-vegetated

If the ANTH_NON field is populated then the layer is evaluated as anthropogenic vegetated.

Each layer is evaluated for land cover and if it meets the criteria for more than one type then it is considered an error. For example, if both SP1 and NFL are populated then it meets the criteria for both Treed and Non-forest Vegetated and so would be considered an error. If the layer does not meet the criteria for any of the land cover types then it is also considered an error.

Each land cover type has a set of required fields as well as optional fields. Required fields must be populated with values that are within the domain of acceptable values for that field. An individual AVI polygon can have either one or two layers associated with it. The primary layer is required while the secondary layer is optional. Regardless of the land cover type, the following field must be populated in the primary layer.

NOTE: A rule may be classified as either an error or a warning. The rule type is indicated with either a (Error) or (Warning) after rule description. When you see a %s in the message this represents a place holder for the field value. For example, for the message: **Interpreter Initials: %s must be uppercase** the %s will contain the Interpreter Initials field value.

INITIALS

Rule	Message
1.1.1 Must be populated (error)	Interpreter Initials missing, must be entered
1.1.2 Field must contain two characters (Error)	Interpreter Initials: %s less than 2 characters
1.1.3 Must be uppercase (Error)	Interpreter Initials: %s must be uppercase

Rule	Message
1.1.4 Can only contain characters A-Z (Error)	Interpreter Initials: %s must only contain letters A-Z'

CORE DATA

The primary layer must always contain data according to one of the land cover types indicated.

Rule	Message
1.2.1 You can only associated one land cover type for a layer. For instance, a layer cannot be both treed and naturally non-vegetated (Error)	Layer contains core data for both: %s and %s, cannot have data for more than 1 type in same layer
1.2.2 A layer must have complete core data for one of the land cover types (Error)	No core data found for forested, non-forest veg, nat-non-veg, anth-veg, or anth-non-veg, must contain data for at least one of these types

2 Field Domain Values

Each field has a set of acceptable values that can be assigned to the field based on the land cover assigned to the layer. Where a field is not required for the assigned land cover, then the value is usually Null, Blank (empty string), or Zero depending on the field type. The following sections indicate the range of acceptable values that can be assigned to a field.

2.1 Polygon Number (POLY_NUM)
Integer value between 0 – 9999999999

2.2 Moisture Regime (MOIST_REG)
Where field is not applicable (ANTH_NON, etc…) value should be Null or Blank, otherwise one of:

d,m,w, a

2.3 Crown Closure (DENSITY)
Where field is not applicable (ANTH_NON, etc…) value should be Null or Blank, otherwise one of:

A, B, C, D

2.4 Height (HEIGHT)
Where field is not applicable (NAT_NON, etc…) the value should be Null or 0, otherwise:

Integer value between: **1-40**

Note: Height range is validated in context of land cover so may have additional constraints placed on range of valid values. See specific land cover validation sections for further details.

2.5   Species (SP1 – SP5)

Where field is not applicable (NAT_NON, etc…) the value should be Null or 0, otherwise one of:

Sw, Sb, Se , P, Pl, Pj, Pa, Pf, Fb, Fd, Fa, Lt, La, Lw, Aw, Bw, Pb, A

2.6   Species Percent (SP1_PER – SP5_PER)

Where field is not applicable (NAT_NON, etc…) the value should be Null or 0, otherwise:

Integer value between: **1 - 10**

2.7   Structure (STRUC)

Where field is not applicable (single layer) value should be Null or Blank, otherwise one of:

M, C, H

2.8   Structure Value (STRUC_VAL)

This is a layer specific value dependent on the Structure value assigned. It either represents a percent of the layer area for Horizontal polygons or a height range for Complex polygons

2.8.1   Multi-storied (M)
0 or Null

2.8.2   Horizontal (H)
1 – 9

2.8.3   Complex (C)
1 – 10

2.9   Origin (ORIGIN)

Where field is not applicable (NAT_NON, etc…) the value should be Null or 0, otherwise:

1600 – Current Year

2.10   Timber Productivity Rating (TPR)

Where field is not applicable value should be Null or Blank, otherwise one of:

G, M, F, U

2.11   Interpreter Initials (INITIALS)

For primary layer must be two alphabetic characters between A – Z. For secondary layer must be Null or Blank

2.12   Non-forest Vegetated (NFL)

Where layer is **not** Non-forest Vegetated the value should be Null or Blank otherwise one of:

SC, SO, HG, HF, BR

2.13   Non-forest Vegetated Crown Closure (NFL_PER)

Where layer is **not** Non-forest Vegetated the value should be Null or 0 otherwise:

Integer value between: **1 – 10**

2.14 Naturally Non-vegetated (NFL)

Where layer is **not** Naturally Non-vegetated the value should be Null or Blank otherwise one of:

NWI, NWL, NWR, NWF, NMB, NMC, NMR, NMS

2.15 Anthropogenic Vegetated (ANTH_VEG)

Where layer is **not** Anthropogenic Vegetated the value should be Null or Blank otherwise one of:

CA, CP, CPR, CIP, CIW, CIH

2.16 Anthropogenic Non-vegetated (ANTH_NON)

Where layer is **not** Anthropogenic Non-vegetated the value should be Null or Blank otherwise one of:

ASC, ASR, AIH, AIE, AIG, AIF, AIM, AII

2.17 Stand Modifier (MOD1 – MOD2)

Where field is not applicable value should be Null or Blank, otherwise one of:

BV, SF, SL, BK, CC, BU, WF, CL, DI, IK, UK, WE, DT, BT, SN, ST, SI, SC, PL, TH, GR, IR

2.18 Stand Data and Confirmation (DATA)

Where field is not applicable value should be Null or Blank, otherwise one of:

F ,P ,V ,C ,S ,A ,L , I

2.19 Stand Data and Confirmation Year (DATA_YR)

Where not applicable the value should be Null or 0 otherwise:

1940 – Current Year

3   Treed Layer (SP1 – SP5)

If SP1 is populated then the layer is classified as treed and the following rules will be enforced:

3.1   Required Fields

The following fields must be populated for a treed layer:

1. SP1
2. SP1_PER
3. MOIST_REG
4. HEIGHT
5. DENSITY
6. ORIGIN
7. TPR
8. PHOTO_YR
9. INITIALS (only in primary layer)

3.2   Excluded Fields

The following fields cannot be populated if the layer is classified as treed:

1. NAT_NON
2. NFL
3. NFL_PER
4. ANTH_VEG
5. ANTH_NON

All other fields are optional

3.3   Moisture Regime Validation

Rule	Message
3.3.1 If SP1 is Sb or Lt then MOIST_REG should not be m or d (Warning)	A mesic or dry moisture Regime: %s found in conjunction with a %s species 1
3.3.2 If SP1 in: Pl, Pj, Pa, Pf, P, A, Aw then MOIST_REG should not be w (Warning)	A wet moisture Regime: %s found in conjunction with a %s species 1
3.3.3 A MOIST_REG of 'a' is unlikely for a treed stand (Error)	An aquatic moisture regime of "a" cannot be associaed with a Forested layer

3.4   TPR Validation

Rule	Message
3.4.1 If SP1 in Sw, Se, Pl, Pj, P, A, Aw, Pb, Bw, Fd then TPR is unlikely to be U (Warning)	TPR: %s found in conjunction with a %s species 1

3.5   Species Validation

Rule	Message
3.5.1 Species must be sequentially entered with no missing values within the sequence. Example, SP1 cannot be blank if SP2 is populated (Error)	%s Species 1 cannot be blank if any of SP2 - SP5 is populated %s Species 2 cannot be blank if any of SP3 - SP5 is populated Etc...
3.5.2 The sum of all SP_PER fields must add up to 10 (Error)	%s Total species percent: %s invalid, does not add up to 10
3.5.3 If a SP field is populated then the associated SP_PER field must also be populated and vice-versa (Error)	%s Species percent 1: %s present but missing a species call
3.5.4 No species may be duplicated in SP1 – SP5 (Error)	%s Species 2: %s invalid, already exists, cannot be duplicated (Same for SP 3 – 5)
3.5.5 If one of SP1 – SP5 is Aw or Pb then there cannot be an 'A' in SP1 – SP5 (Error)	%s Cannot have a species: A if one of the other species is Aw or Pb
3.5.6 If one of SP1 – SP5 is Pl, Pj, Pa, Pf then there cannot be a 'P' is SP1 – SP5	'%s Cannot have a species: P if one of the other species is Pl, Pj, Pa, or Pf

3.5.7 SP1_PER must be between 1 – 10 (Error)	Species percent 1: %s invalid, must be between 1 and 10
3.5.8 SP2_PER – SP5_PER must be between 1 – 5 (Error)	Species percent 2: %s invalid, must be between 1 and 5 (Same for SP_PER3 – SP_PER5)
3.5.9 SP_PER must appear in descending order. Example: you cannot has a SP1_PER or 4 then a SP2_PER of 6 (Error)	%s Species percent 5: %s invalid, cannot be greater than percent of a previous species

The Stand Modifier (MOD1 – MOD2) and Stand Data (DATA) fields are validated in a separate section as they can apply to more than one land cover layer type. See these sections for further details.

4 Non-Forest Vegetated Layer (NFL)

If the NFL field is populated then the layer is classified as Non-forest Vegetated

4.1 Required Fields

The following fields must be populated:

1. NFL
2. MOIST_REG
3. TPR

4.2 Excluded Fields

The following fields cannot be populated if the layer is classified as Non-forest Vegetated:

1. SP1 – SP5
2. SP1_PER – SP5_PER
3. DENSITY
4. ORIGIN
5. NAT_NON
6. ANTH_NON

All other fields are optional

4.3 Height

Rule	Rule
4.3.1 If NFL is SO or SC then the HEIGHT field must be populated (Error)	Non-forest Vegetated Height for SO or SC is missing
4.3.2 If NFL is SO or SC then HEIGHT must be between 1 – 6 (Error)	Non-forest Vegetated Height for SO or SC: %s invalid, must be between 1 – 6
4.3.3 If NFL is not SO or SC then HEIGHT must be Null or 0 (Error)	Non-forest Vegetated Percent can only be associated with SC or SO. (NFL: %s NFL Percent: %s)

4.4 Non-forest Vegetated Crown Closure (NFL_PER)

Rule	Rule
4.4.1 If NFL is SO or SC then the NFL_PER field must be populated (Error)	Non-forest Vegetated Percent is missing, required when SO or SC
4.4.2 If NFL is SO or SC then NFL_PER must be between 1 – 10 (Error)	Non-forest Vegetated Percent: %s invalid must be between 1 – 10
4.4.3 If NFL is not SO or SC then NFL_PER must be Null or 0 (Error)	Non-forest Vegetated Percent can only be associated with SC or SO

4.5   Anthropogenic Vegetated

Rule	Rule
4.5.1 Only an ANTH_VEG value of CPR is allowed with a non-forest vegetated layer (Error)	Non-forest Vegetated can only be associated with an Anthropogenic Vegetated of CPR, was found with: %s

4.6   Data Confirmation (DATA)

Rule	Rule
4.6.1 A DATA value of 'I' is not allowed (Error)	Non-forest Vegetated cannot have a Data Source code of I

5   Naturally Non-vegetated Layer (NAT_NON)

A layer is classified as Naturally Non-vegetated if the NAT_NON field is populated.

5.1   Required Fields

The following fields must be populated:

1.   NAT_NON

5.2   Excluded Fields

The following fields cannot be populated if the layer is classified as Non-forest Vegetated:

1.   SP1 – SP5
2.   SP1_PER – SP5_PER
3.   DENSITY
4.   HEIGHT
5.   ORIGIN
6.   ANTH_VEG
7.   ANTH_NON
8.   NFL

5.3   Moisture Regime (MOIST_REG)

Rule	Message
5.3.1 If NAT_NON is NMB then a moisture regime is required (Error)	Moisture Regime required when Naturally Non-vegetated layer is NMB
5.3.2 If NAT_NON is **not** NMB then no moisture regime is allowed (Error)	Moisture Regime cannot be present in Naturally Non-vegetated layer unless NMB

5.4   Modifier (MOD1 – MOD2)

Rule	Message
5.4.1 No MOD is allowed if NAT_NON in NMC, NMS, NWI, NMR (Error)	Modifier cannot be present in Naturally Non-vegetated layer type NMC, NMS, NWI or NMR
5.4.2 The MOD SN is only allowed if NAT_NON is in NWL, NWR, NWF (Error)	Modifier restricted to SN in Naturally Non-vegetated layer of NWL, NWR or NWF

5.5   Data Confirmation (DATA)

Rule	Rule
5.6.1 A DATA value of 'I' is not allowed (Error)	Naturally Non-vegetated layer cannot have a Data Source code of I

6   Anthropogenic Vegetated Layer (ANTH_VEG)

If the ANTH_VEG field is populated then the layer is evaluated as anthropogenic vegetated.

6.1   Required Fields

The following fields are required for an ANTH_VEG layer:

1. ANTH_VEG
2. MOIST_REG

6.2   Excluded Fields

The following fields cannot be populated if the layer is classified as Anthropogenic Vegetated:

1. SP1 – SP5
2. SP1_PER – SP5_PER
3. DENSITY
4. HEIGHT
5. ORIGIN
6. TPR
7. NAT_NON
8. ANTH_NON

6.3   Non-forest Vegetated (NFL)

Rule	Message
6.3.1 NFL must be populated if ANTH_VEG is CPR and then NFL must be either SC or SO (Error)	When Anthropogenic Vegetated is CPR then must have an Non-forest Vegetated call of SO or SC

6.4   Modifier (MOD1 – MOD2)

Rule	Message
6.4.1 If ANTH_VEG is CIP or CIW then the only allowable modifier is one of the following: SN, ST, IR, GR, CC, CL, BU (Error)	Invalid Modifier 1: %s When Anthropogenic Vegetated is CIP or CIW then Modifier can only be SN, ST, IR, GR, CC, CL or BU
6.4.2 If ANTH_VEG is **not** CIP or CIW then the only allowable modifier is one of the following: SN, ST, IR, GR, CC, CL (Error)	Invalid Modifier 1: %s When Anthropogenic Vegetated is not CIP or CIW then Modifier can only be SN, ST, IR, GR, CC or CL

6.5   Data Confirmation (DATA)

Rule	Rule
6.5.1 A DATA value of 'I' is not allowed (Error)	Anthropogenic Vegetated cannot have a Data Source code of I

7   Anthropogenic Non-vegetated Layer (ANTH_NON)

If the ANTH_NON field is populated then the layer is evaluated as anthropogenic vegetated.

7.1   Required Fields

The following fields are required for an ANTH_VEG layer:

1.   ANTH_NON

7.2   Excluded Fields

The following fields cannot be populated if the layer is classified as Anthropogenic Vegetated:

1.   SP1 – SP5
2.   SP1_PER – SP5_PER
3.   DENSITY
4.   HEIGHT
5.   MOIST_REG
6.   ORIGIN
7.   TPR
8.   NAT_NON
9.   NFL
10. ANTH_VEG
11. MOD1 – MOD2
12. MOD1_EXT – MOD2_EXT
13. MOD1_YR – MOD2_YR

7.3   Data Confirmation (DATA)

Rule	Rule
7.3.1 A DATA value of 'I' is not allowed (Error)	Anthropogenic Non-vegetated cannot have a Data Source code of I

8 Layer Structure (STRUC)

Layer structure is not restricted to a single land cover layer type and a special set of validation functions have been implemented to evaluate it.

8.1 General Rules

Rule	Message
8.1.1 If the primary layer (overstorey) has a DENSITY of A or B then there should be an secondary layer call (Error)	No understorey; when Density is either A or B then likely to have an understorey
8.1.2 If primary layer contains a NFL value of SO and NFL_PER is <= 5 then likely to have a secondary layer (Warning)	No understorey; when NFL is SO and NFL_PER is less than or equal to 5 then likely to have an understorey

8.2 Multi-story Layers (STRUC = M)

Rule	Message
8.2.1 If primary layer has a STRUC value of M then there must be a secondary layer (Error)	Stand structure M but no data was found in understorey
8.2.2 The STRUC_VAL cannot be populated (in either the primary or secondary layer) if STRUC is M (Error)	Invalid stand structure value: %s, when stand structure is M cannot have stand structure value
8.2.3 If the primary layer STRUC is M then do not need a secondary USTRUC value of M (Warning)	Understorey stand structure value M not required when overstorey stand structure is M
8.2.4 If the primary layer STRUC is M then secondary USTRUC value cannot contain any other value other then M (Error)	Invalid stand structure value: %s, when overstorey stand structure is M understorey stand structure should be blank

8.3 Horizontal Layers (STRUC = H)

Rule	Message
8.3.1 When primary layer has STRUC value of H then the secondary layer USTRUC must also be H (Error)	Stand structure: %s invalid, when overstorey stand structure is H then the understorey stand structure must also be H
8.3.2 The primary layer STRUC_VAL and secondary layer USTRUC_VAL must be between 1 and 9 (Error)	Stand structure value: %s invalid, must be between 1 and 9 when a horizontal stand
8.3.3 The primary layer STRUC_VAL and secondary layer USTRUC_VAL must add up to 10 (Error)	When stand structure is H the stand structure total value must be 10 but is: %s for this stand

8.4 Complex Layers (STRUC = C)

Rule	Message
8.4.1 The secondary layer USTRUC value cannot be C (Error)	Complex structure only allowed in overstorey
8.4.2 The primary layer SP1 field must be populated if classified as complex (Error)	Complex structure only allowed for forested layers

Rule	Message
8.4.3 The primary layer SP1 field must only contain one of following: Sb, Lt, Fb, Sw (Error)	Species 1: %s invalid, when the stand structure is C, leading tree species must be either Sb, Lt, Fb, or Sw
8.4.4 If the primary layer SP1_PER < 8 then SP2 must also be in Sb, Lt, Fb, Sw and the sum of SP1_PER and SP2_PER must be >= 8 (Error)	When the stand structure is C, the leading tree species (1 and 2) must be either Sb, Lt, Fb, or Sw and have a minimum stand percentage of 8: sp1/sp2_per is only %s for this stand
8.4.5 The STRUC_VAL field must contain a value (Error)	When the stand structure is C must have a height range
8.4.6 The STURC_VAL must be between 1 - 10	Complex height difference: %s invalid, must be between 1 and 10

9   Stand Data and Confirmation (DATA)

In addition to validation at the layer level, the following rules are independently implemented for the DATA field:

Rule	Message
9.1.1 DATA field cannot be used with an Anthropogenic Vegetated layer (Error)	Data Source I cannot be used in conjunction with an Anthropogenic Vegetated stand
9.1.2 DATA field cannot be used with an Anthropogenic Non-vegetated layer (Error)	Data Source I cannot be used in conjunction with an Anthropogenic Non-vegetated stand
9.1.3 DATA field cannot be used with an Naturally Non-vegetated layer (Error)	Data Source I cannot be used in conjunction with an Naturally Non-vegetated stand
9.1.4 When the DATA value is 'I' then no DATA_YR can be used (Error)	When Data Source is I then no Data Source Year is allowed
9.1.5 If DATA_YR is populated then the DATA field must also be populated (Error)	Data Source is missing but Data Source Year: %s is populated
9.1.6 DATA_YR value must be within the range of 1940 and the current year (Error)	Data Source Year: %s invalid, must be between 1940 and %s

10 Modifiers (MOD1 – MOD2)

In addition to validation at the layer level, the following rules are independently implemented for the MOD1 and MOD2 field:

10.1 Modifier Extents (MOD1_EXT – MOD2_EXT)

Following rules are applied to both MOD1_EXT and MOD2_EXT

Rule	Message
10.1.1 Modifier extent value must be between 1 – 5 (Excluding modifier CL) (Error)	Modifier 1 Extent: %s invalid, must be between 1 - 5
10.1.2 If the modifier is CL then no modifier extent is allowed (Error)	Modifier 1 Extent: %s invalid, no extent is allowed with a CL modifier
10.1.3 If modifier extent is populated then the modifier field must also be populated (Error)	Modifier 1 Extent: %s present without a modifier

10.2 Modifier Year (MOD1_YR – MOD2_YR)

The following rules apply to both MOD1_YR and MOD2_YR

Rule	Message
10.2.1 The valid range for year is between 1600 and the current year (Error)	Modifier 1 Year: %s invalid, must be between 1600 and %s
10.2.2 If modifier year is populated then the corresponding modifier must also be populated (Error)	Modifier 1 Year: %s present without a modifier

10.3 Modifier (MOD1 – MOD2)

Rule	Message
10.3.1 The following list of modifiers cannot be duplicated in MOD1 and MOD2: BV, SF, SL, BK, WF, CL, DI, IK, UK, WE, DT, BT, SN ,ST ,GR, IR (Error)	Modifier 1: %s and Modifier 2: %s cannot be the same
10.3.2 The following modifiers can be duplicated if the modifier year is different: CC, BU, SI, SC, PL, TH (Error)	Modifier 1: %s and Modifier 2: %s cannot be the same unless modifier years are different
10.3.3 Notification that modifier 1 and modifier 2 are the same with only the modifier years being different (Warning)	Modifier 1: %s Year: %s) and (Modifier 2: %s Year: %s) are the same with only difference in modifier years
10.3.4 Modifier 2 cannot be populated if modifier 1 does not contain a value (Error)	Modifier 2 cannot have a value if Modifier 1 does not already have a value. (mod1: %s mod2: %s)
10.3.5 If both modifier 1 and modifier contain a value and one of those modifiers is CC then the CC modifier must be modifier 1 (Error)	Where a layer has multiple modifiers and one of them is CC then the CC must be defined as modifier 1 regardless of origins
10.3.6 If modifier 1 is not CC then if there are more than one modifier the most recent modifier	Where first modifier is not CC then the most recent Stand Modifier must be second modifier. (mod1 yr: %s mod2 yr: %s)

Rule	Message
according to modifier year must be the second modifier (Error)	
10.3.7 Where modifier 1 and modifier 2 is CC then the most recent CC by modifier year must be modifier 2 (Error)	Where CC is contained in both modifier 1 and 2, the most recent CC must be the second modifier. (mod1 yr: %s mod2 yr: %s)
10.3.8 The modifier year cannot be greater then the PHOTO_YR unless DATA = S (Error)	Modifier year: %s cannot be greater than the Photo year: %s unless DATA = S
10.3.9 If the modifier is CC-4 and the difference between the modifier year and photo year is less than 5 years then crown closure must be greater than A (Error)	When modifier 1 is CC, extent is 4, and year of cut is less than 5 years old (using photo year), then you cannot have a forested stand with a crown closure greater than A. (crown closure: %s)
10.3.10 If the modifier is CC-3 and the difference between the modifier year and photo year is less than 5 years then crown closure must not be greater than B (Error)	When modifier 1 is CC, extent is 3, and year of cut is less than 5 years old (using photo year), then you cannot have a forested stand with a crown closure greater than B. (crown closure: %s)
10.3.11 If the modifier is CC-2 and the difference between the modifier year and photo year is less than 5 years then crown closure must not be greater than C (Error)	When modifier 1 is CC, extent is 2, and year of cut is less than 5 years old (using photo year), then you cannot have a forested stand with a crown closure greater than C. (crown closure: %s)
10.3.12 If modifier is BU and the origin of the layer is >= 30 then the BU modifier should not be used (Error)	When a burn origin is > or = 30 years (using photo year) then modifier 1 BU should not be used. Burn is reflected in origin. Calculated Age: %s
10.3.13 If the modifier is CC then a modifier year is required (Error)	Year of cutblock missing for modifier 1; must have a modifier year
10.3.14 If the modifier is CC then modifier year cannot be less than 1930 (Error)	Year of cutblock is prior to 1930 for modifier 1. (mod yr: %s)
10.3.15 If the modifier is CC then modifier year is questionable if less than 1950 (Warning)	Year of cutblock is prior to 1950 for modifier 1. (mod yr: %s)
10.3.16 If modifier is either CC or BU and the modifier extent is 5 then origin of layer cannot be less than modifier 1 year (Error)	When MOD1 is CC or BU and MOD1_EXT is 5 then Origin cannot be less than MOD1_YR (origin: %s mod1_yr: %s)
10.3.17 If layer is treed with MOD1 = CC, MOD1_EXT = 5 and no BU modifier 2 then origin of layer must be same as modifier 1 year (Error)	For treed stands, when MOD1 is CC and MOD2 <> BU and MOD1_EXT is 5, then Origin must be same as MOD1_YR (origin: %s mod1_yr: %s)
10.3.18 If modifier 1 is CC and modifier 1 extent is less than 5 then the origin of the layer must be less than modifier 1 year (Error)	When MOD1 is CC and MOD1_EXT < 5, then Origin must be less than MOD1_YR (origin: %s mod1_yr: %s)
10.3.19 If modifier 1 is CC and modifier 2 is BU with modifier 1 extent = 5 and modifier 2 extent > 3 and modifier 1 year is greater than modifier 2 year and layer origin <> modifier 1 year then layer cannot be classified as treed (Error)	When MOD1 is CC with MOD2_EXT = 5 and Origin not equal to MOD2_YR then stand cannot be treed (sp1: %s origin: %s mod1_yr: %s)
10.3.20 If modifier 1 is CC and modifier 1 extent is 5 and modifier 2 is not BU with modifier extent > 3 then layer origin must be same as modifier 1 year (Error)	When MOD1 is CC with MOD1_EXT = 5 and Origin not equal to MOD1_YR then stand cannot be treed (sp1: %s origin: %s mod1_yr: %s)

Rule	Message
10.3.21 If modifier is BU then modifier year must be populated (Error)	Year of burn missing for modifier 1; must have a modifier year
10.3.22 If modifier 1 is CC and modifier 2 is BU and both modifier extents are 5 and if modifier 2 year is greater than modifier 1 year then the origin must match modifier 2 year (Error)	If modifier extent is 5 and where modifier year for BU is more recent then CC then Origin must match that of BU (origin: %s mod2_yr: %s
10.3.23 For the primary layer, If layer origin is >= 1970 then likely to have modifier of CC or BU (Warning)	Stands with origin >= 1970 have most likely been burned or harvested so should have a modifier, extent and modifier year (origin: %s)
10.3.24 If layer 1 (overstorey) is treed and the ARIS field is populated then should have a CC modifier with associated modifier year (Error)	When ARIS field is populated then should have a CC modifier and modifier year
10.3.25 If modifier 1 is BK and the TPR is U or F then the BK call is questionable (Warning)	TPR U or F found in conjunction with a BK modifier is questionable
10.3.26 If modifier 1 is BK and modifier 2 is SN then modifier 2 year cannot be less than modifier 1 year (Error)	SN MOD2_YR cannot be less than BK MOD2_YR (mod1_yr: %s mod2_yr: %s)
10.3.27 If modifier 1 is BK then modifier 2 should be BK (Error)	When BK is used as a modifier then MOD2 must be SN
10.3.28 If modifier 1 is BK and modifier 2 is SN with modifier 2 extent less than 2 then the layer crown closure cannot be C or D	When MOD1 is BK and MOD2 is SN with MOD2_EXT greater than 2 then density cannot be C or D
10.3.29 If modifier 1 is BK with a modifier extent of 5 and the layer is treed then no pine species is allowed in SP1-SP5 (Error)	When modifier is BK and modifier extent is 5 then no pine is allowed as a species
10.3.30 If modifier 1 is BK with a modifier extent less than 5 and the layer is treed then a pine species must be present in SP1-SP5 (Error)	When modifier is BK and modifier extent is less than 5 then one of the species must be pine
10.3.31 If modifier is BK then the layer should be treed (Warning)	When BK is used as a modifier then layer should be treed
10.3.32 The modifier BK can only be assigned to modifier 1 (Error)	The modifier BK must be assigned to MOD1 not MOD2
10.3.33 If layer is treed and crown closure is > A and modifier 1 either CC or BU with a modifier extent = 5 then origin must = modifier 1 year (Error)	Treed layer has a CC or BU modifier1 with an associated year and extent = 5 but the origin of the stand does not match the modifier year. (mod_yr: %s origin: %s)
10.3.34 If layer is treed and crown closure is A and modifier 1 either CC or BU and a modifier extent = 5 then origin must = modifier 1 year (Warning)	Treed layer has a CC or BU modifier1 with an associated year and extent = 5 but the origin of the stand does not match the modifier year. (mod_yr: %s origin: %s)
10.3.35 If modifier 1 is either CC or BU and the modifier 1 extent = 4 then origin of layer should = modifier 1 year (Warning)	Treed layer has a CC or BU modifier1 with an associated year but the origin of the stand does not match the modifier year. (mod_yr: %s origin: %s)
10.3.36 If modifier 1 is CC then modifier 2 cannot be CL (Error)	A CC modifier cannot be found in conjunction with a CL modifier

Rule	Message
10.3.37 If the moisture regime is 'a' then there should not be a CC modifier associated with the layer (Warning)	A CC modifier was found in association with an aquatic moisture regime

11 Timber Productivity Rating (TPR)

The main validation for TPR is performed by calculating its value using the formulas that determine the value that should be applied to the layer. These formulas are maintained in the avi_tpr.py source code. For formula details see this source.

Rule	Message
11.1.1 TPR calculations require that the photo year for the polygon is populated (Error)	Field PHOTO_YR not populated, required to calculate TPR
11.1.2 If the polygon stand structure is M and both layers are treed then if the primary layer species 1 is the same as the secondary layer species then the TPR for each layer must match (Error)	Overstorey and understorey have different TPR values, should be same when overstorey species 1 is same as understorey species 1. (O sp1: %s tpr: %s U sp1: %s tpr: %s)
11.1.3 If the polygon stand structure is M and neither the primary or secondary layer is treed then if each layer has been assigned a TPR value then these values should be the same (Error)	Non-forest Overstorey/Non-forest Understorey: TPR values do not match. (O tpr: %s U tpr: %s)
11.1.4 If the polygon stand structure is M and the primary layer is treed while the secondary layer is not treed but has an assigned TPR value then the TPR for secondary layer must match that of the primary layer (Error)	Understorey TPR value should match forested overstorey TPR. (O tpr: %s U tpr: %s)
11.1.5 If the polygon stand structure is M and the secondary layer is treed while the primary layer is not treed but has an assigned TPR value then the TPR for primary layer must match that of the secondary layer (Error)	Overstorey TPR value should match forested understorey TPR. (O tpr: %s U tpr: %s)
11.1.6 If a layer is treed then it must have a TPR value (Error)	TPR missing from forested layer
11.1.7 If a layer is non-forest vegetated then it must have a TPR value (Error)	TPR missing: when NFL populated: (%s) then TPR is required
11.1.8 If the layer is anthropogenic vegetated with a value of CPR then the layer requires a TPR (Error)	TPR missing: when Anthropogenic Vegetated is CPR then TPR is required
11.1.9 If the layer is naturally non-vegetated with a value of NMB the it requires a TPR (Error)	TPR missing: when Naturally Non-vegetated is NMB then TPR is required
11.1.10 If the layer is naturally non-vegetated and is not NMB then no TPR value is allowed (Error)	TPR cannot be present in Naturally Non-vegetated layer unless NMB (NatNon: %s TPR: %s)
11.1.11 Photo year must be between 1980 and current year (Error)	Invalid PHOTO_YR: %s, must be between 1980 and current year

Rule	Message
11.1.12 Submitted TPR must match the calculated TPR (Error)	Calculated TPR: %s does not match submitted TPR: %s

12 Relationship Validation

These rules apply to relationships between stand layers and other attributes that are is some way related or dependent.

Rule	Message
12.1.1 The second layer of a stand cannot contain any data unless the stand structure is either M or H (Error)	Understorey attributes found but overstorey stand structure is neither M nor H (Fields with data: %s)
12.1.2 If the stand structure contains either M or H then the secondary layer must contain data (Error)	When the Stand Structure is M or H then must have understorey attributes, none were found. (Stand Structure: %s)
12.1.3 If the primary layer has a moisture regime of 'a' and NFL is HF then if the stand structure is **not** H, the understory must have a NAT_NON value of NWL of NWF (Error)	When the overstorey contains HF and the moisture regime is aquatic then NWL or NWF is required in the understorey
12.1.4 If the primary layer is non-forest vegetated with a value of either SO or SC then the secondary layer should **not** be SO or SC as well (Warning)	Overstorey and understorey have the same non-forest vegetated call of: %s
12.1.5 If the primary layer is non-forest vegetated with a value of either SO or SC then the secondary layer cannot be non-forest vegetated other than SO or SC (Error)	Overstorey and understorey have the same non-forest vegetated call of: %s
12.1.6 If primary layer is naturally non-vegetated then the secondary layer cannot contain the same naturally non-vegetated call (Error)	Overstorey and understorey have the same naturally non-vegetated call of: %s
12.1.7 If primary layer is anthropogenic vegetated then the secondary layer cannot contain same anthropogenic vegetated call (Error)	Overstorey and understorey have the same anthropogenic vegetated call of: %s'
12.1.8 If primary layer is anthropogenic non-vegetated then the secondary layer cannot contain same anthropogenic non-vegetated call (Error)	Overstorey and understorey have the same anthropogenic non-vegetated call of: %s
12.1.9 If stand structure is M then none of the secondary layer modifiers should be CC or BU (Error)	CC or BU modifier should not be contained in understorey
12.1.10 If stand structure is M and the secondary layer contains either treed, anthropogenic vegetated, or non-forest vegetated then the moisture regimes of both layers must be the same (Error)	When stand structure is M then overstorey and understorey moisture regime values should be same. (O moist reg: %s U moist reg: %s)

Rule	Message
12.1.11 If stand structure is M and the secondary layer is non-forest vegetated SC or SO then the primary layer cannot be anthropogenic vegetated (Error)	When SO or SC is contained in understorey then you cannot have an anthropogenic vegetated call in the overstorey. (O anth veg: %s U nfl: %s)
12.1.12 If stand structure is M and the secondary layer is non-forest vegetated SC or SO then the primary layer cannot be anthropogenic non-vegetated (Error)	When SO or SC is contained in understorey then you cannot have an anthropogenic non-vegetated call in the overstorey. (O anth non: %s U nfl: %s)
12.1.13 If stand structure is M then the secondary layer origin cannot be greater than the primary layer origin unless the DATA field contains F indicating it has been field checked (Error)	Understorey origin cannot be older than overstorey origin unless stand is field checked. (O origin: %s U origin: %s)
12.1.14 If stand structure is M then the secondary layer cannot be anthropogenic vegetated (Error)	Cannot have an anthropogenic vegetated understorey: %s
12.1.15 If primary layer is treed and stand structure is M then secondary layer cannot be anthropogenic non-vegetated unless it is in ASR, ASC, AIF (Error)	Cannot have an anthropogenic non-vegetated understorey (other than ASR, ASC, or AIF) unless overstorey is treed. (U anth non-veg: %s)
12.1.16 If primary layer is treed and stand structure is M then secondary layer cannot be naturally non-vegetated (Error)	A Naturally Non-vegetated understorey is not allowed in a multistoried stand when the overstorey is treed. (O sp1: %s U nat non-veg: %s)
12.1.17 If stand structure is M then the only time the secondary layer can contain a naturally non-vegetated call (restricted to: NMS, NWF, NWL, NMC) is if the primary layer is non-forest vegetated (Error)	You can only have a Naturally Non-vegetated understorey of NMS, NWF, NWL or NMC when overstorey is not Non-forest Vegetated. (O nfl: %s U nat non: %s)
12.1.18 If stand structure is M and the primary layer is non-forest vegetated (excluding SO and SC), then secondary layer cannot be treed unless DATA is A or F (Error)	When non-forest vegetated overstorey is not SO or SC then you cannot have a forested understorey unless data source is A, F. (O nfl: %s U sp1: %s)
12.1.19 If stand structure is M and the primary layer is non-forest vegetated with either SO or SC, then secondary layer cannot be anthropogenic vegetated (excluding CIP and CIW) unless DATA is A, F, S (Error)	When overstorey is SO or SC then you cannot have a anthropogenic vegetated understorey other than CIP or CIW unless data source is A, F, or S. (O nfl: %s U anth veg: %s)
12.1.20 If stand structure is M and the primary layer is non-forest vegetated then the secondary layer cannot have a naturally non-vegetated call of NMS unless DATA is F or A (Error)	When overstorey is SO or SC then you cannot have a naturally non-vegetated understorey of NMS unless data source is A or F. (O nfl: %s U nat non-veg: %s)
12.1.21 If stand structure is M and the primary layer is non-forest vegetated then the secondary layer cannot have a naturally non-vegetated call of NWL or NWF (Error)	When overstorey is SO or SC then you cannot have a naturally non-vegetated understorey of NWL or NWF. (O nfl: %s U nat non-veg: %s)

Rule	Message
12.1.22 If stand structure is M and the primary layer is non-forest vegetated with a value HG, HF, or BR then the secondary layer cannot be naturally non-vegetated (Error)	When overstorey is HG, HF or BR then you cannot have a non-forest vegetated understorey. (O nfl: %s U nfl: %s)
12.1.23 If stand structure is M and the primary layer is non-forest vegetated HF then the secondary layer cannot be naturally non-vegetated NWI or NWR (Error)	When overstorey is HF then you cannot have a naturally non-vegetated understorey of NWI or NWR. (O nfl: %s U nat non-veg: %s)
12.1.24 If stand structure is M and the primary layer is non-forest vegetated HF then the secondary layer cannot be naturally non-vegetated NMR, NMS, NMC unless DATA is F or A (Error)	When overstorey is HF then you cannot have a naturally non-vegetated understorey of NMR, NMS. or NMC unless data source is A or F. (O nfl: %s U nat non-veg: %s)
12.1.25 If stand structure is M and the primary layer is non-forest vegetated HF and the secondary layer is naturally non-vegetated NWL or NWF then the moisture regime for the primary layer must be 'a' (Error)	When overstorey is HF and you have a naturally non-vegetated understorey of NWL or NWF then the overstorey moisture regime must be aquatic. (O moist reg: %s)
12.1.26 If stand structure is M and the primary layer is non-forest vegetated HR or BR then the secondary layer cannot have a naturally non-vegetated call of NMR, NMS, NMC unless data is F or A (Error)	When overstorey is HG or BR then you cannot have a naturally non-vegetated understorey of NMR, NMS. or NMC unless data source is A or F. (O nfl: %s U nat non-veg: %s)
12.1.27 If stand structure is M and the primary layer is non-forest vegetated HR or BR then the secondary layer cannot have a naturally non-vegetated call other than NMR, NMS, NMC when data is F or A (Error)	When overstorey is HG or BR then you cannot have a naturally non-vegetated understorey other than NMR, NMS. or NMC (Must Also Be Field Checked)
12.1.28 If stand structure is M you cannot have an secondary layer if primary layer is anthropogenic non-vegetated (Error)	When overstorey is Anthropogenic Non-vegetated then no understorey is allowed (O anth non: %s)
12.1.29 If stand structure is M you cannot have a secondary layer if primary layer is anthropogenic vegetated (Error)	When overstorey is Anthropogenic Vegetated then no understorey is allowed (O anth veg: %s)
12.1.30 If stand structure is M you cannot have a secondary layer if primary layer is naturally non-vegetated (Error)	When overstorey is Naturally Non-vegetated then no understorey is allowed (O nat non: %s)
12.1.31 If stand structure is M and the primary and secondary layers both have a height then the primary layer must have the higher height (Error)	Overstorey Height must be greater than understorey Height. (O height: %s U height: %s)
12.1.32 If stand structure is M and the primary and secondary layers both have a height and both layers are treed then height difference between primary and secondary layers must be at least 3 meters (Error)	Overstorey Height must be at least 3 meters greater than understorey Height when both overstorey and understorey are treed. (O height: %s U height: %s)

Rule	Message
12.1.33 If stand structure is M and the primary and secondary layers both have a height then the heights can only be the same if secondary layer contains a non-forest vegetated value of SC or SO (Error)	When the overstorey Height is the same as the understorey Height then understory must be SC or SO. (O height: %s U height: %s)
12.1.34 If stand structure is M and both the primary and secondary have a DATA value of F then the DATA_YR for each layer must be the same (Error)	When both the understorey and overstorey have a Data Source value of F then the Data Source Years must be the same (O: data: %s data yr: %s U data source: %s yr: %s)
12.1.35 If stand structure is M then the secondary UDATA cannot have a value of A unless the primary DATA value is either A or I (Error)	When the understorey has a Data Source value of A then the overstorey Data Source value must be either A or I. (O data source: %s U data source: %s)
12.1.36 If stand structure is M and both the primary and secondary have a DATA value of A then the DATA_YR for each layer must be the same (Error)	When both the understorey and overstorey has a Data Source value of A then Data Source Year values must the same. (O data yr: %s U data yr: %s)
12.1.37 If stand structure is M and DATA value is F then UDATA must also be F and bother DATA-YRs must be the same (Error)	When the understorey has a Data Source value of F or S then the overstorey Data Source must be F and the data years must be the same (O: data source: %s data yr: %s U data: %s yr: %s)
12.1.38 If stand structure is M and DATA is A then UDATA can only be A, S, F, I (Error)	When overstorey Data Source is A then understorey Data Source can only be A, S, F, or I. (O data: %s U data: %s)
12.1.39 If stand structure is M and DATA is S or F then UDATA must be the same value and DATA_YR must be same as UDATA_YR (Error)	When the overstorey has a Data Source value of F or S then the understorey Data Source must be same and the Data Years must be the same (O: data: %s data yr: %s U data: %s yr: %s)
12.1.40 If stand structure is H and only one of the layers is treed then the treed layer must be the primary layer (Error)	When a horizontal structure and only one of the horizontal components has forested data then that forested data must be found in the first horizontal component
12.1.41 If stand structure is H and both layers have a height then the layer with the highest height must be the primary layer even it its percent coverage is smaller (Error)	With a horizontal structure the tallest component must be first even if its horizontal percentage is less than the other component. (O height: %s Y height: %s)
12.1.42 If stand structure is H and both layers are treed then SP1 cannot be same in both layers if their height and species percent are the same	With a horizontal structure, species 1 cannot be duplicated in the two components when their species percentages and heights are the same
12.1.43 If stand structure is H then the non-forested vegetated call cannot be duplicated in the layers.	Non-forest vegetated cannot be duplicated if a horizontal structure. (O nfl: %s U nfl: %s)
12.1.44 When both horizontal components are treed then the tall one must be first.	When both components of a horizontal stand are treed then the component with the greater height must be in the first component. (O height: %s Y height: %s)

Rule	Message
12.1.45 Unlikely to have understorey if crown closuer is D (Warning)	When the overstorey crown closure is D then it is unlikely that there would be an understorey. (O denstiy: %s U density: %s)
12.1.46 Unlikely to have a UDATA value (Warning)	Understorey data source questionable. (U data: %s)
12.1.47 Unlikely to have modifiers in the understory (Warning)	Understorey modifier 1 questionable. (U mod1: %s