

Meeting Notes

NAFC Inventory and Monitoring Working Group (IWMG)

Special meeting on Working Group Database Project and Related Topics

Washington, DC September 3-4, 2008

Attendees:

US - Greg Reams, Brad Smith, Rich Guldin, Zhiliang Zhu, Pat Miles (all USFS)
Canada - Joanne Frappier, Mark Gillis, Simon Bridge, Alex Song (all CFS)
Mexico- Ernesto Diaz (CONAFOR), Jose Rodríguez (INEGI)
Guests – Cody Rice (CEC), Linda Langner (USFS)

Overview

The primary focus of the meeting was to discuss the development of a North American database in support of the FAO global Forest Resource Assessment (FRA) reporting process. The Working Group received a \$25,000 grant from the NAFC Board of Alternates (BOA) to pursue this effort. Since this effort is in support of a longer term agenda to support FRA needs, National Correspondents and FRA Remote Sensing project representatives also participated in the meeting to discuss the Database Project as well as related issues including the Remote Sensing Project, response to FRA 2010 reporting tables and collaboration with the Commission for Economic Cooperation (CEC) in support of their North American Atlas Project.

The meeting began with an introduction and expected outcomes from the meeting by Richard Guldin, the U.S. representative to the Montreal Process Working Group. Rich's brief powerpoint overview provided in Appendix D. A brief presentation was made by Brad Smith on the Database Project (Appendix E). Cody Rice provided a real-time demonstration of the current status of the CEC North American Atlas.

Following discussions outlined in the Agenda, the group was charged to develop the issue statements and provide them for review and inclusion in the Minutes of the meeting. Outcomes of the meeting are presented in 5 issue statements with background, discussion and recommended actions.

Contents of this meeting summary

IMWG ISSUES AND ACTIONS

1. The North American Database Project
2. The FRA Global Remote Sensing Project and North American participation
3. Concerns about submission of FRA 2010 Tables 14-17 on Institutional Frameworks
4. Opportunities to collaborate on the CEC North American Atlas
5. FAO North American Outlook Study

Appendices

- A. Meeting Agenda
- B. Meeting participants
- C. Database Project funding proposal
- D. Opening remarks (powerpoint)
- E. NAFC Database Overview (powerpoint)
- F. NAFC Database Workplan

ISSUE 1

The North American Database Project

Background: A key initiative identified by the NAFC Inventory and Monitoring Working Group is to develop and validate a common North American inventory, monitoring and assessment database for reporting purposes. This integrated forest information would be based on new NFI inventory and monitoring data of the three countries. This database would produce refined snapshot of the state of the major forest ecosystems of North America using an ecological reporting framework rather than one based political or jurisdictional boundaries.

Discussion: Basic cross-walks and integrating protocols have been established for data sharing and evaluation and assessment, continental-wide interpretive maps about the nature of North America forests. This project will move us substantially toward a longer-term goal to develop and implement common North American-wide protocols to facilitate data exchange, evaluation and assessment among the three NAFC countries. The project also directly addresses a primary objective of the North American Forestry Commission - to report on forests from a North American perspective.

Action item: The 3 countries will develop a work plan to generate a prototype relational database for completion prior to the World Forestry Congress in Argentina, October 2009. We anticipate providing both an interactive database demonstration and a poster outlining database development. A preliminary workplan is attached in Appendix F. The Plan defines:

- Data sources
- Attributes and Classifiers
- Activities
- Deliverables
- Implementation
- Timelines (milestones)

ISSUE 2

The FRA Global Remote Sensing Project and North American participation

Background

As part of the FRA 2010, FAO, its member countries and partner organizations will undertake a global remote sensing survey of forests. The survey will substantially improve knowledge on land use change including deforestation, reforestation and natural expansion of forests. The assessment will cover the whole land surface of the Earth with about 9000 samples.

The remote sensing survey objectives are:

- To monitor forests for the time period 1975 to 1990 to 2000 to 2005 delivering: (i) area change statistics, (ii) information on land use dynamics (change matrices), and (iii) forest maps.
- As an integral part of the FRA 2010 remote sensing survey is to establish a publicly accessible information framework in support of monitoring of forests, land use, and the environment. These data are envisioned to facilitate further global or regional monitoring of the terrestrial environment at large, as well as to assist national monitoring efforts.

The recommended dual approach of: (i) systematic sampling using Landsat, and (ii) full coverage monitoring using MODIS vegetation continuous fields is described in Forest Resources Assessment Working Paper - 141 Options and recommendations for a global remote sensing survey of forests.

NAFC Position

Over the past several years, forest monitoring programs have been designed and implemented to assess forest characteristics over time to produce information to support policy and decision-making and international reporting. The NAFC countries (Canada, United States of America and Mexico) priority is to continue to support national monitoring programs to meet national information needs and to support international programs utilizing the same national monitoring program information.

In order to support the FRA proposal to sample image data to characterize forest characteristics, the survey defined by FRA must be incorporated into existing forest monitoring initiatives in a seamless way.

Incorporating National Forest Monitoring Activities into the FRA Proposal:

The FRA remote sensing survey has potential linkages to National forest monitoring activities. The survey could provide reliable, statistically sound information to draw valid conclusions about forest change.

There are a number of options to incorporate the national monitoring activities and support the remote sensing survey. These include:

1. Use existing National Forest Inventory plots to derive the estimates of change
2. Use existing National Forest Inventory plots to calibrate/validate the survey results
3. Use a NFI plot location selected at random within the area represented by the FAO plot, as the FAO plot

NAFC Recommendation

The NAFC countries request FAO to clarify the relationship between the FRA remote sensing survey and the survey discussions to support REDD (Reducing emissions from deforestation and forest degradation).

The NAFC countries will support the FAO FRA remote sensing survey through the use of existing NFI plot data to calibrate/validate survey results; and, subject to available funding in each NAFC jurisdiction, jurisdictions will work with FAO to implement the remote sensing survey by establishing the remote sensing survey plots at existing NFI plot locations within the areas represented by the FAO plot.

There is no interest in analysis or interpretation of the circa 1975 Landsat MSS data archive. A number of issues with the older Landsat data including the nature of the data in the archive, the spatial resolution and geometric qualities of the imagery, and a lack of turn-key, standardized, normalization approaches preclude the use of the coarser spatial resolution archival Landsat data to provide reliable information about the change in North America's forests at this time.

Statistical analysis of the change will be conducted at a national level and aggregated to the regional level. Classification results and compiled plot results will be available on the NFI public website.

Cost - Consideration should be given to support complementary assessments such as the FAO FRA Remote Sensing Assessment, where they contribute to meeting national monitoring objectives. In the National context this is considered incremental work and requires new funding support. Provision of funding by FAO would facilitate implementation of the proposed program over NAFC countries using national expertise.

ISSUE 3

Concerns about submission of FRA 2010 Tables 14-17 on Institutional Frameworks

Background: As part of the FRA 2010, four tables were added to address institutional frameworks. These tables correspond to Criterion 7 information in the Montreal Process. Since all 3 NAFC countries are in the Montreal Process, this meeting provided a first opportunity for a group of Montreal Countries to review the tables and consider how to respond. A similar opportunity was not provided at the FRA National Correspondents Meeting in Rome in March 2008. A concern was raised at the March meeting that the Montreal Process Working Group was in the process of reviewing Criterion 7 but that it would not be complete in time for FRA 2010. This put the Montreal country National Correspondents in the awkward position of providing FRA input for these tables prior to the Montreal Working Group review process of Criterion 7 and their joint review of the FRA tables.

Discussion: The National Correspondents have decided to delay submission of FRA Tables 14-17 (Appendix C) until December 2009. This would allow the Montreal Process Working Group to review the tables and make comments during their next meeting in Russia in November 2008.

Action item: The NAFC Inventory and Monitoring Working Group requests that the Montreal Process Working Group provide comments on the tables and recommend options for how the Montreal Process countries could provide a more effective interface with the FAO-FRA process prior to the 2015 FRA Report.

Two years prior to each FRA Report, usually in June, FAO holds an Expert Consultation (the last 5 have been at Kotka, Finland) with participation from 70-80 National Correspondents, NGO representatives, FAO personnel and others to review the next FRA Report and make recommendations on what should and should not be included. This Consultation is followed in March of the next year by the COFO meeting where national forestry leaders from all countries are briefed on the recommendations of the consultation.

Several options may be considered improve Montreal communication with FRA:

Option 1: Have direct representation of the Montreal Process in the Kotka Expert consultations. This would be a representative group (2 or 3 maximum) as the total number of participants at the consultation must be manageable. These representatives would then report back to the Montreal Working Group.

Option 2: Have Montreal Working Group identify and designate several Montreal country National Correspondents as representatives of the Montreal Process and charge them to report back to the Working Group following the Kotka consultation.

Option 3: Have representatives of all the international process groups, including Montreal convene in Rome after the Kotka (June) consultation and prior to the COFO meeting (following March) to review, comment and concur with the reporting process for the next FRA.

Option 4: Some other approach deemed feasible and effective by the Working Group.

ISSUE 4

Opportunities to collaborate on the CEC North American Atlas

Background: The development of a North American Forest Database presents an opportunity for the North American Forest Commission (NAFC) and the Commission for Environmental Cooperation (CEC) to promote understanding of the state of North American forests through mapping.

Discussion: In addition to its role in meeting FAO reporting obligations, the NAFC forest database would also support the creation of environmental thematic maps such as forest extent, characteristics, management, and carbon stock. Once NAFC has completed these maps and associated metadata, this series will be added to the CEC's North American Environmental Atlas <<http://www.cec.org/naatlas>> as a forest thematic layer. As with other layers, CEC would provide attribution and links to the originator of the thematic maps, in this case NAFC. CEC expects that there would be wide interest in these thematic layers and would publicize their availability through CEC's network of contacts.

Action opportunity: The NAFC contribution to this effort would be a North American Forest Database containing harmonized, summary data on forest attributes in North America, within each country, and across terrestrial ecoregions. In support of this effort, the CEC can provide North American Atlas framework base maps (shorelines, national boundaries, ecoregions, etc.)—that support the display of this forest data at a continental scale. These base maps are a consensus product of CEC's mapping agency partners in Canada, Mexico, and the United States. CEC should attend the regular NAFC Inventory Working Group meeting in the U.S. next spring to review progress and begin developing a timeline and final product set for collaboration.

Timeframe: The preliminary products could be completed by August 2009.

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ISSUE 5

Comments on the FAO North American Outlook Study

Background (*excerpted from FAO documents*) - Assessing and analyzing the status, trends and outlook for forestry is an integral component of FAO's forestry strategy. Outlook studies highlight long-term trends in the sector and identify emerging opportunities and challenges. Drawing on the inputs from various initiatives, they examine the impact of key internal and external forces acting on the sector. By taking into account economic, social, institutional and technological changes, outlook studies support policy reviews and strategic planning, depict the range of choices available to forestry policy makers and describe the alternative scenarios that might arise as a result of these choices.

FAO produces both global and regional forest sector outlook studies. Global studies examine trends in the production, trade and consumption of forest products and in specific thematic areas that are common to many countries. Regional studies examine a wider range of issues in more detail, including issues that are of particular concern to specific regions and groups of countries. The global and regional studies complement and reinforce each other.

Discussion (*excerpted from comments from Doug Kneeland, FAO*)

FAO approached the NAFC Bureau of Alternates with a proposal for a North America study but scaled down from what was done in other regions. The NAFC BOA agreed to use a simpler process, with each country preparing a country study, then FAO preparing a regional summary based on the country reports (FAO would not publish the country reports).

The purpose of the proposed study was to have a chapter on North America in SOFO 2009. In the spring of 2008, FAO prepared a draft regional report that was circulated to the three countries for comments, and a second draft was discussed by NAFC at their meeting in June. Following the NAFC meeting, the US and Canada sent additional comments, which were incorporated into the latest version that was sent for publication in June 2008. The report, based on data from FRA 2005, will be released in March 2009, at the COFO meeting in Rome. FAO does not have a specific date in mind to update the NA outlook study.

Process for implementing outlook studies - FAO places emphasis on 1) involving all stakeholders in the process, especially country experts and other key players, such as multilateral and bilateral organizations, the private sector and non-governmental organizations; and 2) developing national-level expertise on outlook study methodology, to improve knowledge management in countries to ensure wide ownership of outputs.

Concerns of the NAFC IMWG

It was difficult to discern the objective of the report and topics could not be treated in depth. Summarizing trends across the three countries is a challenge and, in some cases, may mask real differences between the countries. It seemed it would be more appropriate to highlight key challenges to be faced in managing forest resources in the future such as increasing population with a stable or declining forest area; uncertainty about the future use of forest land once owned by forest industry; devising new policies and programs that more effectively encourage retention and management of forest land; and the combined effects of climate change, fire, and invasive species on future forest health. These topics are mentioned briefly in parts of the document, but would seem to deserve more attention.

Specific items of concern-

- Lead time was too short for adequate response, especially on future scenarios. Need to engage country experts sooner.
- Data to be used was unclear. U.S. developed a country report based on data for FRA 2010, but the report relied on FRA 2005
- Audience for the report needs to be more clear to develop more consistent results.

Appendix A – Meeting Agenda

NAFC Inventory and Monitoring Working Group

Special meeting on Database Project and related topics in support of FRA

One Washington Circle Hotel Washington DC, September 3-4, 2008

Day 1

9:00 - 5:00 joint session (All)

- Discussion opportunities for DB approach
- Review potential variables
- Review definitions
- Review spatial needs for DB
- Finalize variables
- Spatial coverage
 - CEC/ NA Atlas
 - NAFC
- Tables/maps/graphics

Small NAFC Outlook study breakout during afternoon (Correspondents)

Day2

9:00-2:45 concurrent sessions

Database project (DB)

- Outline DB design
- Web template
- Work plan

FRA (NC, FRA and RS)

- Review tables for FRA and country issues
- Coordinate response to tables 14-17
- Discussion cooperation with CEC
- Review FRA RS approach
- Coordinate NAFC response

3:00--5:00 joint session (ALL)

- Approve DB design/work plan
- Wrap up

Appendix B - Attendees

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Appendix C – Request for Funding from the NAFC Bureau of Alternatives

Inventory, Monitoring and Assessment Working Group

Project Title: Using the FAO ecological framework to report on the status of the major forest ecosystems of North America through shared national inventory database linkages

Project Participants: Greg Reams¹, Mark Gillis², Simon Bridge², Alberto Sandoval Uribe³, Joe Kapron⁴, Alex Song², Micheal Wilson¹, Brad Smith¹, Patrick Miles¹.

¹ USDA-Forest Service. ² NRCAN - Canadian Forest Service. ³ CONAFOR, Mexico. ⁴ Ontario Ministry of Natural Resources

Background: A key initiative identified by the Working Group is to develop and validate a common North American inventory, monitoring and assessment database linkages for reporting purposes. This integrated forest information would be based on new NFI inventory and monitoring data of the three countries. This linked assessment would produce refined snapshot of the state of the major forest ecosystems of North America using an ecological reporting framework rather than one based political or jurisdictional boundaries. Basic cross-walks and integrating protocols have been established for data sharing and evaluation and assessment, continental-wide interpretive maps about the nature of North America forests and must now be refined. This project is essential in a longer-term goal to develop and implement common North American-wide protocols to facilitate data exchange, evaluation and assessment among the three NAFC countries. This project also direct addresses a primary objective of the Commission - to report on forests from a North American perspective.

Need for NAFC Seed Money: A draft proposal outlining research and field activity for selected sites within Canada, USA and Mexico has been prepared. It outlines products, timelines, partnerships and results expected. Costing for implementation through 2012 is estimated at \$300 K (U.S. dollars). Current need is \$25,000 to fund to a workshop of key scientists is now needed to facilitate development of a new protocol based on now in place national forest inventories for the three countries. The requested money would also allow development of a demonstration poster and strategic follow-up meetings with potential partners. Much effort has already been expended in developing preliminary results based on existing data and protocols. A powerpoint slide summary of the current will be updated.

Impact of Not Carrying Out Activity: Currently, an integrated North American assessment of the status of our forests is not possible. Data exchange and analyses across country boundaries is not possible due to differing monitoring protocols, collection methods and attributes compiled. This situation will continue without initiatives such as this proposal. The Working Group's objective is to have a demonstration poster and refined protocol and report available for distribution in October 2008. Without seed monies to further analyse and scrutinize the various country data sets, the objective of identifying increased sharable data across counties cannot be met. Thus, an opportunity to profile key work of the NAFC would be lost.

Total Funding Requested (\$US): (*Summer, 2008*): **\$25,000**

This project will serve to provide the essential background information on data compatibility, options for integration or for cross-walks among attributes or data necessary for the Working Group to produce a refined approach for determining the status of the forests of North America

Workshop would determine:

- revised common attributes possible for North American assessment
- revised options for cross-links among national inventory attributes
- revised methods for linking datasets to ecological framework
- revised tables of appropriate attributes by FAO ecological region

The workshop will require the services of facilitators to keep the process moving efficiently toward the desired goals.

Date Funding Requested: April, 2008

North America Forest Database Project Work Plan

(Draft version 0.6)

North America Forest Commission
Forest Inventory and Monitoring Working Group

September 12, 2008

Table of Content

Overview.....	13
Data sources	13
Attributes and Classifiers.....	13
Activities.....	14
Deliverables	15
Options for the implementation	15
Timelines (milestones).....	15
Concerns and Issues.....	16
Appendix I Proposed Database Table Structures of the Lookup Tables	16
Appendix II Proposed Database Table Structures of the Summary Data Tables	18

List of Tables

Table 1 Country lookup	16
Table 2 Ecosystem Region lookup	16
Table 3 Land use lookup.....	17
Table 4 Ownership lookup.....	17
Table 5 Protection lookup.....	17
Table 6 Regeneration type lookup	17
Table 7 Forest management lookup.....	18
Table 8 Species list lookup	18
Table 9 Volume, biomass, and carbon within each Ecosystem Region	18
Table 10 Area of forest and other wooded land within each Ecosystem Region	19
Table 11 Volume by species within each Ecosystem Region.....	19
Table 12 Biomass and carbon within each Ecosystem Region.....	19

Overview

In order to address the need of regional forest reports, for example, the United Nations (UN) Food and Agriculture Organization (FAO) reports of Forest Resources Assessment (FRA), it is essential to build a central forest database for the North America (Canada, the United States and Mexico). The national forest inventory program leads from all the three countries have the interest in building a North America Forest Database (NAFDB) for long time. The North America Forest Commission Forest Inventory and Monitoring Working Group including the database experts from all the three countries met in Washington DC on the 3rd and 4th of September 2009 to discuss the goal and guideline of the north America database project.

The goal of the project is to develop an integrated/centralized forest database for North America, to report on the forest status of the North America by Ecosystem Regions (particularly FAO FRA Table 1—8), and to establish the basis for the future. The database must be able to handle trends.

Data sources

The database will consist of the estimates of each Ecosystem Region in the North America. The national forest inventory of each country is responsible for providing the summaries of the forest status for each Ecosystem Region within its national border.

The primary Ecosystem Region system is the FAO Ecosystem Region System. Estimates of each Ecosystem Region for other systems, for example, Commission for Environmental Cooperation (CEC) Ecosystem Region System, will be provided by each country if there is such a request.

The primary attributes are the ones specified in the FAO report Table 1—8 (excluding Table 5). More attributes (Ecosystem Region-level estimates) will possibly be generated for other client reports.

In the case that an Ecosystem Region crosses the national border, each country will submit the summaries over the portion of the Ecosystem Region within its country. The summaries over the entire Ecosystem Region will be regenerated based on the summaries from each country.

All the terms in the database will follow the FAO definitions.

Attributes and Classifiers

The following is a list of attributes and classifiers extracted from the FAO Table 1—8 (excluding Table 5).

- Area of forest land

- Area of other wooded land
- Area of forest land by ownership (public, private: individuals, private business entities and institutions or local communities, and other ownership)
- Area of forest land by protection
- Area of forest land by land use
- Area of forest land by forest management
- Area of forest land by regeneration
- Volume (growing stock) of forest land by coniferous and broadleaved
- Volume (growing stock) of other wooded land by coniferous and broadleaved
- Growing stock of commercial species
- Growing stock (volume) by the 10 most common species
- Above-ground biomass
- Below-ground biomass
- Dead wood biomass
- Carbon in above-ground biomass
- Carbon in below-ground biomass
- Carbon in dead wood biomass
- Carbon in litter

See the appendixes for the proposed database table structures.

Activities

1. Design the database (DB entities and relationships)
 - a. Identify the attributes and classifiers for the database
 - b. Design the database table structures
 - c. Define the relationships between the tables (entities) and draw the ER diagram
 - d. Create a document including a data dictionary of the database design
2. Determine what data management system (DBMS) to be used, e.g. Microsoft Access, SQL server, Oracle, etc.
 - a. Determine a DBMS to be used
 - b. Implement the database (create the tables and enforce the constraints)
3. Design and develop the user interface and associated applications (or web services) to access the database for reporting
 - a. Define the users of the database and the way to access the data (locally or remotely)
 - b. Determine the technology to be used for the user interface based on the DBMS and the way to access the data
 - c. Design and develop the user interface
 - d. Design report templates (layouts and formats of the reports that users will print or download)
 - e. Design and develop applications (or web services) to retrieve data for users if using DBMS other than MS Access
4. Deploy the database and the applications (or web services)
5. Collect the summary data from each individual national forest inventory and load the data into this database
6. Create a poster and demonstrate the database for the World Congress 2009

7. Maintain the system including the database and applications (or web services) updates

Deliverables

1. Document on the database design including the descriptions of all entities and their relationships (ER diagram)
2. Completed database deployed on a database server
3. User interface and associated applications to access the data for reporting (customized reports can be generated through the user interface)

Options for the implementation

- **Option 1**
Use Microsoft Access to host the data and MS Access Form/Report for the user interface and report output
- **Option 2**
Use Oracle to host the data and Oracle Forms for the user interface and report output
- **Option 3**
Use Oracle, Microsoft SQL Server or PostGres to host the data and webpage for user interface. Web applications (or web services) need to be developed and deployed on a web server that has connection (access) to the database server.

Option	Advantage	Disadvantage
Option 1	Easy to implement	No remote access (?)
Option 2	<ul style="list-style-type: none"> • Remotely accessible through internet/network 	<ul style="list-style-type: none"> • Clients need to install certain software e.g. Oracle Client on their computers • There could be security and Oracle license issues if users use it through internet/network
Option 3	<ul style="list-style-type: none"> • Remotely accessible through internet anywhere across the world • Thin client, i.e. clients do not need to install any required software (except for a web browser) 	<ul style="list-style-type: none"> • Take longer time to develop (more expensive than other two) • Need to maintain both a database server and a web server •

We recommend Option 1 to start the project for the short term goal (World Congress 2009). Option 3 would be a appropriate for long term since it needs more resources and time.

Timelines (milestones)

Here is a proposed timeline for the recommended implementation Option 1.

Activity	Time to complete	Remark
1a	October 31, 2008	
1b	November 30, 2008	The table structures and the entity relationships need to be considered the same time.
1c	November 30, 2008	
1d	December 31, 2008	
2a	January 31, 2009	
2b	February 28, 2009	
3a	January 31, 2009	
3b	January 31, 2009	Need to work concurrently with 2a.
3c	April 30, 2009	
3d	May 31, 2009	
3e	May 31, 2009	SQL statements should be developed when the reports/forms are designed.
4	May 31, 2009	It would be deployed right away when the database tables and the forms/reports are created.
5	March 31, 2009	
6	July 2009?	
7	Ongoing	The maintenance is an ongoing activity.

Concerns and Issues

1. Database server host, where will the database be hosted?
2. Who is going to maintain the database?
3. Data synchronization with the individual national forest inventory
4. Funding for the database maintenance and further development

Appendix I Proposed Database Table Structures of the Lookup Tables

Table 1 Country lookup

Field	Field name	Description	Format	Index	Null
1	COUNTRY_ID	Country code used in the database records	Char3	Y	N
2	NAME_ENGLISH	The country name in English	Char50	N	N
3	NAME_FRENCH	The country name in French	Char50	N	N
4	NAME_SPANISH	The country name in Spanish	Char50	N	N

Table 2 Ecosystem Region lookup

Field	Field name	Description	Format	Index	Null
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1	ECOREGION_ID	Ecosystem Region code used in the database records	Char3	Y	N
2	ECOSYSTEM	Ecosystem used to define the Ecosystem regions	Char5	Y	N
3	NAME_ENGLISH	The Ecosystem region name in English	Char80	N	N
4	NAME_FRENCH	The Ecosystem region name in French	Char80	N	N
5	NAME_SPANISH	The Ecosystem region name in Spanish	Char80	N	N

Table 3 Land use lookup

Field	Field name	Description	Format	Index	Null
1	LANDUSE_ID	Land use code used in the database records	Char3	Y	N
2	DESC_ENGLISH	The land use description in English	Char50	N	N
3	DESC_FRENCH	The land use description in French	Char50	N	N
4	DESC_SPANISH	The land use description in Spanish	Char50	N	N

Table 4 Ownership lookup

Field	Field name	Description	Format	Index	Null
1	OWNERSHIP_ID	Ownership code used in the database records	Char3	Y	N
2	DESC_ENGLISH	The ownership description in English	Char50	N	N
3	DESC_FRENCH	The ownership description in French	Char50	N	N
4	DESC_SPANISH	The ownership description in Spanish	Char50	N	N

Table 5 Protection lookup

Field	Field name	Description	Format	Index	Null
1	PROTECT_ID	IUNC protection class code used in the database records	Char3	Y	N
2	DESC_ENGLISH	The protection description in English	Char50	N	N
3	DESC_FRENCH	The protection description in French	Char50	N	N
4	DESC_SPANISH	The protection description in Spanish	Char50	N	N

Table 6 Regeneration type lookup

Field	Field name	Description	Format	Index	Null
1	REGEN_ID	Regeneration (stand origin) code used in the database records	Char3	Y	N
2	DESC_ENGLISH	The protection description in	Char50	N	N

		English			
3	DESC_FRENCH	The protection description in French	Char50	N	N
4	DESC_SPANISH	The protection description in Spanish	Char50	N	N

Table 7 Forest management lookup

Field	Field name	Description	Format	Index	Null
1	MANAGE_ID	Forest management code used in the data records	Char3	Y	N
2	DESC_ENGLISH	The protection description in English	Char50	N	N
3	DESC_FRENCH	The protection description in French	Char50	N	N
4	DESC_SPANISH	The protection description in Spanish	Char50	N	N

Table 8 Species list lookup

Field	Field name	Description	Format	Index	Null
1	SPECIES_ID	IUNC protection class code used in the database records	Char3	Y	N
2	NAME_ENGLISH	The species common name in English	Char50	N	N
3	NAME_FRENCH	The species common name in French	Char50	N	N
4	NAME_SPANISH	The species common name in Spanish	Char50	N	N
5	NAME_SCIENCE	The species scientific name	Char 50	N	N

Appendix II Proposed Database Table Structures of the Summary Data Tables

Table 9 Volume, biomass, and carbon within each Ecosystem Region

Field	Field name	Description	Format	Index	Null
1	ECOREGION_ID	Ecosystem region identifier	Char3	Y	N
2	COUNTRY_ID	Country identifier	Char3	Y	N
3	YEAR	The year that the summary data refer to	Num(4,0)	Y	N
4	FORE_VOL_CON	Growing stocking (volume) in coniferous forest land	Num(10,1)	N	Y
5	FORE_VOL_DEC	Growing stocking (volume) in broadleaved forest land	Num(10,1)	N	Y
6	OTWD_VOL_CON	Growing stocking (volume) in coniferous other wooded land	Num(10,1)	N	Y
7	OTWD_VOL_DEC	Growing stocking (volume) in deciduous other wooded land	Num(10,1)	N	Y
8	BIOM_ABOVE	Above-ground biomass in million metric tonnes	Num(10,1)	N	Y

9	BIOM_BELOW	Below-ground biomass in million metric tonnes	Num(10,1)	N	Y
10	BIOM_DEAD	Dead wood biomass in million metric tonnes	Num(10,1)	N	Y
11	CARB_ABOVE	Above-ground carbon in million metric tonnes	Num(10,1)	N	Y
12	CARB_BELOW	Below-ground carbon in million metric tonnes	Num(10,1)	N	Y
13	CARB_DEAD	Carbon in dead wood biomass in million metric tonnes	Num(10,1)	N	Y
14	CARB_LITTER	Carbon in litter in million metric tonnes	Num(10,1)	N	Y

Table 10 Area of forest and other wooded land within each Ecosystem Region

Field	Field name	Description	Format	Index	Null
1	ECOREGION_ID	Ecosystem region identifier	Char3	Y	N
2	COUNTRY_ID	Country identifier	Char3		
3	YEAR	The year that the summary data refer to	Num(4,0)	Y	N
4	LANDUSE_ID	Land use identifier	Num(2,0)		
4	OWNERSHIP_ID	Ownership identifier	Num(2,0)	Y	N
4	PROTECT_ID	IUNC protection classes	Num(2,0)	Y	N
4	REGEN_ID	Regeneration type identifier	Num(2,0)	Y	N
4	MANAG_ID	Forest management type identifier	Num(2,0)	Y	N
5	FORE_AREA	Forest are in 1000 hectares	Num(10,1)	N	N
6	OTWD_AREA	Other wood land area in 1000 hectares	Num(10,1)	N	N

Table 11 Volume by species within each Ecosystem Region

Field	Field name	Description	Format	Index	Null
1	ECOREGION_ID	Ecosystem region identifier	Char3	Y	N
2	COUNTRY_ID	Country identifier	Char3	Y	N
3	YEAR	The year that the summary data refer to	Num(4,0)	Y	N
4	SPECIES_ID	Species identifier	Char4	Y	N
5	VOLUME	Growing stocking (volume) of the species	Num(10,1)	N	Y

Table 12 Biomass and carbon within each Ecosystem Region

Field	Field name	Description	Format	Index	Null
1	ECOREGION_ID	Ecosystem region identifier	Char3	Y	N
2	COUNTRY_ID	Country identifier	Char3	Y	N
3	YEAR	The year that the summary data refer to	Num(4,0)	Y	N
4	BIOM_ABOVE	Above-ground biomass in million metric tonnes	Num(10,1)	N	Y
5	BIOM_BELOW	Below-ground biomass in million metric tonnes	Num(10,1)	N	Y
6	BIOM_DEAD	Dead wood biomass in million	Num(10,1)	N	Y

		metric tonnes			
7	CARB_ABOVE	Above-ground carbon in million metric tonnes	Num(10,1)	N	Y
8	CARB_BELOW	Below-ground carbon in million metric tonnes	Num(10,1)	N	Y
9	CARB_DEAD	Carbon in dead wood biomass in million metric tonnes	Num(10,1)	N	Y
10	CARB_LITTER	Carbon in litter in million metric tonnes	Num(10,1)	N	Y

APPENDIX D

**Building Consistent
Forest Information
for North America**

Richard Guldin

*Director, Quantitative Sciences
USDA Forest Service*

**NAFC Specialists Meeting
3-4 Sept 2008**

Overview

- **Welcome to Washington, DC**
- **Desired Outcomes of the Meeting**



Desired Outcomes

- **Consistent information database on forest conditions and trends for North America for domestic use and international meetings**
- **Integrated remote sensing products for resource managers and policy makers; locally and globally**
- **Information in FAO reports that accurately depicts the outlook for North American forests**



Database Project

- **A consistent set of data and products for**
 - *World Forestry Congress*
 - *FAO reports*
 - *Use within North America*
- **Timeline for identifying**
 - *Potential products*
 - *Design for database, including base variables*
 - *Work plan for creating and populating the database*



Remote Sensing Project

- **FAO remote sensing project**
- **Other uses for FAO data, including REDD**
- **CEC Atlas**



FAO National Correspondents

- **Consistent information for**
 - *FRA 2010*
 - *FAO regional Outlook reports*

APPENDIX E

North American Ecoregion Database Project

North American Forest
Commission (NAFC) Inventory,
Monitoring, and Assessment
Working Group



North America in a global perspective

Population 7%

Land area 16%

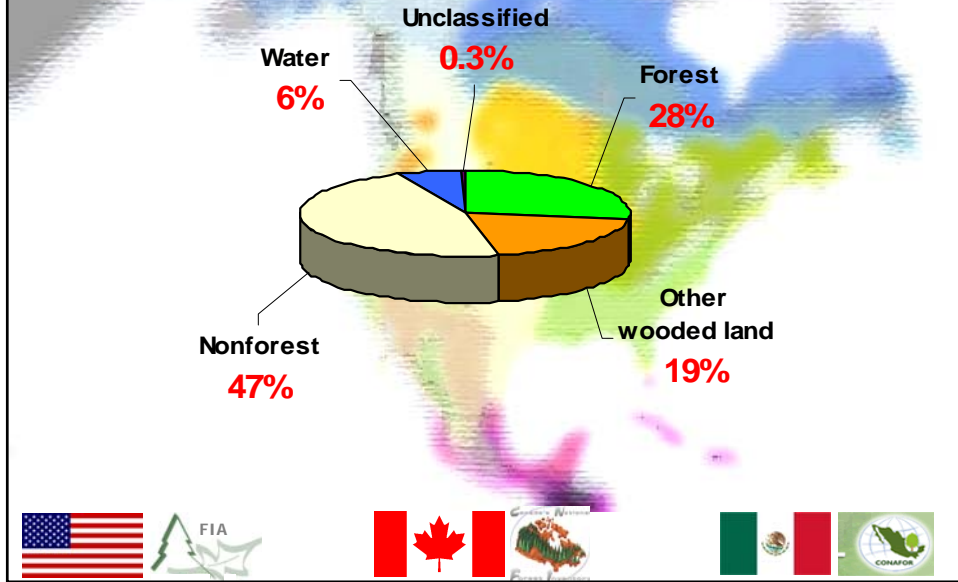
Forest area 16%

Plantations 14%

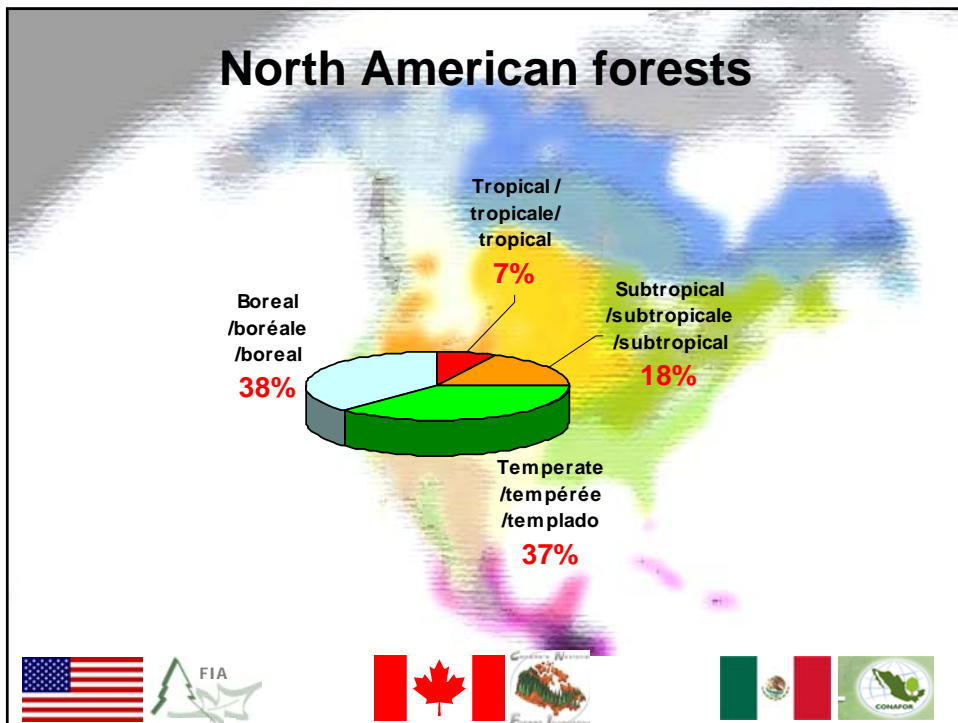
Volume 16%



North American land cover



North American forests



Project goals

- **Develop an integrated North American forest inventory database using FAO Ecological Zones**
- **Report on the status of the forests of North America based on available information**
- **Establish basis for future inventory collaboration**



Identify core data

- **The three countries have identified nearly 130 data elements as core in their national forest inventories**
- **40 were unique to only one country**
- **85 were shared with two countries**
- **50 were common to all three countries – 8-10 will be selected for the database project**



Potential variables

for FRA tables 1-8

- **Area- land, forest land, water**
- **Volume (biomass) estimates**
- **Status (available, protected)**
- **Ownership (public, private)**
- **Managed land and unmanaged land**
- **Type of forest (natural, plantation)**



Tasks

- **Evaluate of the current forest inventory techniques and databases of the three countries.**
- **Document and report on common variables for the database and potential outputs**
- **Establish a work plan for completing a demonstration DB and Poster for the World Forestry Congress in October 2009 in Argentina**
- **Review opportunities for additional integrated map products**



Guidelines

1. Use FAO major ecological zone boundaries
2. Use FAO definitions for terms
3. Include all forest as defined by FAO
4. Have hierarchical design
5. Use metric units.



Outlook

- All three countries are moving forward and should be able to meet most basic international information needs.
- All three countries are now using a grid approach to sampling at similar scales and are in close collaboration on designs, variables, and definitions.
- Additional harmonization will be required as new inventories and protocols are fully implemented in all three nations.



Project participants

Mark Gillis	<i>NRCan – Canadian Forest Service</i>
Alex Song	<i>NRCan - Canadian Forest Service</i>
Pat Miles	<i>USDA- US Forest Service</i>
Brad Smith	<i>USDA- US Forest Service</i>
Greg Reams	<i>USDA- US Forest Service</i>
Rigoberto Palofax	<i>CONAFOR , Mexico</i>
Aturo Victoria	<i>INEGI, Mexico</i>
Alberto Rodriguez	<i>INEGI, Mexico</i>

And, there are many others supporting mapping and data delivery as well in each country.



Current thresholds for defining forest

(na = not applicable)

Attribute	Canada	USA	Mexico
Min. area (ha)	na	0.4	0.5
Min. tree height (m)	5	4	4-5
Min. % Crown cover	na	na	10
Min. % Stocking	10	10	10



APPENDIX F

North America Forest Database Project Work Plan

(Draft version 0.6)

DRAFT

North America Forest Commission
Forest Inventory and Monitoring Working Group

September 12, 2008

Table of Content

Overview.....	3
Data sources	3
Attributes and Classifiers	4
Activities	4
Deliverables	5
Options for the implementation	5
Timelines (milestones).....	6
Concerns and Issues.....	7
Appendix I Proposed Database Table Structures of the Lookup Tables	7
Appendix II Proposed Database Table Structures of the Summary Data Tables	9

List of Tables

Table 1 Country lookup	7
Table 2 Ecosystem Region lookup	7
Table 3 Land use lookup.....	7
Table 4 Ownership lookup.....	7
Table 5 Protection lookup.....	8
Table 6 Regeneration type lookup	8
Table 7 Forest management lookup.....	8
Table 8 Species list lookup	8
Table 9 Volume, biomass, and carbon within each Ecosystem Region	9
Table 10 Area of forest and other wooded land within each Ecosystem Region	9
Table 11 Volume by species within each Ecosystem Region.....	10
Table 12 Biomass and carbon within each Ecosystem Region.....	10

Overview

In order to address the need of regional forest reports, for example, the United Nations (UN) Food and Agriculture Organization (FAO) reports of Forest Resources Assessment (FRA), it is essential to build a central forest database for the North America (Canada, the United States and Mexico). The national forest inventory program leads from all the three countries have the interest in building a North America Forest Database (NAFDB) for long time. The North America Forest Commission Forest Inventory and Monitoring Working Group including the database experts from all the three countries met in Washington DC on the 3rd and 4th of September 2009 to discuss the goal and guideline of the north America database project.

The goal of the project is to develop an integrated/centralized forest database for North America, to report on the forest status of the North America by Ecosystem Regions (particularly FAO FRA Table 1—8), and to establish the basis for the future. The database must be able to handle trends.

Data sources

The database will consist of the estimates of each Ecosystem Region in the North America. The national forest inventory of each country is responsible for providing the summaries of the forest status for each Ecosystem Region within its national border.

The primary Ecosystem Region system is the FAO Ecosystem Region System. Estimates of each Ecosystem Region for other systems, for example, Commission for Environmental Cooperation (CEC) Ecosystem Region System, will be provided by each country if there is such a request.

The primary attributes are the ones specified in the FAO report Table 1—8 (excluding Table 5). More attributes (Ecosystem Region-level estimates) will possibly be generated for other client reports.

In the case that an Ecosystem Region crosses the national border, each country will submit the summaries over the portion of the Ecosystem Region within its country. The summaries over the entire Ecosystem Region will be regenerated based on the summaries from each country.

All the terms in the database will follow the FAO definitions.

Attributes and Classifiers

The following is a list of attributes and classifiers extracted from the FAO Table 1—8 (excluding Table 5).

- Area of forest land
- Area of other wooded land
- Area of forest land by ownership (public, private: individuals, private business entities and institutions or local communities, and other ownership)
- Area of forest land by protection
- Area of forest land by land use
- Area of forest land by forest management
- Area of forest land by regeneration
- Volume (growing stock) of forest land by coniferous and broadleaved
- Volume (growing stock) of other wooded land by coniferous and broadleaved
- Growing stock of commercial species
- Growing stock (volume) by the 10 most common species
- Above-ground biomass
- Below-ground biomass
- Dead wood biomass
- Carbon in above-ground biomass
- Carbon in below-ground biomass
- Carbon in dead wood biomass
- Carbon in litter

See the appendixes for the proposed database table structures.

Activities

1. Design the database (DB entities and relationships)
 - a. Identify the attributes and classifiers for the database
 - b. Design the database table structures
 - c. Define the relationships between the tables (entities) and draw the ER diagram
 - d. Create a document including a data dictionary of the database design
2. Determine what data management system (DBMS) to be used, e.g. Microsoft Access, SQL server, Oracle, etc.
 - a. Determine a DBMS to be used
 - b. Implement the database (create the tables and enforce the constraints)
3. Design and develop the user interface and associated applications (or web services) to access the database for reporting
 - a. Define the users of the database and the way to access the data (locally or remotely)

- b. Determine the technology to be used for the user interface based on the DBMS and the way to access the data
- c. Design and develop the user interface
- d. Design report templates (layouts and formats of the reports that users will print or download)
- e. Design and develop applications (or web services) to retrieve data for users if using DBMS other than MS Access
4. Deploy the database and the applications (or web services)
5. Collect the summary data from each individual national forest inventory and load the data into this database
6. Create a poster and demonstrate the database for the World Congress 2009
7. Maintain the system including the database and applications (or web services) updates

Deliverables

1. Document on the database design including the descriptions of all entities and their relationships (ER diagram)
2. Completed database deployed on a database server
3. User interface and associated applications to access the data for reporting (customized reports can be generated through the user interface)

Options for the implementation

- **Option 1**
Use Microsoft Access to host the data and MS Access Form/Report for the user interface and report output
- **Option 2**
Use Oracle to host the data and Oracle Forms for the user interface and report output
- **Option 3**
Use Oracle, Microsoft SQL Server or PostGRES to host the data and webpage for user interface. Web applications (or web services) need to be developed and deployed on a web server that has connection (access) to the database server.

Option	Advantage	Disadvantage
Option 1	Easy to implement	No remote access (?)
Option 2	<ul style="list-style-type: none"> • Remotely accessible through internet/network 	<ul style="list-style-type: none"> • Clients need to install certain software e.g. Oracle Client on their computers • There could be security and Oracle license issues if users use it through internet/network

Option 3	<ul style="list-style-type: none"> • Remotely accessible through internet anywhere across the world • Thin client, i.e. clients do not need to install any required software (except for a web browser) 	<ul style="list-style-type: none"> • Take longer time to develop (more expensive than other two) • Need to maintain both a database server and a web server •
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We recommend Option 1 to start the project for the short term goal (World Congress 2009). Option 3 would be a appropriate for long term since it needs more resources and time.

Timelines (milestones)

Here is a proposed timeline for the recommended implementation Option 1.

Activity	Time to complete	Remark
1a	October 31, 2008	
1b	November 30, 2008	The table structures and the entity relationships need to be considered the same time.
1c	November 30, 2008	
1d	December 31, 2008	
2a	January 31, 2009	
2b	February 28, 2009	
3a	January 31, 2009	
3b	January 31, 2009	Need to work concurrently with 2a.
3c	April 30, 2009	
3d	May 31, 2009	
3e	May 31, 2009	SQL statements should be developed when the reports/forms are designed.
4	May 31, 2009	It would be deployed right away when the database tables and the forms/reports are created.
5	March 31, 2009	
6	July 2009?	
7	Ongoing	The maintenance is an ongoing activity.

Concerns and Issues

1. Database server host, where will the database be hosted?
2. Who is going to maintain the database?
3. Data synchronization with the individual national forest inventory
4. Funding for the database maintenance and further development

Appendix I Proposed Database Table Structures of the Lookup Tables

Table 1 Country lookup

Field	Field name	Description	Format	Index	Null
1	COUNTRY_ID	Country code used in the database records	Char3	Y	N
2	NAME_ENGLISH	The country name in English	Char50	N	N
3	NAME_FRENCH	The country name in French	Char50	N	N
4	NAME_SPANISH	The country name in Spanish	Char50	N	N

Table 2 Ecosystem Region lookup

Field	Field name	Description	Format	Index	Null
1	ECOREGION_ID	Ecosystem Region code used in the database records	Char3	Y	N
2	ECOSYSTEM	Ecosystem used to define the Ecosystem regions	Char5	Y	N
3	NAME_ENGLISH	The Ecosystem region name in English	Char80	N	N
4	NAME_FRENCH	The Ecosystem region name in French	Char80	N	N
5	NAME_SPANISH	The Ecosystem region name in Spanish	Char80	N	N

Table 3 Land use lookup

Field	Field name	Description	Format	Index	Null
1	LANDUSE_ID	Land use code used in the database records	Char3	Y	N
2	DESC_ENGLISH	The land use description in English	Char50	N	N
3	DESC_FRENCH	The land use description in French	Char50	N	N
4	DESC_SPANISH	The land use description in Spanish	Char50	N	N

Table 4 Ownership lookup

Field	Field name	Description	Format	Index	Null
1	OWNERSHIP_ID	Ownership code used in the	Char3	Y	N

		database records			
2	DESC_ENGLISH	The ownership description in English	Char50	N	N
3	DESC_FRENCH	The ownership description in French	Char50	N	N
4	DESC_SPANISH	The ownership description in Spanish	Char50	N	N

Table 5 Protection lookup

Field	Field name	Description	Format	Index	Null
1	PROTECT_ID	IUNC protection class code used in the database records	Char3	Y	N
2	DESC_ENGLISH	The protection description in English	Char50	N	N
3	DESC_FRENCH	The protection description in French	Char50	N	N
4	DESC_SPANISH	The protection description in Spanish	Char50	N	N

Table 6 Regeneration type lookup

Field	Field name	Description	Format	Index	Null
1	REGEN_ID	Regeneration (stand origin) code used in the database records	Char3	Y	N
2	DESC_ENGLISH	The protection description in English	Char50	N	N
3	DESC_FRENCH	The protection description in French	Char50	N	N
4	DESC_SPANISH	The protection description in Spanish	Char50	N	N

Table 7 Forest management lookup

Field	Field name	Description	Format	Index	Null
1	MANAGE_ID	Forest management code used in the data records	Char3	Y	N
2	DESC_ENGLISH	The protection description in English	Char50	N	N
3	DESC_FRENCH	The protection description in French	Char50	N	N
4	DESC_SPANISH	The protection description in Spanish	Char50	N	N

Table 8 Species list lookup

Field	Field name	Description	Format	Index	Null
1	SPECIES_ID	IUNC protection class code used in the database records	Char3	Y	N

2	NAME_ENGLISH	The species common name in English	Char50	N	N
3	NAME_FRENCH	The species common name in French	Char50	N	N
4	NAME_SPANISH	The species common name in Spanish	Char50	N	N
5	NAME_SCIENCE	The species scientific name	Char 50	N	N

Appendix II Proposed Database Table Structures of the Summary Data Tables

Table 9 Volume, biomass, and carbon within each Ecosystem Region

Field	Field name	Description	Format	Index	Null
1	ECOREGION_ID	Ecosystem region identifier	Char3	Y	N
2	COUNTRY_ID	Country identifier	Char3	Y	N
3	YEAR	The year that the summary data refer to	Num(4,0)	Y	N
4	FORE_VOL_CON	Growing stocking (volume) in coniferous forest land	Num(10,1)	N	Y
5	FORE_VOL_DEC	Growing stocking (volume) in broadleaved forest land	Num(10,1)	N	Y
6	OTWD_VOL_CON	Growing stocking (volume) in coniferous other wooded land	Num(10,1)	N	Y
7	OTWD_VOL_DEC	Growing stocking (volume) in deciduous other wooded land	Num(10,1)	N	Y
8	BIOM_ABOVE	Above-ground biomass in million metric tonnes	Num(10,1)	N	Y
9	BIOM_BELOW	Below-ground biomass in million metric tonnes	Num(10,1)	N	Y
10	BIOM_DEAD	Dead wood biomass in million metric tonnes	Num(10,1)	N	Y
11	CARB_ABOVE	Above-ground carbon in million metric tonnes	Num(10,1)	N	Y
12	CARB_BELOW	Below-ground carbon in million metric tonnes	Num(10,1)	N	Y
13	CARB_DEAD	Carbon in dead wood biomass in million metric tonnes	Num(10,1)	N	Y
14	CARB_LITTER	Carbon in litter in million metric tonnes	Num(10,1)	N	Y

Table 10 Area of forest and other wooded land within each Ecosystem Region

Field	Field name	Description	Format	Index	Null
1	ECOREGION_ID	Ecosystem region identifier	Char3	Y	N
2	COUNTRY_ID	Country identifier	Char3		

3	YEAR	The year that the summary data refer to	Num(4,0)	Y	N
4	LANDUSE_ID	Land use identifier	Num(2,0)		
4	OWNERSHIP_ID	Ownership identifier	Num(2,0)	Y	N
4	PROTECT_ID	IUNC protection classes	Num(2,0)	Y	N
4	REGEN_ID	Regeneration type identifier	Num(2,0)	Y	N
4	MANAG_ID	Forest management type identifier	Num(2,0)	Y	N
5	FORE_AREA	Forest are in 1000 hectares	Num(10,1)	N	N
6	OTWD_AREA	Other wood land area in 1000 hectares	Num(10,1)	N	N

Table 11 Volume by species within each Ecosystem Region

Field	Field name	Description	Format	Index	Null
1	ECOREGION_ID	Ecosystem region identifier	Char3	Y	N
2	COUNTRY_ID	Country identifier	Char3	Y	N
3	YEAR	The year that the summary data refer to	Num(4,0)	Y	N
4	SPECIES_ID	Species identifier	Char4	Y	N
5	VOLUME	Growing stocking (volume) of the species	Num(10,1)	N	Y

Table 12 Biomass and carbon within each Ecosystem Region

Field	Field name	Description	Format	Index	Null
1	ECOREGION_ID	Ecosystem region identifier	Char3	Y	N
2	COUNTRY_ID	Country identifier	Char3	Y	N
3	YEAR	The year that the summary data refer to	Num(4,0)	Y	N
4	BIOM_ABOVE	Above-ground biomass in million metric tonnes	Num(10,1)	N	Y
5	BIOM_BELOW	Below-ground biomass in million metric tonnes	Num(10,1)	N	Y
6	BIOM_DEAD	Dead wood biomass in million metric tonnes	Num(10,1)	N	Y
7	CARB_ABOVE	Above-ground carbon in million metric tonnes	Num(10,1)	N	Y
8	CARB_BELOW	Below-ground carbon in million metric tonnes	Num(10,1)	N	Y
9	CARB_DEAD	Carbon in dead wood biomass in million metric tonnes	Num(10,1)	N	Y
10	CARB_LITTER	Carbon in litter in million metric tonnes	Num(10,1)	N	Y