PRESENTATION GIVEN AT TRANSLINKS REDD WORKSHOP

SEPTEMBER 10-12, 2008

LIMA, PERU

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This workshop was made possible by the generous support of the American people through the United States Agency for International Development (USAID) under the terms of the TransLinks Cooperative Agreement No.EPP-A-00-06-00014-00 to the Wildlife Conservation Society (WCS). TransLinks is a partnership of WCS, The Earth Institute, Enterprise Works/VITA, Forest Trends and the Land Tenure Center. The contents are the responsibility of the authors and do not necessarily reflect the views of USAID or the United States government.

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WCS's Carbon Strategy in Karukinka

Potential for generating carbon offsets

Winrock 2008

Promoting Transformation by
Linking Natural Resources,
Economic Growth, and
Good Governance

KARUKINKA

Ricardo Muza
WCS-Chile

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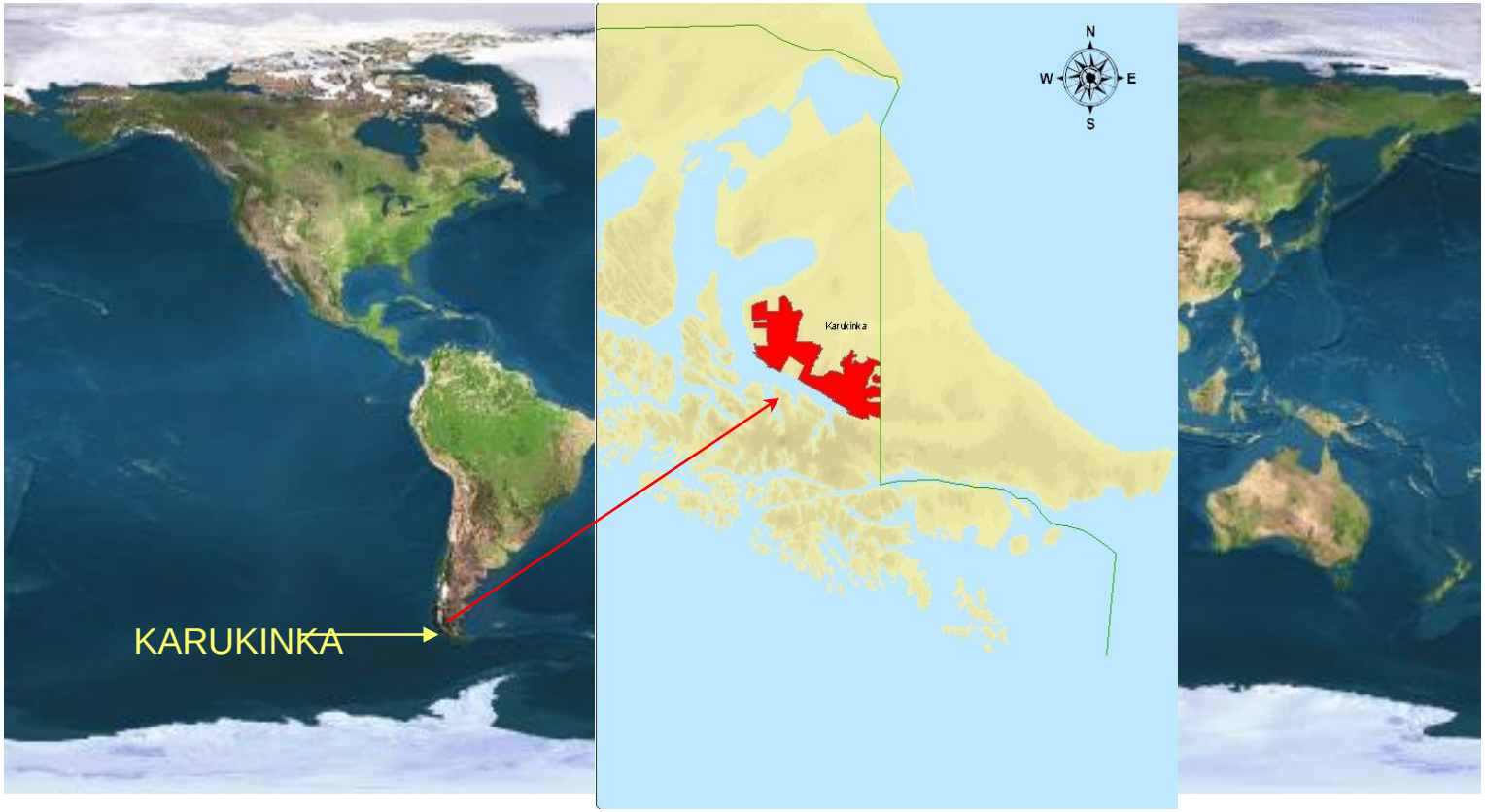
BACKGROUND



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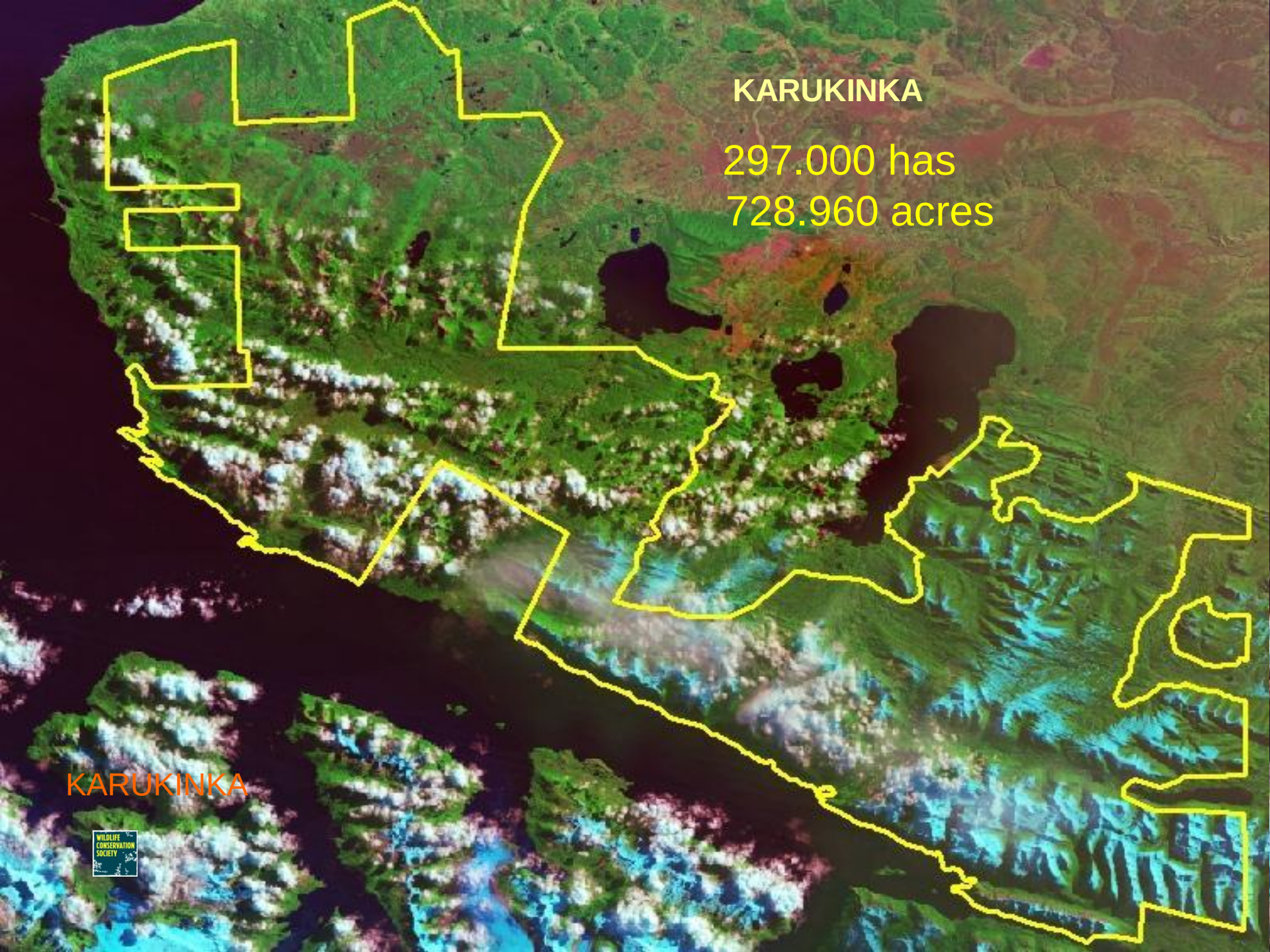
KARUKINKA
297.000 has
728.960 acres
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The area has steep topography dominated by lenga (*Nothofagus pumilio*), a deciduous tree that shares many characteristics with beech and produces high value wood favored for furniture, cabinetry, construction and pulp. There are also significant areas of coigue (*Nothofagus betuloides*), an evergreen species similar to lenga in form and use, as well as areas of mixed lenga/coigue forests. Non-forest terrestrial ecosystems within Karukinka are dominated by peat bogs

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Class Name	%
Grassland/Bush	0.8
Peatbog & Upland Nonforest	25.1
Deciduous Forest	49.6
High Andean Zone	13.6
Subandean Zone	1.7
Water	0.6
Evergreen Forest	8.2
Grassland/Steppe	0.3

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- Before belonging to WCS, almost all the land located within the current Karukinka boundary belonged to a Forest company (Trillium).
- Trillium had a Carbon Project (Rio Condor Project). The primary objective of this project was to reduce the emissions of carbon dioxide from forestry and land use activities. (SGS Carbon study)
- The reductions in emissions, projected to be approximately 19 million tonnes of carbon dioxide, would have been achieved by reducing the harvest of old-growth forest from an estimated total of 90,000 ha to 51,000 ha over a 60-year period.
- The Forest company defaulted on its loans and the project came to an abrupt end in 2002
- Goldman Sachs acquired the land and they donated it to the Wildlife Conservation Society in September 2004. This became one of the largest private donations of land for conservation in history
- WCS requires approximately $500,000 per year for basic operations and additional funding for its specialized research programs. GS establish a core operating fund and an additional $5.06 million for an endowment fund that would generate, at a payout of five percent, over $250,000. Therefore, WCS needs to generate revenue from private donations as well as a set of sustainable activities. These are likely to be low-impact economic activities such as fishing and tourism that both sustain the Karukinka project in the medium and long-term and contribute to the local economy.

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CURRENT CARBON STORAGE IN KARUKINKA

Field measurements of aboveground forest carbon stocks

The land use strata sampled by Winrock were:

1.- Undisturbed mature lenga forests in Karukinka (200-300 years old)

2.- Selectively logged forests in Karukinka (cut 20 years ago)

3.- Undisturbed mature lenga forests (200-300 years old) at Russfin (a local timber company)

4.- Harvested forests at Russfin (one stand cut in 2002, another cut in 2007)

5.- Undisturbed coastal lenga-coigue mixed forests in Karukinka (near Rio Bueno)

6.- Beaver impacted forests in Karukinka

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Tree biomass

$\ln Y = a + b \ln X$ (Caldentey et al. 1993)

R2 = 0.984

Y = biomass in kilograms (kg)
X = diameter at breast height (DBH) in centimetres (cm)
a = -1.488
b = 2.095

Standing dead wood

Diameter at the top of the bole
bole height
wood density

Lying dead wood diameter >= 10 cm

line-intersect method Harmon and Sexton (1996)

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Carbon stocks of different land use strata for Karukinka project

Forest Type	Disturbance Type	Mean carbon stocks (tCO2/ha)
Lenga	Undisturbed	699
Lenga-coigue	Undisturbed	912
Lenga	Selectively logged	495
Lenga	Undisturbed (Russfin)	757
Lenga	2007 Cut (Russfin)	272
Lenga	2002 Cut (Russfin)	524
Lenga	Beaver impacted	515

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Field measurements of peat

sample	volume (cm3)	sample wet wt (g)	sub-sample wet wt (g)	sub-sample Dry wt (g)	Dry:Wet	sample Dry wt (g)	Bulk density (Kg/m3)
1	9,682	5,900	1,110	128	0,115	680	70,27
2	8,568	3,500	690	65	0,094	330	38,48
3	8,568	4,000	1,000	87	0,087	348	40,62
4	8,568	4,900	1,140	170	0,149	731	85,28
5	8,568	4,900	792	118	0,149	730	85,21
6	8,568	5,900	1,100	132	0,120	708	82,63
average					0,119		67,08

Assumptions for calculating the total carbon storage of peat within the Karukinka boundary.

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Attribute	value
Peat Area (ha)	75,243
peat Depth (m)	3,5
Peat Volume (m3)	2,633,505,000
Bulk Density (Kg/m3)	67,08
Peat carbon content	45%
Total peat C storage (tC)	79,494,982
Total peat C storage (TtCO2)	291,746,584

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Total carbon storage in Karukinka

land cover type	Area (ha)	C stocks (t CO2/ha)	Total C Stocks (t CO2)
Deciduous forest	148.897	699	104.079.003
Evergreen forest	24.534	912	22.375.008
Peat	75.243	3877	291.746.584
Total			418.200.595

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Commercial harvest area (60 year total), average forest carbon stock and total estimated carbon stocks on Trillium's Rio Condor holding, stratified by stem density class. Data obtained from the SGS verification report.

Stratum (stem density, stems per hectare)	Harvestable area (ha)	Average carbon stock (t CO2/ha)	Total carbon stocks (t CO2)
< 200	1,728	472	815.517
200-800	74,525	675	50,311,433
800-1400	19,201	736	14,124,259
>1400	2,578	781	2,013,601
TOTAL	**98,033**		**67,264,810**

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WCS's Carbon Strategy in Karukinka

Five main activities

Avoiding Logging → If WCS can prove that they would log, but that receiving funding for carbon would push them to abandon this option, then an avoided logging project could be feasible as a carbon strategy

Mitigating Beaver Impacts on Forested Areas → Beavers were introduced into TDF in 1946. Since then, their populations have expanded greatly and their dams have caused extensive destruction to riparian forest areas. A carbon strategy for WCS would be to begin a beaver eradication program to mitigate the impacts of these animals on forest carbon stocks.

Improving Forest Regeneration → Enhance and improve the regeneration of native lenga forests that have been logged in the past by Trillium.

Protecting Peat Resources → Protect the peat resources of Karukinka from being exploited by a peat mining industry

Preventing Deforestation → receive carbon benefits from protecting the Karukinka forests against deforestation

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WCS carbon strategies categorized by activity type within the Voluntary Carbon Standard (VCS) and Chicago Climate Exchange (CCX) frameworks.

WCS carbon strategy	VCS Activity Type	CCX Activity Type
Avoiding logging	Improved Forest Management	Sustainable Forest Management
Beaver mitigation	Reduced Emissions from Deforestation	Sustaintable Forest management
Improved forest regeneration	Afforestation, Reforestation and Revegetation	Afforestation
Peat Protection	A potentially new VCS sector	A potentially new CCX sector
Avoiding Deforestation	Reduced Emission from Deforestation	Forest Conservation

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CARBON STRATEGIES FOR KARUKINKA

Avoided logging

For an avoided logging baseline, a detailed timber harvesting plan would need to be developed that outlines the location, area and volume of timber that would be removed per year. Field measurements would assess the emissions and change in dead wood stocks that would result from the logging practices. Analyses would also be necessary to estimate the wood products that would be derived from the harvested wood and the rate at which the wood products would be retired and emitted to the atmosphere.

Potential offsets from stopping timber harvesting within WCS over a 30-year project life using Russfin's regional rate of harvesting as a baseline scenario.

Regional harvest baseline

regional harvest rate and volume extracted as the baseline case.

Live biomass removals						Change in dead wood pool				
Year	Area	Volume (m3/ha)	Volume Removed (m3/yr)	Total C Removed (t CO2/yr)	Damaged (t CO2/yr)	Dead wood Pool (t CO2)	Change in dead wood Pool (t CO2/yr)	Change in dead wood pool (t CO2/yr)	Annual Wood products (t CO2/yr)	Annual offsets from stop logging (t CO2/yr)
						Decomposition rate = 0.05				
Total			1,440,000	1.108.080	697.680		370.446	172.800	564.834	2.072.939

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Feasibility under CDM: Fail

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CDM projects allow only afforestation/reforestation.

Feasibility under VCS: Fail

Under VCS, WCS could not claim that it would harvest its Karukinka forests at a rate equal to the regional average as a baseline scenario because this **would not be** an acceptable baseline

A. the baseline rate of harvesting for VCS must be specific to the project area, not a regional rate

B. WCS would need to document that it has 5 to 10 years of management records on the property to show normal historical harvesting practices

Feasibility under CCX: Fail

Under CCX, forest management projects are compared against a base year. The base year would be the carbon stocks in the forest today (before any logging has occurred). Therefore, the business as usual case of trees being cut down cannot be considered under CCX.

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Mitigating beaver damage to lenga forests

The area of beaver dam expansion within the project boundary and the difference in carbon stocks between undisturbed and beaver-impacted forests would need to be measured through time. The average areas of new beaver impact per unit time would be estimated for the baseline case, and a carbon impact would be estimated per area of forest impacted. Following project implementation, the area of beaver impact could be estimated through time using aerial photography

Average carbon stocks in undisturbed and beaver-impacted lenga forests in Karukinka.

Carbon Pool	Undisturbed lenga forest (t CO2/ha)	Beaver-impacted (t CO2/ha)	Difference in carbon stocks (t CO2/ha)
Trees >5 cm	488	110	-378
Standing Dead Wood	41	162	+121
Lying Dead Wood	171	242	+71
Total	700	515	-185

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First approximation of the potential baseline carbon emissions from beaver impacts within Karukinka.

Year	Area	New dead wood added (t CO2/ha)	Total C Damaged (t CO2)	Dead wood pool (t CO2)	Change in dead wood pool (t CO2)	Annual offsets from beaver mitigation (t CO2)
1	27	192	5.184	5.184	5.184	5.184
10	27	192	5.184	41.823	3.305	3.305
20	27	192	5.184	67.190	2.005	2.005
30	27	192	5.184	82.576	1.216	1.216

Total **82.576**

The carbon benefits generated from a beaver eradication program as shown in Table above. Are not necessarily equal to the baseline emissions avoided (as was the case for the stop logging scenario presented). The extent of WCS carbon benefits would depend on the extent to which the area impacted by beaver dams could be reduced. If we assume a 50% reduction in area impacted within Karukinka (from 27 ha/yr in the baseline case to 13.5 ha/yr in the project case) due to WCS's eradication program, total carbon benefits over 30 years are estimated as **41,288 t CO2**, or **1,376 t CO2 per year**. Assuming a price of $6 per t CO2 (current CCX price), selling the carbon credits generated by mitigating the impact of beavers in Karukinka could generate
close to **$10,000** per year

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Feasibility under CDM: Fail

Only afforestation/reforestation projects are allowed under the CDM.

Feasibility under VCS: Pass

The accounting methodology would be original, but Winrock believe that this strategy would fit under an avoided deforestation project type for the VCS

Feasibility under CCX: Fail

Under CCX beaver eradication would be a forest management project. Forest management projects are compared against a base year. The base year would be the carbon stocks in the forest today (before the expansion of beavers to the forest site). The business as usual of forest degradation due to beavers can therefore not be considered under the CCX

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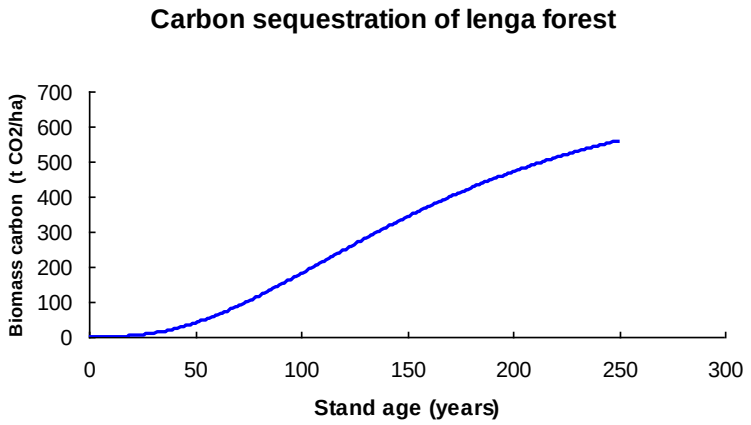
Forest restoration / Improved regrowth

The difference in carbon stocks would need to be tracked through time between the project area (fenced to prevent guanaco browsing and potentially stocked with lenga seedlings) and a baseline area with no treatment

Lenga regeneration could be enhanced in areas that have been harvested in the past using fences to keep **guanacos out of the re growing** stand and potentially stocking these areas with lenga seedlings that are raised in a nursery.
A proxy stand of previously logged lenga forest could be established as the baseline land use, and the fenced area would then be the project land use. Carbon stocks in both areas would then be monitored over time in both areas and the carbon benefits would be the difference in carbon stocks



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If a 30-year carbon project is assumed on a project area of **1,000 ha** (the size of the project would need to be defined specifically, 1,000 ha is just an estimate), the carbon benefits from increased sequestration on project lands can be estimated as **300,592 t CO2**, or approximately **10,020 t CO2/yr.** At a carbon price of $6 per t CO2 this equates to approximately **$60,000** per year of carbon revenue, although most of the carbon credits come in later years of the project as trees accumulate carbon.

Carbon benefits of a 1,000 ha aided regeneration carbon project.

Year	Area	Basline carbon accumulation (t CO2/ha)	Project carbon accumulation (t CO2/ha)	Annual offsets from aided regeneration (t CO2)
1	1000	0	0.001	1
10	1000	0	1.343	1,343
20	1000	0	11.336	11,336
30	1000	0	36.795	36,795
Total				300,592

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Feasibility under CDM: Fail

Although this is a reforestation project, one key requirement of the CDM is that the project land must be without forest since at least December 31, 1989. As the Karukinka lands were forested on this date and became deforested since then, a reforestation project would not be eligible under CDM.

Feasibility under VCS: Pass

Under VCS, there is no "1990 rule" as there is for CDM projects. The requirement for VCS Afforestation, Reforestation and Revegetation (ARR) projects is that the project land must have been non-forest at least ten years prior to the start of the project. As the first Trillium lands were logged in the 1990s, a reforestation project beginning in 2008-2009 within Karukinka would be eligible

Feasibility under CCX: Pass

The credit would be the difference in carbon stocks before and after guanaco exclusion.

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Peat Protection

A detailed baseline case would need to be presented that outlines a real and measurable threat to the peat areas within Karukinka. This would involve obtaining regional data on peat drainage, area of harvest and extraction rates as well as documentation on why the peat resource within Karukinka is at risk

Under current Chilean law, peat mining is considered separate from land ownership so that even though WCS owns the Karukinka property, **they do not own the mining rights**. Therefore, the rights can be purchased by another company and peat can be extracted. By purchasing them, WCS could potentially conserved the peat from exploitation.

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SCENARIO 1: Regional harvest baseline

Potential carbon benefits from preventing peat harvesting within Karukinka at a level equal to the regional rate.

Year	Volume harvested (m3)	Bulk Density (Kg/m3)	Carbon content	Total avoid emissions from peat harvesting (t CO2)
1	65.000	67,1	0,45	7.201
10	65.000	67,1	0,45	7.201
20	65.000	67,1	0,45	7.201
30	65.000	67,1	0,45	7.201
total	**1.950.000**			**216.020**

A peat bulk density of 67.1 kg/m3 was derived from field measurements on six peat core samples and a peat carbon content of 45% is assumed based on data received from WCS. Total estimated carbon benefits from preventing peat extraction at this regional level within Karukinka are approximately **216,026 t CO2,** or **7,200 t CO2 per year**. At a current carbon price of $6 per t CO2, this translates into potential revenue of over **$40,000** per year.

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Feasibility under CDM: Fail

CDM projects allow only afforestation/reforestation.

Feasibility under VCS: New sector – VCS board currently developing methods – Probable Fail

It will be necessary under VCS to show an imminent threat to the specific peat stocks within the boundaries of Karukinka; using a regional baseline is not likely to be acceptable.

Feasibility under CCX: New sector – likely would pass after approval by CCX

It is likely that CCX will allow a regional baseline for peat as it does for conservation. The total area and/or
volume of peat in the region (rather than just inside Karukinka) would need to be known.

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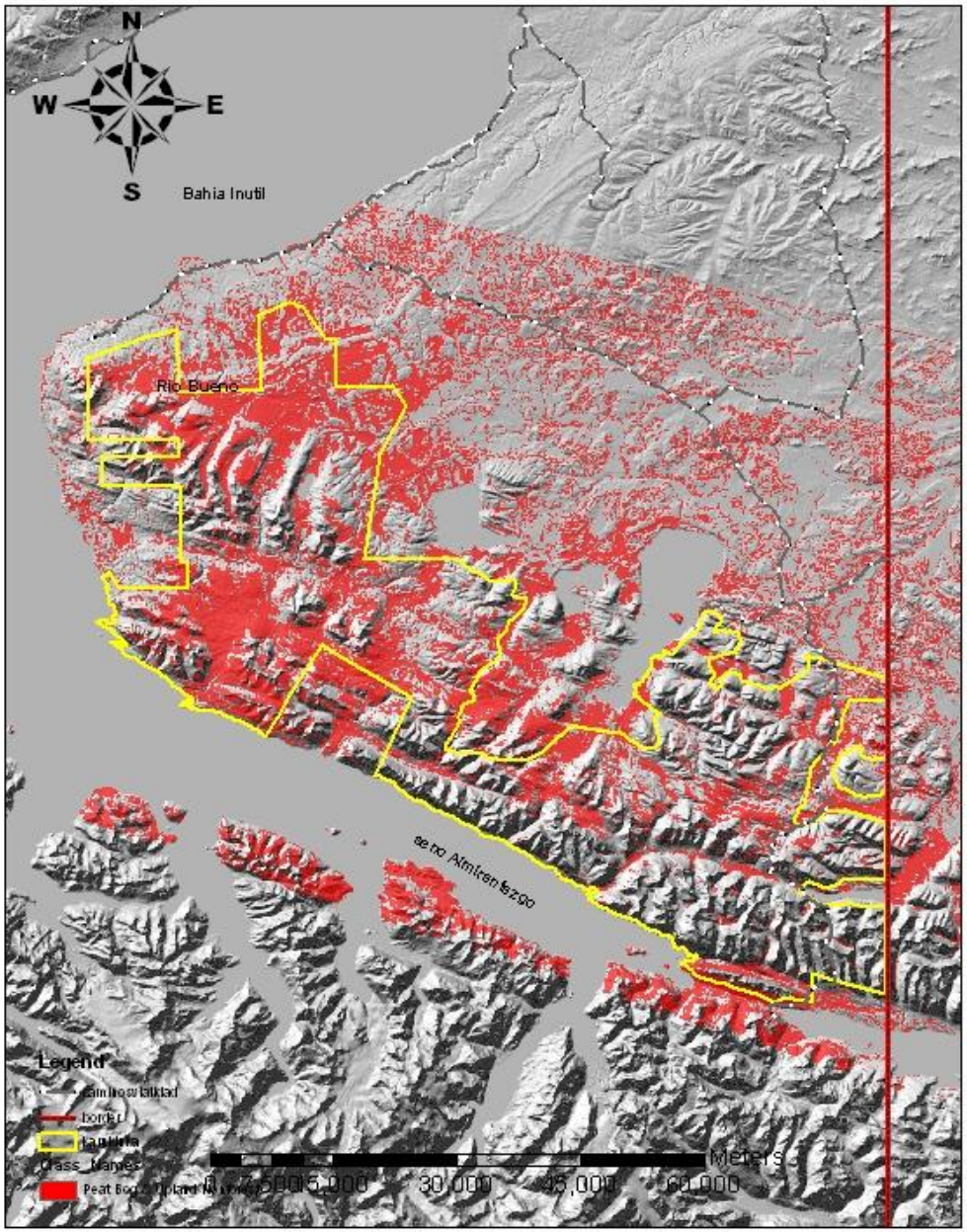

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SCENARIO 2: Peat mining law change

If WCS were to lobby the Chilean government to change the mining law and prohibit peat mining throughout Tierra del Fuego or throughout the entire country of Chile, the carbon savings could potentially be very large. It is difficult at this time to estimate potential benefits until more information is available regarding national rates and volumes of peat harvested. At this time, this scenario of WCS successfully convincing the Chilean government to ban peat mining is unlikely.

Feasibility under CDM: Fail

Only afforestation/reforestation projects are allowed under the CDM.

Feasibility under VCS: New sector – VCS board currently developing methods – Potential Pass

Since peat is a potentially new sector for VCS, the guidelines for peat projects are not yet fixed. In Winrock's opinion, if WCS could prove that carbon financing or the promise of carbon financing was in some way essential to fund the efforts to lobby for the law changes, this project could go forward.

Feasibility under CCX: New sector – likely would pass after approval by CCX

It is likely that CCX will allow a regional baseline for peat as it does for conservation. If the peat mining law were changed due to WCS efforts, WCS could apply the regional rate of peat harvesting for each region in Chile where peat exists

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Avoided deforestation

No deforestation has occurred within the boundaries of Karukinka since WCS management began. The argument would have to be made that without operating finances WCS would not be able to resist the growing regional deforestation pressures. Given that any such deforestation would be illegal and that deforestation occurring in the region is overwhelmingly legal, it might be a difficult argument to successfully make.

Rather than adopting a logging baseline as a carbon project, WCS could adopt an avoided deforestation baseline by looking at the regional rate of deforestation. The carbon credits generated would then be calculated as the area of Karukinka that is protected from this deforestation multiplied by the difference in carbon stocks between forested and deforested areas.

If unsustainable timber harvesting is the main driver of deforestation in the region, then the measured difference in carbon stocks between undisturbed and logged Russfin plots (757 and 524 t CO2/ha, respectively) is assumed to represent the change in carbon stocks resulting from deforestation on Tierra del Fuego (233 t CO2/ha). If the driver of deforestation in the region is development or agriculture (carbon stocks assumed as zero), then the change in carbon stocks resulting from deforestation is assumed as 757 t CO2.

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Feasibility under CDM: Fail

Only afforestation/reforestation projects are allowed under the CDM.

Feasibility under VCS: Fail

For an avoided deforestation project under VCS, the baseline deforestation rate must be compared between the project area and a larger reference area that encompasses areas outside the project boundary. In general, VCS guidelines for avoided deforestation projects are directed toward uncontrolled, unplanned deforestation that often occurs in areas of tropical forest. To produce credible carbon benefits, WCS would have to prove that **Karukinka is demonstrably under threat of deforestation**, or will become under threat during the crediting period,
by doing a spatial analysis that addresses deforestation agents, drivers and rates in the region. However, because WCS owns the land and no deforestation has been recorded during the time of this ownership, a baseline case of illegal, "unplanned" deforestation would be difficult to justify.

Feasibility under CCX: Pass

Under CCX, avoided deforestation projects use the regional deforestation rate as the baseline scenario. For example, CCX lists deforestation rates by state for avoided deforestation projects in Brazil. If a credible deforestation rate is developed for Tierra del Fuego, using this baseline approach for a WCS avoided deforestation project in Karukinka is likely to be approved under CCX.

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Summary of the likelihood of approval under different carbon project standards for each of WCS's carbon strategies

Carbon Strategy	CDM	VCS	CCX
No selective logging	NO	YES	NO
Beaver eradication	NO	YES	NO
Improve regrowth	NO	YES	YES
Peat protection	NO	Maybe	Maybe
Avoided deforestation	NO	NO	YES

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