

**A. Title of Proposed Project**

Standardization of the Freshwater Ecosystems in Central and South America

**B. Contact Information for Principal Investigator(s)**

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**C. Contact information for Managing Institution**

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**D. If Applicable, a List of other participating Institutions**

**E. Project Summary: An abstract of the proposal (200 words or less). This must be submitted in the proponent's native language and in English and Spanish (as the case may be).**

The Nature Conservancy (TNC) has recently completed comprehensive ecoregional assessments of freshwater biodiversity and associated threat status across Central and South America. These assessments are part of a larger effort to identify high priority habitats that lack adequate protection. The data associated with these assessments have been derived through GIS-based modeling of hydrological systems, followed by expert review and validation. Ecosystem freshwater elements have been mapped in order to represent the full spectrum of freshwater biodiversity that exists using combinations of biophysical factors such as climate, geology, and elevation. In order to integrate these freshwater datasets into IABIN's ecosystem thematic network, TNC will create a freshwater standardized classification and fill out the standard format with approximately 200 classes that span both Central and South America. As part of the proposed work, these data will contain metadata and hosted on a web-accessible server which will make the freshwater products available for viewing through a web mapping application and linked to the IABIN portal.

In summary, the proposed tasks to be completed are:

- 1) Create the freshwater standard classification and guide the review and refine process until it is finalized.
- 2) Fill out the standard format for Central and South America regions – approximately 200 freshwater classes. Will take 1 hour to upload each one.
- 3) Ensure metadata availability.
- 4) Host the data on a web map service

EN ESPAÑOL

The Nature Conservancy (TNC) recientemente ha terminado varias evaluaciones ecorregionales sobre la biodiversidad en los sistemas de las aguas continentales así como sobre las amenazas asociadas tanto en Centro América como en Sur América. Estos análisis han sido parte de un esfuerzo mayor que pretende identificar los hábitats prioritarios que carecen de una protección adecuada. Los datos asociados han sido derivados de sistemas hidrológicos modelados sobre la base de SIG, seguidos de revisiones y validaciones de expertos en la materia. La ubicación de los elementos de la biodiversidad de las aguas continentales ha sido mapeada con el fin de representar el espectro completo resultado de la combinación biofísica de factores como clima, geología, elevación, entre otros. Con el fin de integrar estas bases de datos a la red temática de ecosistemas de IABIN's, TNC creará y llenará una clasificación estandarizada con aproximadamente 200 clases que cubren Centro América y Sur América. Como parte de este trabajo propuesto, los datos contendrán metadata y estarán albergados ("hosted") en una red accesible a través de un servidor que harán estos productos disponibles para su revisión y vista con aplicaciones de mapeo y vinculados al portal de IABIN por parte de todos los usuarios de internet.

En resumen, las tareas propuestas a llevarse a cabo son las siguientes:

1. Creación de la clasificación estándar y guía de los procesos de revisión y refinamiento hasta su finalización.
2. Llenado del formato estándar para las regiones de Centro y Sur América – aproximadamente 200 clases para los sistemas de aguas continentales. Tomará aproximadamente 1 hora "subir" cada una a la red.
3. Garantía de disponibilidad de la metadata
4. Albergue ("host") de los datos en una red de servicios de mapeo.

## **F. Classification System Description (Maximum four pages)**

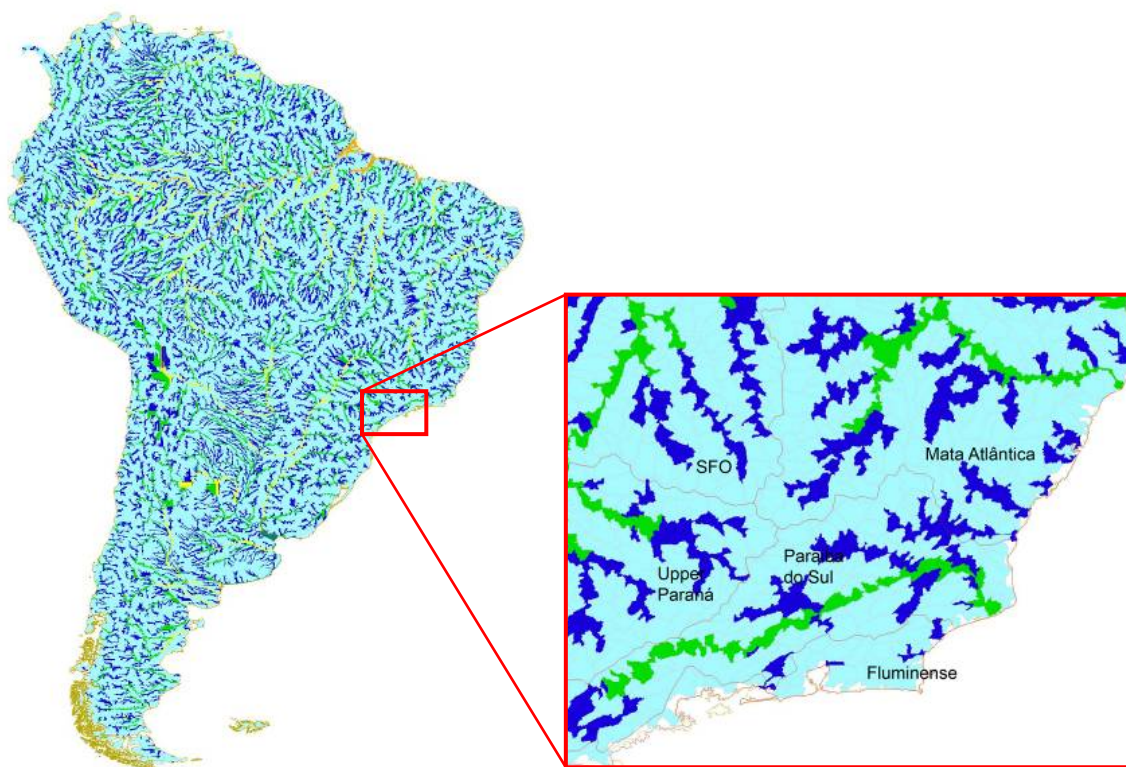
Over the past two years, TNC has spent considerable time developing freshwater ecoregional assessment products for Central and South America. Ecoregional assessments provide a regional scale, biodiversity-based context for implementing conservation efforts. They identify ecologically significant areas for conservation action with a goal of protecting representative biodiversity. They are the result of rigorous scientific analyses, incorporating an extensive expert review, and are the most comprehensive and current efforts to set conservation priorities at a regional scale. The main products developed are:

- A portfolio of priority freshwater conservation areas, highlighting the most important and suitable areas for conservation of ecoregional biodiversity.
- Maps of relative conservation value of all freshwater features in each ecoregion.
- A compilation of the comprehensive biodiversity information and data that were used to develop the assessment.
- A thorough documentation of the assessment process, portfolio identification and site prioritization methods, and data management, so that future iterations of the assessments can build upon previous work.

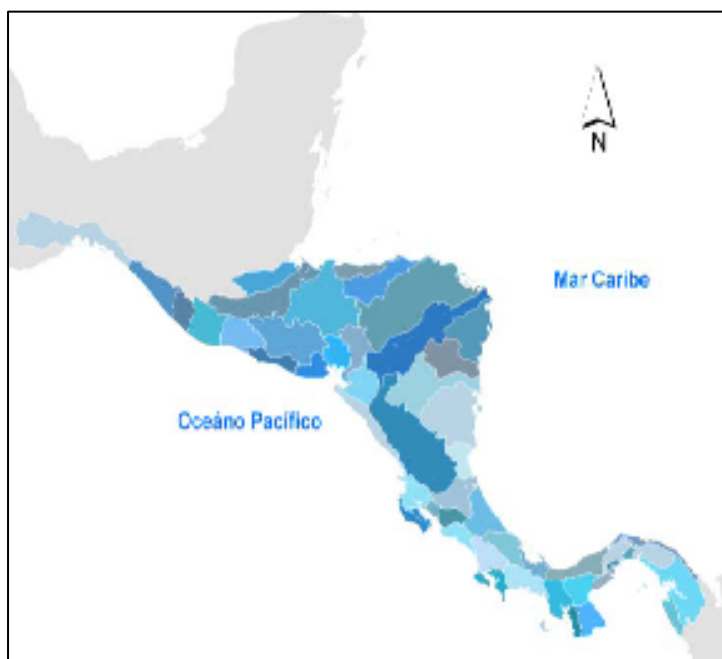
It is proposed that TNC use the freshwater ecoregional datasets to create a standardized freshwater classification that can be used across freshwater ecosystems in Central and South America. These classification systems have been developed using methodology proposed by Higgins et al, 2005 and are the result of reviews and consultations with a variety of freshwater experts. These freshwater datasets have been primarily derived using 90m SRTM digital elevation models (DEM) and the associated Hydrosheds product developed by WWF, USGS, and CIAT (<http://hydrosheds.cr.usgs.gov>). Several derivatives from the SRTM data include drainage direction, flow accumulation, and river networks. Drainage direction defines the direction of flow from each cell in the conditioned DEM to its steepest down-slope neighbor. Flow accumulation defines the amount of upstream area (in number of cells) draining into each cell. The drainage direction layer is used to define which cells flow into the target cell. The number of accumulated cells is essentially a measure of the upstream catchment area. The river network layers are directly derived from the drainage direction layers (Lehner et al, 2008).

For Central America, river systems were classified using drainage area size, elevation zones, climate regime, and connectivity. Lentic systems were classified using size (area and depth), elevation zones, geologic origin, and function (open vs. closed systems). The South American freshwater ecosystem classification were developed using a nested watershed units approach with sizes ranging from 100-10 million square kilometers. Each watershed unit was attributed with biophysical information and a multivariate method was used to derive the classification, based primarily on geology, geomorphology, hydrographic attributes, and climate.

Based on these similar classification methods, it is proposed that TNC will develop a common freshwater standard format template to document the different freshwater ecosystem classes at both a national and regional level. The freshwater standard format template will be filled out for each class in an ecosystem classification with fields that describe the class according to a series of attributes.



An example of South America's full nested freshwater features showing a mosaic of distinct occurrences for each of the five size classes (Petry and Sotomayor, 2008).



The freshwater ecological drainage units developed for Central America's freshwater ecoregional assessment (TNC, 2009).

TNC will accomplish the following tasks:

- 1) Create the freshwater standard classification and guide the review and refine process until it is finalized.
- 2) Apply the Standard Format for Fresh Water Ecosystems to each class for the freshwater classification system to be developed. This implies filling out a Web template for each class.
- 3) Develop metadata utilizing IABIN standards for all the information provided and related and fill in these metadata in the ETN file in the CASSIA system developed by the Instituto Alexander von Humboldt.
- 4) Provide and host the freshwater ecosystem data on an internet-based map visualizer available at a server provided with TNC resources.
- 5) Support the IABIN philosophy by demonstrating a commitment to making the resulting data freely available to the public and explicitly agreeing to conditions given under Section I.4.

**Provide timeframe/work plan (including preparation of technical and financial progress reports).**

The Mesoamerica & Caribbean Region Science Team for The Nature Conservancy (TNC) will develop and apply the standard format for freshwater ecosystems that will be provided, to each class in the above referenced classification system for Central and South America. TNC will provide the existing ecosystem map as an internet map service through our external data portal and hosting institution. TNC will ensure data quality via expert review and corresponding metadata will be developed utilizing IABIN standards. All data developed for this project will be made freely available to the public through our external data portal. The team will submit regular progress reports to IABIN to ensure timely delivery of all products.

<b>Work Plan</b>	<b>Month 1-2</b>	<b>Month 3-4</b>	<b>Month 5-6</b>
1. Development of Freshwater Standard Format Classification for the ETN.	X		
2. Application of the Freshwater Standard Format to freshwater ecosystem data for Central and South America. Data will be submitted on a regular interval for reviewed to ensure proper data quality.		X	
3. Completion of metadata.		X	
4. Design and development of web mapping application and link to IABIN portal.			X
5. Project Final Report (financial and technical included).			X

## Performance and Impact Indicators

Objectives	Impact indicators	Result Indicators
Create standard format classification for freshwater ecosystems in Central and South America	Standard format classification for freshwater ecosystems	Standard format classification that is available for use in the web template
Fill out standard format for Central and South America freshwater ecosystems	Digitized Central and South America freshwater ecosystems in the standard format	Completed freshwater standard format for Central and South America freshwater ecosystems
Complete metadata for standardized freshwater ecosystems	Metadata for standardized freshwater ecosystems	Metadata of standardized freshwater ecosystems available for public download
Make the completed freshwater ecosystem and associated metadata available on a publicly-available internet map service.	Central and South America standardized freshwater ecosystems made available to the public.	Data is made available to the public through the TNC data portal and linked to the IABIN portal.

## Project Budget

Item	IABIN funds	"Matching funds"	Total
<b>Operating Costs</b>			
Technical services:			
1. Create freshwater standard classification format	\$5,000		
2. Fill out standard format for Central and South America freshwater data	\$10,000		
3. Complete metadata	\$5,000		
4. Provide data on web map service	\$10,000		<b>\$30,000</b>
<b>In-kind support to the project:</b>			
Supplies and equipment		\$30,000	<b>\$30,000</b>
<b>Total</b>	<b>\$30,000</b>	<b>\$30,000</b>	<b>\$60,000</b>

## References

Higgins, Jonathan V., Mark T. Bryer, Mary L. Khoury and Thomas W. Fitzhugh. 2005. A Freshwater Classification Approach For Biodiversity Conservation Planning. *Conservation Biology*, vol. 19, no2, pp. 432-445. The Nature Conservancy.

Lehner, B., K. Verdin, A. Jarvis. 2008. New Global Hydrography Derived From Spaceborne Elevation Data. *Eos, Transactions, AGU*, 89(10): 93-94.  
<http://www.worldwildlife.org/science/projects/freshwater/item1991.html> and  
<http://hydrosheds.cr.usgs.gov/>

Petry, P. and L. Sotomayor, 2009, Mapping Freshwater Ecological Systems with Nested Watersheds in South America, The Nature Conservancy, Arlington, VA.

TNC. 2009. Evaluación de ecorregiones de agua dulce en Mesoamérica, sitios prioritarios para la conservación en las ecorregiones de Chiapas a Darién. Programa de Ciencias Regional, Región de Mesoamérica y El Caribe. The Nature Conservancy, San José, Costa Rica. 520 pags