TOOL FOR

REVERSAL RISK ANALYSIS AND BUFFER POOL CONTRIBUTION DETERMINATION

VERSION 2.0

November 2024

ACR AT WINROCK INTERNATIONAL

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ACR℠

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ABOUT ACR℠

ACR is a leading global carbon crediting program operating in regulated and voluntary carbon markets. Founded in 1996 as the first private voluntary greenhouse gas (GHG) registry in the world, ACR creates confidence in the integrity of carbon markets to catalyze transformational climate results. ACR ensures carbon credit quality through the development of environmentally rigorous, science-based standards and methodologies as well as oversight of GHG project verification, registration, and credit issuance and retirement reporting through its transparent registry system. ACR is governed by Environmental Resources Trust LLC, a wholly owned nonprofit subsidiary of Winrock International.

Acknowledgments

This tool version update was authored by ACR. ACR was fortunate to have many partners who contributed their time and expertise to this update process, including Anew Climate, Finite Carbon, Green Assets, TerraCarbon, and The Climate Trust.

We thank the staff of the United States Forest Service who published the original datasets used in the wildfire and biotic risk sections and provided technical expertise regarding their use. We also thank the staff of the Federal Emergency Management Agency for their work developing and maintaining the National Flood Hazard Layer which informs the hydrologic risk section.

Contents

TABLES

EQUATIONS

Acronyms

AFOLU	Agriculture, Forestry, and Other Land Use
ERT	Emission Reduction Ton
FEMA	Federal Emergency Management Agency
GHG	Greenhouse gas
GIS	Geographic information system
ILAT	Forest Trends Global Illegal Logging and Associated Trade
NFHL	National Flood Hazard Layer
NIDRM	National Insect & Disease Risk Map
NWPL	National Wetland Plant List
U.S.	United States
WGI	Worldwide Governance Indicators
WHP	Wildfire Hazard Potential

1 Introduction

1.1 Summary

The *Tool for Reversal Risk Analysis and Buffer Pool Contribution Determination* (Tool) provides an assessment framework for greenhouse gas (GHG) terrestrial sequestration projects to perform a Reversal Risk Analysis. A project's Reversal Risk Analysis determines its Buffer Pool Contribution Percentage, which is the proportion of credits deposited at each issuance into the ACR Buffer Pool to mitigate the risk of unintentional reversals.

The Buffer Pool Contribution Percentage is multiplied by the Total GHG Emission Reductions and Removals for each Reporting Period (Equation 10) to calculate the Buffer Pool Contribution for each issuance.

The ACR Buffer Pool only compensates for Unintentional Reversals and thus, only unintentional types of risks are assessed in this Tool. If a project experiences an Unintentional Reversal, an amount of Emission Reduction Tons (ERTs) equivalent to the Unintentional Reversal's Verified Lost Carbon Amount is subsequently cancelled from the ACR Buffer Pool. Please refer to the *ACR Buffer Pool Terms and Conditions* for details on this process.[1]

This Tool and the *ACR Buffer Pool Terms and Conditions* operate in conjunction with the legally binding Agriculture, Forestry, and Other Land Use (AFOLU) Carbon Project Reversal Risk Mitigation Agreement between ACR and Project Proponents, which details the requirements for reporting and compensating for Unintentional and Intentional Reversals.

1.2 Applicability

Terrestrial sequestration GHG projects that account for carbon sequestration in forests, wetlands, grasslands, shrublands, or agricultural lands[2] (i.e., AFOLU projects) that have the potential for GHG emission reductions and removals to be reversed and must employ a risk mitigation option in accordance with the *ACR Standard*. Projects contributing to the ACR Buffer Pool must utilize this Tool

[1] Available under the Program Resources section of the ACR website.

[2] Other project types may be applicable.

to conduct a Reversal Risk Analysis to derive the Buffer Pool Contribution Percentage (Equation 9), and associated Buffer Pool Contribution (Equation 10).

Per the *ACR Standard*, geologic sequestration projects mitigate reversal risk via other mechanisms and this Tool does not apply.

- For programmatic development approach (PDA) projects, an updated risk analysis is required in conjunction with validation and prior to ERT issuance to any newly enrolled lands, unless otherwise specified in the methodology.

1.3 Reversal Risk Analysis Reporting

The initial Reversal Risk Analysis, performed at validation, must be reported within or as an appendix to the GHG Project Plan. Subsequent risk analyses, performed throughout the Minimum Project Term, must be reported within or as an addendum to the Monitoring Report, per the *ACR Standard* and *ACR Buffer Pool Terms and Conditions*. In the event of a Crediting Period renewal beyond the initial Minimum Project Term, Reversal Risk Analysis and reporting apply.

The results of the Reversal Risk Analysis and associated Buffer Pool Contribution Percentage must be reported, including:

- A list of applicable risk and adjustment categories (Section 2);
- The risks and adjustments derived from each category;
- The inputs and results for each applicable equation within this Tool; and
- A description of how each applicable category was determined.

2 Risk and Adjustment Categories

This tool evaluates seven applicable risk sources to unintentional reversal that are considered in two categories (Management and Governance Risks as well as Natural Disaster Risks). When Project Proponents take tangible steps to reduce reversal risk, applicable General Risk Adjustments may be allocated to reduce the Buffer Pool Contribution Percentage for qualifying projects.

2.1 Risk and Adjustment Category Scope and Definitions

Table 1: Management and Governance Risks

FINANCIAL	Financial failure may compromise the continued monitoring, reporting, and verification of project stocks and could terminate the project without assuring the permanence of previously issued ERTs over the Minimum Project Term.
SOCIAL AND POLITICAL	Social and political risks are attributed to the expropriation of carbon project land by both governmental and non-governmental actors, corruption, and shifts in politics, legal frameworks, social perception, or resource needs which may increase risks to carbon stocks.
ILLEGAL LOGGING	The loss of carbon stocks through illegal logging by outside actors is considered an intentional reversal (and thus is not covered by the ACR Buffer Pool). However, these losses could ultimately contribute to financial failure and project termination.

Table 2: Natural Disaster Risks

WILDFIRE	Wildfire may result in a reduction of carbon stocks, depending on severity. Wildfire risk varies significantly by region.
BIOTIC	Insects and diseases are present in most terrestrial ecosystems and can have variable impacts upon carbon stocks. Risk to carbon stocks can be assessed

	based on prevalence of host species, geography, and proximity to established populations.
HYDROLOGIC	Flood events, potentially compounded with levee or infrastructure failures, can have detrimental effects upon carbon stocks.
OTHER NATURAL DISASTER	Other natural disasters include hurricanes, tornadoes, other extreme storms, windthrow, drought, and geologic and volcanic events can have detrimental effects upon carbon stocks.

Table 3: General Risk Adjustments

CONSERVATION COMMITMENT ADJUSTMENT	Risk can be reduced if a project can provide verifiable evidence of a legally binding and enforceable conservation commitment. Further reduction can be applied if the conservation commitment requires annual monitoring by a non-project participant.
DIVERSIFIED RISK ADJUSTMENT	Aggregated and PDA projects may be eligible for a decreased risk assessment if they demonstrate sufficient diversification across ecological regions, number of parcels, and project area acreage.

2.2 Assigning Risk and Adjustment Categories

All projects are subject to the following risk categories and are potentially subject to the following adjustments:

- Financial Risk;
- Social and Political Risk;
- Wildfire Risk;
- Other Natural Disaster Risk;
- Conservation Commitment Adjustment; and
- Diversified Risk Adjustment.

Certain project types are subject to additional categorical risk assessments as follows:

- **Forest projects** must additionally determine scores for each of the following categories:
  - Illegal Logging Risk;

    - Biotic Risk; and
    - Hydrologic Risk.

- **Wetland projects** must additionally determine a score for the following category:
    - Hydrologic Risk.

- **Grassland projects** must additionally determine a score for the following category:
    - Hydrologic Risk.

3 Risk and Adjustment Determination Instructions

Projects must calculate scores for each applicable risk and adjustment category as follows:

3.1 Financial Risk

All projects must estimate financial risk using one of the following options:

- Assume the conservative default value (Financial Risk = 5.75%), derived as the midpoint of potential financial risk calculated using Equation 1.
- Assign financial risk with the Project Proponent's credit rating by referencing Table 4. Credit ratings must be current at the time of verification and sourced from one of the following, at the discretion of the Project Proponent, Moody's Investor Service,[3] S&P Global Ratings,[4] or Fitch Ratings.[5]

Table 4: Financial Risk Based on Credit Rating

Moody's	S&P / Fitch	ACR FINANCIAL RISK
Aaa	AAA	3.000%
Aa1	AA+	3.275%
Aa2	AA	3.550%
Aa3	AA–	3.825%
A1	A+	4.100%

Moody's	S&P / Fitch	ACR FINANCIAL RISK
A2	A	4.375%
A3	A–	4.650%
Baa1	BBB+	4.925%
Baa2	BBB	5.200%
Baa3	BBB–	5.475%

[3] https://www.moodys.com/

[4] https://www.spglobal.com/ratings/en/

[5] https://www.fitchratings.com/search/

- Calculate financial risk with Project Proponent's business credit score using Equation 1. Eligible business credit scores include the Dun & Bradstreet Failure Score,[6] Experian Financial Stability Risk Score,[7] or Equifax Business Risk Score.[8] Other reputable third-party measures of credit worthiness or bankruptcy risk may be proposed for use and are subject to verification and ACR approval. Credit inquiries must be initiated by the Project Proponent themselves (ACR will not perform a credit check on behalf of any project). Prior to use in Equation 1, business credit scores must be scaled from 0 to 100, where 0 is the most risky and 100 is the least risky. Business credit scores are expressed as a percent deduction, multiplied by 5.5% and added to the minimum financial risk rating (3%). The maximum possible risk score in this category is 8.5%.

Equation 1: Financial Risk

$$\textbf{Financial Risk} = \left(\left[1 - \frac{\textbf{Business Credit Score}}{\textbf{100}}\right] \times 5.5\%\right) + 3\%$$

- For land trusts and other non-profit conservation organizations eligible for accreditation by the Land Trust Accreditation Commission, demonstrate accreditation in good standing at the time of verification (Financial Risk = 3.5%). In the event the organization does not maintain or otherwise loses its status as accredited by the Land Trust Accreditation Commission, it will no longer qualify for reduced risk.

3.2 Social and Political Risk

All projects shall evaluate governance of the country where the project is located using the World Bank Worldwide Governance Indicators (WGI). The most recent version of the dataset at the time of verification must be used. Since this risk category represents a wide range of social and political threats to carbon stock permanence, all six indicators (Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption) must be used. These shall be averaged for the project's host country for the past five years (Average WGI Score). The WGI are based on a 5-point scale ranging from -2.5 to +2.5; Equation 2 translates the averaged WGI to a percent deduction which is then multiplied by the assumed maximum risk (8%):

[6] https://www.dnb.com/resources/financial-stress-score-definition-information.html
[7] https://www.experian.com/assets/business-information/brochures/financial-stability-risk-score-ps.pdf
[8] https://www.equifax.com/business/product/business-risk-score/

Equation 2: Social and Political Risk

$$\textbf{Social ad Political Risk} = \left(1 - \frac{[\textbf{Average WGI Score} + 2.5]}{5}\right) \times 8\%$$

3.3 Illegal Logging Risk

Forest projects shall utilize the most current version (as of verification) of the Forest Trends Global Illegal Logging and Associated Trade (ILAT) Risk Data Tool[9] to determine the risk of timber theft and illegal deforestation based on the country where the project is located. Annex I lists ILAT Risk Scores by country,[10] which must be used in Equation 3. ILAT Risk Scores are indexed on a scale of 1 to 100, expressed as a percentage, and multiplied by half of Financial Risk (Equation 3). As illegal logging activities are considered intentional, the ACR Buffer Pool will only compensate for reversals contributing to financial failure and project termination. The maximum potential illegal logging risk is 4.25%.

Equation 3: Illegal Logging Risk

$$\textbf{Illegal Logging Risk} = \frac{\textbf{ILAT Risk Score}}{100} \times \textbf{Financial Risk} \times 0.5$$

3.4 Wildfire Risk

- **Forest projects located in the U.S.** shall estimate wildfire risk using the most recently published version (at the time of verification) of the Wildfire Hazard Potential (WHP) pixelated raster dataset.[11] The maximum potential wildfire risk percentage for forest projects located in the U.S. is 12%. The classified (rather than the continuous) dataset must be used in conjunction with Table 5:

[9] Forest Trends. (2022). Illegal Deforestation and Associated Trade (IDAT) Risk. https://www.forest-trends.org/wp-content/uploads/2022/03/Methodology-for-State-ILAT-project-website_Feb-2022-1.pdf

[10] As of the most recent ILAT publication (dated August 2021) at time of writing, ILAT risk score for U.S. is 5.53, and ILAT risk score for Canada is 3.39.

[11] https://www.firelab.org/project/wildfire-hazard-potential

Table 5: Wildfire Risk Associated with Wildfire Hazard Potential (WHP) Classes for Forest Projects Located in the U.S.

WHP CLASSES	ACR WILDFIRE RISK
Very Low	4%
Low	6%
Moderate	8%
High	10%
Very High	12%
Non-burnable	0%
Water	0%

The following generalized steps are required and can be implemented using various geographic information system (GIS) platforms and tools, so long as they produce equivalent and verifiable results. Steps 2 and 3 use GIS software:

Step 1 Download the data publication zip file.[12] Projects located outside Alaska and Hawaii shall use the classified raster layer for conterminous United States ("whp2023_cls_conus"), while projects located in Alaska and Hawaii shall use their applicable layers ("whp2020_cls_ak" and "whp2020_cls_hi" respectively).

Step 2 Clip the classified raster layer to the project area polygon, creating a raster data layer. Small areas of overlap and underlap are likely to exist.

Step 3 Use Table 5 to assign wildfire risks to each of the WHP classes within the tabular data from the clipped raster layer. Create an average of the wildfire risks weighted by area (Base Wildfire Risk). The class_desc field contains the WHP classes. The Count field represents the number of 270-meter pixels, which may be used as a surrogate for area.

[12] Most recent publication as of time of writing can be found at: Dillon, G. K. (2023). Wildfire Hazard Potential for the United States (270-m), version 2023 (4th Edition). Fort Collins, CO: Forest Service Research Data Archive. https://doi.org/10.2737/RDS-2015-0047-4

The weighted average may include pixels of 0 risk (Non-burnable and Water), but base risk may not equal less than 4% (Base Wildfire Risk ≥ 4%).

Step 4 Projects may opt to reduce their base risk by 25% by demonstrating that recent (since the WHP dataset's depiction of conditions) mitigation treatments have occurred (Mitigation Adjustment = 25%). Verifiable records must be provided. Qualifying fuel treatment should focus on site-specific needs and must follow the basic principles of fuel reduction treatments that effectively reduce wildfire risk (i.e., reduce surface fuels, increase height to live crown, decrease crown density and retain large fire resistant trees).[13] Mitigation treatment effectiveness must be justified by at least one Substantiating Source (see Definitions section of this Tool). Duration of treatment effectiveness must be considered. Coordination with local fire prevention services and other preparedness efforts that do not reduce fuel loads or create fire breaks do not qualify for risk reduction.

Step 5 Calculate wildfire risk to carbon stocks using Equation 4:

Equation 4: Wildfire Risk (U.S. Forest Projects)

$$\textbf{Wildfire Risk} = \textbf{Base Wildfire Risk} \times (1 - \textbf{Mitigation Adjustment})$$

- **Forest projects located outside of the U.S.** must estimate wildfire risk using one of the following options:
  - Determine wildfire risk at a regional scale and assign the default values in Table 6. The choice of regional wildfire risk must be justified by at least one Substantiating Source. Projects claiming "high" regional wildfire risk require no justification.

    Projects spanning multiple wildfire risk regions must calculate an average weighted by area. The regionally derived wildfire risk (Regional Wildfire Risk) is used in Equation 5.

    Projects outside of the U.S. may also opt to reduce their risk by 25% by providing verifiable records of recent mitigation treatments (Mitigation Adjustment = 25%). See Step 4 for Forest projects located in the U.S. for fuel treatment criteria and substantiation options.

[13] Agee, J. K., & Skinner, C. N. (2005). Basic principles of forest fuel reduction treatments. Forest ecology and management, 211(1-2), 83-96. https://doi.org/10.1016/j.foreco.2005.01.034

Table 6: Regional Wildfire Risk for Forest Projects Located Outside of the U.S.

REGIONAL WILDFIRE RISK	ACR WILDFIRE RISK
Low	5%
Moderate	7%
High	11%

Equation 5: Wildfire Risk (Non-U.S. Forest Projects)

$$\textbf{Wildfire Risk} = \textbf{Regional Wildfire Risk} \times (1 - \textbf{Mitigation Adjustment})$$

- Propose an approach for project-specific estimation of wildfire risk using publicly available data, peer reviewed literature, or other verifiable sources. The principles for risk estimation and reduction from the U.S. approach (i.e., verifiable, substantiated, durable) may be applied. Proposed approaches are subject to verification and ACR approval.

- **Wetland, agricultural land, grassland, and shrubland projects located in the U.S.** shall estimate wildfire risk using the most recently published version of the WHP pixelated raster dataset, following the procedures described for forest projects located in the U.S. except for the following modifications:
  - Wetland, agricultural land, grassland, and shrubland projects must use WHP classified data in conjunction with Table 7 (instead of Table 5):

Table 7: Wildfire Risk Associated with WHP Classes for Wetland, Agricultural Land, Grassland, and Shrubland Projects Located in the U.S.

WHP CLASSES	ACR WILDFIRE RISK
Very Low	2%
Low	3%
Moderate	4%
High	5%

Very High	6%
Non-burnable	0%
Water	0%

- For wetland projects, Step 3's average wildfire risk weighted by area has no minimum value beyond the limits of the WHP dataset (Base Wildfire Risk ≥ 0%).
- For agricultural land, grassland, and shrubland projects, Step 3's average wildfire risk weighted by area may not equal less than 2% (Base Wildfire Risk ≥ 2%), rather than 4%.
- Steps 4 and 5 are omitted for wetland, agricultural land, grassland, and shrubland projects (Wildfire Risk = Base Wildfire Risk).

- **Wetland, agricultural land, grassland and shrubland projects located outside of the U.S.** must estimate wildfire risk using one of the following options:
  - Apply a default value. Wetland projects may apply a default value of 2% (Wildfire Risk = 2%), and agricultural land, grassland, and shrubland projects may apply a default value of 3% (Wildfire Risk = 3%).
  - Propose an approach for project-specific estimation of wildfire risk using publicly available data, peer reviewed literature, or other verifiable sources. The principles for risk estimation from the U.S. approach may be applied. Proposed approaches are subject to verification and ACR approval.

3.5 Biotic Risk

- **Forest projects located in the U.S.** shall determine biotic risk using the National Insect & Disease Risk Map (NIDRM) pixelated raster dataset.[14] The most recently published version (at the time of verification) which contains composite and agent-specific hazards must be used. The composite hazard shall be used to determine the risk from all agents (insects and disease). The following generalized steps are required and can be implemented using various GIS platforms and tools, so long as they produce equivalent and verifiable end results. Steps 2 and 3 use GIS software:

[14] Forest Health Protection. (2019). National Insect and Disease Composite Risk Map, 2018 Update. Digital Data. Fort Collins, U.S. Department of Agriculture, Forest Service, Forest Health Assessment and Applied Sciences Team. https://www.fs.usda.gov/foresthealth/applied-sciences/mapping-reporting/national-risk-maps.shtml

Step 1 For projects located outside Alaska and Hawaii, download the raster layer named "pct_tbaloss" found in the "L48_composite_hazard.zip" file.[15] Projects located in Alaska or Hawaii may find their "pct_tbaloss" raster layers in the "ak.zip" and "hi.zip" files respectively.

Step 2 Clip the classified raster layer to the project area polygon, creating a raster data layer. Small areas of overlap and underlap are likely to exist.

Step 3 Using the tabular data from the clipped raster layer, create an average of the percent risk weighted by area (Base Biotic Risk). The VALUE field represents the integer percent live basal area subject to mortality from insects and disease. The COUNT field represents the number of 240-meter pixels, which may be used as a surrogate for area.

Step 4 Projects whose accounting includes standing dead wood are expected to transfer carbon stocks in live trees killed by insects or disease to the standing dead wood pool,[16] thereby reducing reversal risk. Accounting for standing dead wood is assumed to reduce reversal risk by half (Dead Wood Inclusion Adjustment = 50%). Projects whose carbon pool boundaries exclude standing dead wood do not apply this reduction (Dead Wood Inclusion Adjustment = 0). Regardless of the weighted average, base risk adjusted for dead wood inclusion may not equal less than 4% (Base Biotic Risk × (1 – Dead Wood Inclusion Adjustment) ≥ 4%).

Step 5 Projects may reduce their base risk by demonstrating that conditions described by the NIDRM dataset are no longer accurate, and that either mitigation treatments and/or recent biotically-driven mortality (as predicted by the NIDRM) have occurred. These risk reductions are combined and then expressed as a percentage of base risk (Mitigation and Recent Mortality Adjustment).

If claiming NIDRM dataset conditions are no longer accurate due to recent mitigation treatments, verifiable records of treatments (occurring since the NIDRM dataset's depiction of conditions) must be provided. Qualifying mitigation treatments must be justified to effectively reduce mortality from a specific agent(s) (threatening the project area according to the NIDRM dataset) by at least one Substantiating Source. Duration of

[15] As of the most recent NIDRM dataset at time of writing, this file can be found in the website section titled "GIS Data for the 2012 National Insect & Disease Risk Map Report", labeled "Composite hazard from all pests".

[16] Hicke, J. A., Allen, C. D., Desai, A. R., Dietze, M. C., Hall, R. J., Hogg, E. H., ... & Vogelmann, J. (2012). Effects of biotic disturbances on forest carbon cycling in the United States and Canada. Global Change Biology, 18(1), 7-34. https://doi.org/10.1111/j.1365-2486.2011.02543.x

treatment effectiveness must be considered. Justified mitigation treatments reduce risk by 25% (Mitigation and Recent Mortality Adjustment = 25%).

Projects which have experienced recent biotically-driven mortality (occurring since the NIDRM dataset's depiction of conditions) may reduce risk with verifiable evidence, including NIDRM updates, remote imagery, forest inventory data, or other verifiable sources. Recent mortality must be mapped such that it can be related to NIDRM data. While a pixel by pixel analysis is not required, a verifiable approach that systematically and conservatively reduces risk must be used.

Risk reductions from either mitigation treatments, recent mortality, or both may not exceed 25% (Mitigation and Recent Mortality Adjustment ≤ 25%).

Step 6 Calculate biotic risk to carbon stocks using Equation 6:

Equation 6: Biotic Risk (U.S. Forest Projects)

$$\textbf{Biotic Risk} = [\textbf{Base Biotic Risk} \times (1 - \textbf{Dead Wood Inclusion Adjustment})] \\ \times (1 - \textbf{Mitigation and Recent Mortality Adjustment})$$

- **Forest projects located outside of the U.S.** must estimate biotic risk using one of the following options:
  - Apply a default value according to Equation 7. This default value (8%) is reduced by half if the project includes the standing dead wood pool (Dead Wood Inclusion Adjustment = 50%). Projects whose carbon pool boundaries exclude standing dead wood do not apply this reduction (Dead Wood Inclusion Adjustment = 0).

Equation 7: Biotic Risk (Non-U.S. Forest Projects)

$$\textbf{Biotic Risk} = 8\% \times (1 - \textbf{Dead Wood Inclusion Adjustment})$$

  - Propose an approach for project-specific estimation of biotic risk using publicly available data, peer reviewed literature, or other verifiable sources. The principles for risk estimation and reduction from the U.S. approach (i.e., verifiable, substantiated, durable) may be applied. Proposed approaches are subject to verification and ACR approval.

3.6 Hydrologic Risk

- **Forest and wetland projects located in the U.S.** shall determine hydrologic risk using the most recently available version (at the time of verification) of the National Flood Hazard Layer (NFHL) dataset.[17] Flood zone designations[18] must be used in conjunction with Table 8. The maximum potential hydrologic risk for forest and wetland projects located in the U.S. is 5%.

Table 8: Hydrologic Risk Associated with National Flood Hazard Layer (NFHL) Flood Zones for Forest and Wetland Projects Located in the U.S.

NFHL FLOOD HAZARD ZONES	FLOOD ZONE SUBTYPE	ANNUAL FLOOD PROBABILITY	ACR HYDROLOGIC RISK
All zones starting with A or V (Special Flood Hazard Zones)	–	1%	5%
B, X	0.2 PCT ANNUAL CHANCE FLOOD HAZARD; AREA WITH REDUCED FLOOD RISK DUE TO LEVEE; 1 PCT DEPTH LESS THAN 1 FOOT	0.2%	1%
C, X	AREA OF MINIMAL FLOOD HAZARD	<0.2%	0%

The following generalized steps are required and can be implemented using various GIS platforms and tools, so long as they produce equivalent and verifiable end results. Steps 2 and 3 use GIS software:

Step 1 Download the geographically applicable NFHL dataset from the Federal Emergency Management Agency (FEMA) Flood Map Service Center.[19] By navigating to "MSC Search All Products" on the left-hand side, selecting the relevant state, and then searching any County and Community, data for the entire state (NFHL Data-State) may

[17] https://www.fema.gov/flood-maps/national-flood-hazard-layer

[18] https://www.fema.gov/glossary/flood-zones

[19] https://msc.fema.gov/

be found under Effective Products. Projects spanning multiple states would need to repeat this process. Data is downloaded as a geodatabase (.gdb) within a compressed zip file.

Step 2 Each state's respective geodatabase contains a polygon layer named "S_FLD_HAZ_AR". Clip this layer to the project area polygon. This creates a flood hazard zone polygon layer that matches the boundaries of the project area. If no NFHL data is available for the project area, move to Step 5.

Step 3 Add a non-integer numeric field to the clipped data to calculate geometry for each flood hazard zone in acres.

Step 4 Use Table 8 to assign hydrologic risks to each of the flood hazard zones within the tabular data of the clipped layer. The FLD_ZONE and ZONE_SUBTY fields must both be used to crosswalk with Table 8. Projects which alter hydrology may not be accurately described by the NFHL, and any such areas must be assigned 5% risk.

Step 5 Assign hydrologic risk to any areas where NFHL data is not available. Wetland projects must assume 5% risk for these areas. Forest projects may either assume 5% risk or may demonstrate reduced or no hydrologic risk. Demonstrations may include other FEMA products, remote imagery, digital elevation models, peer-reviewed or public agency publications, and other verifiable sources. While a precise mapping of flood risk is not required, a verifiable approach which systematically and conservatively estimates risk must be used. Table 8's range of values should be used as a guide when estimating risk for areas for which NFHL data is unavailable.

Step 6 Projects that include flood tolerant species (which are included in GHG project stocking) may reduce their risk. To reduce risk, projects must demonstrate both the presence of the species and their flood tolerance.

Species presence must be demonstrated using forest inventory data representative of the entire project area.

Species flood tolerance must be demonstrated with the most recently available version of the regionally appropriate National Wetland Plant List (NWPL)[20] or another source of similar rigor (subject to verification and ACR approval). If utilizing the NWPL,

[20] U.S. Army Corps of Engineers 2022. National Wetland Plant List, version 3.6. https://wetland-plants.sec.usace.army.mil/

plants designated as hydrophytes (indicator statuses OBL, FACW, FAC and FACU)[21] are considered flood tolerant. Obligate (OBL) species are eligible for 100% risk reduction, Facultative Wetland (FACW) are eligible for 75% risk reduction, Facultative (FAC) species are eligible for 50% risk reduction, and Facultative Upland (FACU) species are eligible for 25% risk reduction.

Projects which are partially composed of flood tolerant species, or are composed of a mix of species with different NWPL indicator statuses, may prorate the risk reduction based on species contribution to carbon stocking. For example, to reduce risk by 50%, a project's carbon stocks could either be completely composed of Facultative (FAC) species, composed of half Obligate (OBL) and half flood intolerant species (as measured by carbon stocking, not species presence), or composed of some other species mixture with a weighted reduction of 50%.

Step 7 Calculate an average weighted risk by area for the project. Apply the corresponding risk reduction to the average weighted area risk. This weighted average with deduction represents the total hydrologic risk to the project (Hydrologic Risk) to be used in Equation 9.

- **Forest and wetland projects located outside of the United States of America (U.S.)** must estimate hydrologic risk using one of the following options:
  - Apply a default value (Hydrologic Risk) according to Table 9:

Table 9: Default Hydrologic Risk for Forest and Wetland Projects Located Outside of the U.S.

PROJECT ATTRIBUTES	ACR HYDROLOGIC RISK
Wetland projects	5%
Forest projects whose area consists of ≥60% wetlands	5%
Forest projects whose area consists of <60% wetlands	0%

[21] Lichvar, R. W., Melvin, N. C., Butterwick, M. L., & Kirchner, W. N. (2012). National wetland plant list indicator rating definitions. US Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory ERDC/CRREL TR-12-1. https://usace.contentdm.oclc.org/digital/collection/p266001coll1/id/4359/

The values from Table 9 may be reduced by half (50%) by demonstrating that flood tolerant species are present. To reduce risk, projects must demonstrate both the presence of the species and their flood tolerance. Species presence must be demonstrated using forest inventory data representative of the entire project area. Species flood tolerance must be justified by at least one Substantiating Source.

- Propose an approach for project-specific estimation of hydrologic risk using publicly available data, peer reviewed literature, or other verifiable sources. The principles for risk estimation and reduction from the U.S. approach (i.e., verifiable, substantiated) may be applied. Proposed approaches are subject to verification and ACR approval.

3.7 Other Natural Disaster Risk

- **All projects** must account for risk from natural disasters not otherwise specified by this Tool using the following:
  - Apply a default value of 2% (Other Natural Disaster Risk = 2%).

3.8 Conservation Commitment Adjustment

Projects with a legally binding conservation commitment are eligible to reduce risk with a conservation commitment adjustment. Conservation commitments can include conservation easements, covenants, deed restrictions, or other legally binding agreements or mechanisms to maintain the project land cover and associated carbon stocks. An eligible conservation commitment must minimally be in effect through the end of the Minimum Project Term. Projects that provide verifiable evidence of the conservation commitment are eligible for a 2% risk reduction (Conservation Commitment Adjustment = −2%). Conservation commitments which require annual monitoring by a third-party (not involved in GHG Project monitoring, reporting or verification) of the carbon stocks quantified by the GHG Project may further reduce risk (Conservation Commitment Adjustment = −3%). The conservation commitment may cover all or parts of the project area. If less than all the project area is covered, this adjustment must be pro-rated by area. Projects applying a Conservation Commitment Adjustment must describe the terms of the conservation commitment relevant to risk reduction (and demonstrate conformance to monitoring requirements, if applicable) in the GHG Project Plan, or a Monitoring Report addendum for subsequent updates.

3.9 Diversified Risk Adjustment

Aggregated and Programmatic Development Approach (PDA) projects may be subject to a diversified risk adjustment if they meet the following applicability criteria:

1. The total project area exceeds 10,000 acres; and
2. The number of distinct and non-adjacent parcels enrolled in the GHG Project exceeds 5. Any adjacent parcels (even if owned by different landowners) are counted as 1 parcel when qualifying for this criterion.

Aggregated/PDA projects meeting the applicability criteria must determine diversified risk adjustment by first evaluating the number of ecological regions, acres within the project area, and non-adjacent parcels according to Tables 10 through 12. These numbers are then used to calculate a diversified risk adjustment in Equation 8.

Table 10: Contribution to Diversified Risk Adjustment by Number of Ecological Regions

NUMBER OF ECOLOGICAL REGIONS	CONTRIBUTION TO DIVERSIFIED RISK ADJUSTMENT
1	- 1.0%
2	- 2.0%
3	- 3.0%

Ecological regions are defined by the United States Environmental Protection Agency's Level 2 Ecological Regions.[22] For projects located outside of the U.S., ecological regions are as defined by One Earth[24] or another ecological mapping system of similar resolution subject to verification and ACR approval. To qualify for use in Table 10, each ecological region must contain at least 10% of the total carbon stocking (including all quantified pools) of the project.

[22] Omernik, J. M. (1987). Ecoregions of the conterminous United States. Annals of the Association of American geographers, 77(1), 118-125. https://doi.org/10.1111/j.1467-8306.1987.tb00149.x

[24] https://www.oneearth.org/bioregions/

Table 11: Contribution to Diversified Risk Adjustment by Total Project Acreage

TOTAL PROJECT ACREAGE	CONTRIBUTION TO DIVERSIFIED RISK ADJUSTMENT
10,000 – 19,999	- 0.5%
20,000 – 49,999	- 1.0%
50,000+	- 1.5%

Table 12: Contribution to Diversified Risk Adjustment by Number of Non-adjacent Parcels

NUMBER OF PARCELS	CONTRIBUTION TO DIVERSIFIED RISK ADJUSTMENT
5 – 14	- 0.5%
15 – 29	- 1.0%
30+	- 1.5%

Any adjacent parcels enrolled in the carbon project are counted as 1 parcel when using Table 12.

The values resulting from Tables 10, 11, and 12 are used in Equation 8 to calculate the diversified risk adjustment.

Equation 8: Diversified Risk Adjustment (Aggregated and PDA Projects)

$$\begin{aligned}\textbf{Diversified Risk Adjustment} \\ &= \textbf{Number of Ecological Regions Contribution} \\ &+ \textbf{Total Project Acreage Contribution} + \textbf{Number of Parcels Contribution}\end{aligned}$$

4 Calculation Procedures

Detailed calculation and determination procedures for each risk and adjustment category are available in Section 4 of this document, the results of which are used to calculate the Buffer Pool Contribution Percentage and Buffer Pool Contribution as specified in this section.

4.1 Calculating Buffer Pool Contribution Percentage

A Project's Buffer Pool Contribution Percentage is calculated by combining the scores from each of the applicable risk and adjustment categories (calculated per Section 4) in Equation 9:

Equation 9: Buffer Pool Contribution Percentage

$$\begin{aligned}
&\textbf{Buffer Pool Contribution Percentage} \\
&\quad = 100\% \\
&\quad - [\,(100\% - \textbf{Financial Risk}) \times (100\% - \textbf{Social and Political Risk}) \\
&\quad \times (100\% - \textbf{Illegal Logging and Conversion Risk}) \times (100\% - \textbf{Wildfire Risk}) \\
&\quad \times (100\% - \textbf{Biotic Risk}) \times (100\% - \textbf{Hydrologic Risk}) \\
&\quad \times (100\% - \textbf{Other Natural Disaster Risk}) \\
&\quad \times (100\% - \textbf{Conservation Commitment Adjustment}) \\
&\quad \times (100\% - \textbf{Diversified Risk Adjustment})\,]
\end{aligned}$$

4.2 Calculating Buffer Pool Contribution

Apply the Buffer Pool Contribution Percentage calculated in Equation 9 to the Total GHG Emission Reductions and Removals generated for the Reporting Period to calculate the Buffer Pool Contribution per Equation 10:

Equation 10: Buffer Pool Contribution

$$\textbf{Buffer Pool Contribution} = \textbf{Total GHG Emission Reductions and Removals} \times \textbf{Buffer Pool Contribution Percentage}$$

Definitions

Professional Forester — An individual engaged in the profession of forestry. If a project is in a jurisdiction that has professional forester licensing laws, the individual must be credentialed in that jurisdiction.[23] Otherwise, the individual must be certified by the Society of American Foresters[24] or Association of Consulting Foresters[25] with multiple years of professional experience in the state or region.

Substantiating Source — Documentation supporting the application of this Tool, including one of the following options:

- Attestation from a Professional Forester, a country-level equivalent (for projects located outside of the U.S.), or other ACR-approved relevant expert;
- Attestation from a local governmental agency involved in natural resource management;
- Peer-reviewed journal article; or
- Another relevant dataset or publication of professional quality.

[23] For projects located in multiple jurisdictions with professional forester licensing laws, the individual must be credentialed in at least one of the jurisdictions.

[24] https://www.eforester.org/Main/Certification_Education/Certified_Forester/Main/Certification/Certification_Home.aspx?hkey=53f11286-5500-4c13-a371-251dd0df0d7a

[25] https://www.acf-foresters.org/

Appendix A: References

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