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APPENDIX 1. REFERENCES AND ADDITIONAL READING

We encourage the readers to consult the following documents for more details on how to develop and implement multipurpose resource inventories.

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APPENDIX 2. ABBREVIATIONS AND ACRONYMS

Abbreviation /Acronym	Meaning
A21	Agenda 21
AHP	Analytic Hierarchy Process – AHP is a multi-criteria decision analysis tool that involves choosing from a number of alternatives based on how well those alternatives rate against a chosen set of criteria. The criteria are weighted by importance to the decision-maker. The overall "score" of an alternative is the weighted sum of its rating against each criterion (Peterson, <i>et al.</i> 1994, Schmoldt, Peterson, and Smith 1994, and Schmoldt, Peterson, and Silsbee 1994).
AIFM	ASEAN Institute of Forest Management
ANOVA	Analysis of Variance
AR/GIS	Active Response Geographic Information System – AR/GIS is a multi-user GIS tool used for place-based negotiations. The tool serves as a linkage between electronic meeting systems and GIS. Meeting participants interact with laptop computers to assess the current status, develop decision criteria, and propose geographically based proposals and scenarios. The GIS simulation models used in the negotiations are site specific. AR/GIS requires the use of a trained facilitator and a skilled ArcView operator (Fox and Faber 1995).
AUM	Animal Unit Month
BC	British Columbia, Canada
BCE	Before Current Era
BPHUT	Badan Inventarisasi Pemetaan Hutan (Forest Mapping and Inventory Organization - Indonesia)
CBD	Convention on Biological Diversity
CE	Current Era
CL	Confidence Limits
COD	Convention on Desertification
CRII	Corporate Resource Inventory Initiative
CWD	Coarse Woody Debris
d.b.h.	Diameter Breast Height
DFID	Department for International Development (U.K.)
d.o.b.	Diameter Outside Bark
d.r.c.	Diameter at Root Collar
DPC	Desired Potential Community
ECE	Economic Commission for Europe
EROS	Earth Resources Observation Satellites
FAO	Food and Agriculture Organization of the United Nations
FAQ	Frequently Asked Questions
FCCC	Framework Convention on Climate Change

Abbreviation /Acronym	Meaning
FNC	Forests National Corporation (Sudan)
FNIC	First Nations Inventory Committee (British Columbia)
FIA	Forest Inventory and Analysis
FP	Forestry Principles
FRA	Forest Resource Assessment
FRAGSTATS	FRAGSTATS is a spatial pattern analysis program for quantifying landscape structure. Two versions of FRAGSTATS exist: one for vector images and one for raster images. FRAGSTATS generates a variety of area metrics, patch density, size and variability metrics, edge metrics, shape metrics, core area metrics, diversity metrics, and contagion and interspersation metrics. The raster version also computes nearest neighbour metrics (McGarigal and Marks 1995).
FVS	Forest Vegetation Simulator – FVS (formerly PROGNOSIS) simulates the future state of primary vegetation (growth and yield). FVS also includes various extensions to represent shrubs, insects, disease, and fire-behaviour. FVS has model variants for throughout the United States. FVS is used in forest planning to predict vegetation through time. Data from FVS are used in Spectrum models. (Teck <i>et al.</i> 1996 and Wykoff <i>et al.</i> 1982).
GIS	Geographic Information System
GOS	Government of Sudan
GPS	Global Positioning System
HEI	Habitat Effectiveness Index
HTML	Hypertext Mark-up Language – The World Wide Web's text-based coding system, as scripting language that is used to write World Wide Web pages. Hypertext allows a document to be linked to an unlimited number of other documents on the Web.
IMPLAN	IMPact analysis for PLANning – IMPLAN tracks regional economic impacts of project, program, and policy decisions. Using input-output analysis, IMPLAN builds profiles of regional economic linkages under different scenarios posed by the analyst. IMPLAN is applicable throughout the United States. An analyst uses it to construct input-output models for any county or groups of counties (USDA Forest Service 1993b).
ICFR	Institute for Commercial Forestry Research (South Africa)
IRG	International Resources Group
ISAF	Istituto Sperimentale per l'Assestamento Forestale e per l'Alpicoltura (Italy)
IUCN	The World Conservation Union
IUFRO	International Union of Forestry Research Organizations.
KPHP	Kesatuan Pegusahaan Hutan Produksk (Production Forest Management Unit - Indonesia)
MAGIS	Multi-Resource Analysis and Geographic Information System - MAGIS is a tactical planning model for planning land management and transportation-related activities on an area or project. The user operates MAGIS in both optimisation and simulation modes. For strategic planning, the user builds MAGIS models for representative projects to test spatial feasibility and other site-specific constraints. The user then applies a better estimate of these constraints to the strategic forest plan model (Zuuring <i>et al.</i> 1995).
MMRC	Mensuration and Modelling Research Consortium (South Africa)

Abbreviation /Acronym	Meaning
MOA	Ministry of Agriculture
MRI	Multipurpose Resource Inventory
NFMA	National Forest Management Act (U.S.A.)
NFS	National Forest System (U.S.A.)
NIJOS	Norsk Institutt for Jord- Og Skogkartlegging (Norwegian Institute of Land Inventory)
NSO	National Statistics Office
NTFP	Non-Timber Forest Product
NWGS	Non-Wood Goods and Services
ODA	Overseas Development Administration (United Kingdom)
P.L.	Public Law
PIP	Pemetaan dan Inventarisasi Partisipatif (Participatory Mapping and Inventory)
PNC	Potential Natural Community
PRA	Participatory Rural Appraisal
PT.IFA	Industries et Forets Asiatiques (Asian Industries and Forests Companies)
RELMDSS	Regional Ecosystem and Land Management Decision Support System – RELMDSS is an integration, analysis, and display tool for the generation and implementation of forest and land use plans. The tool evaluates the effects of various existing or proposed allocations, standards and guides, and treatment schedules related to meeting multiple objectives or desired future conditions across several time periods and scales (Church <i>et al.</i> 1994).
RIC	Resource Inventory Committee (British Columbia)
RICTG	Resource Inventory Co-ordination Task Group (USDA Forest Service)
RHV	Range of Historic Variation
RPA	Renewable Resources Planning Act (United States)
RRA	Rapid Rural Appraisal
SAF	Society of American Foresters
SIMPPLLE	Simulation of Patterns and Processes at Landscape Scales – SIMPPLLE simulates change in vegetative states by using processes (insects, diseases, wildfire) and management treatments. SIMPPLLE addresses only the existing vegetative component of landscapes. Application of SIMPPLLE requires adjusting the vegetation and processes to a specific area (Chew 1993 and 1997).
SMART	Simple Multi-attribute Rating Technique – SMART is another multi-criteria decision analysis tool. In SMART, the user assigns ratings of alternatives directly in the natural scales of the criteria. SMART is more appropriate to use if the user is likely to add new alternatives to the model later. Information on AHP and SMART software can be found on the World Wide Web (WWW).

Abbreviation /Acronym	Meaning
SNAP	Scheduling and Network Analysis Program – SNAP assists in scheduling and transportation planning for resource management projects. For strategic planning, the user builds SNAP models for representative projects to test spatial feasibility and other site-specific constraints. The user then applies a better estimate of these constraints to the strategic forest plan model (Sessions and Sessions 1991).
SPECTRUM	Spectrum is a linear programming model designed to schedule management treatments to achieve ecosystem management, financial, or other goals. Use Spectrum to examine trade-offs and to evaluate alternative management scenarios for strategic planning. Spectrum has the ability to do goal programming. The user enters all data into Spectrum. Analysis requires inventory data and the results of simulation models such as FVS (Sleavin and Camenson 1994, USDA Forest Service 1997).
SRAAD	Sudan Reforestation and Anti-Desertification Project
SSD	Sudan Survey Department
TM	Thematic Mapper
TETF	Terrestrial Ecosystem Task Force (British Columbia)
TITF	Timber Inventory Task Force (British Columbia)
TRIM	Terrain Resource Information Management (British Columbia)
UNCED	United Nations Conference on Environment and Development
URL	Unique Resource Locator - The naming convention computers use to locate pages or documents on the World Wide Web.
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USFS	United States Forest Service
USGS	United States Geologic Survey
VDDT	Vegetation Dynamics Development Tool – VDDT simulates successional pathways and examines the potential effects of disturbance agents on the vegetation (Beukema and Kurz 1996).
VIWG	Vegetation Inventory Working Group (British Columbia, Canada)
WAG	World Agriculture Assessment
WAIS	Wide Area Information Service. The WAIS system is a collection of programs which provide for convenient information distribution over wide area networks).
WCS	Wildlife Conservation Society
WFUD	Wildlife/Fisheries User Day
WSL	World Species List
WWF	World Wide Fund for Nature or World Wildlife Fund
WWW	World Wide Web or more simply, the web. The graphical part of the Internet. A system that allows a user to search for related “pages” across the Internet.
☺	Tip – generally for information only
☺	Tip showing some recommended action
☹	Tip - things to avoid

APPENDIX 3. GLOSSARY

Accuracy – The ability of a method to obtain the "correct" or "true" value. The success of estimating the true value of a quantity. Accurate estimates have low bias and high precision.

Administrative Unit – The basic geographic management area within a land management organization.

Adverse Effects of Climate Change – Changes in the physical environment or biota resulting from climate change, which have significant deleterious effects on the composition, resilience or productivity of natural and managed ecosystems or on the operation of socio-economic systems or on human health and welfare (FCCC).

Anadromous Fish – Fish which are born in fresh water and spend part of their lives in the ocean and then return to fresh water to spawn.

Animal (Deer/Elk) Sign – Indicators of wildlife that include the animals themselves, scat, trails (well used only), tracks, elk wallows, antler rubs, bed grounds, calving areas, mineral licks, or browse.

Aquatic Habitat Types – The classification of instream habitat based on location within channel, patterns of water flow, and nature of flow controlling structures. Riffles are divided into three habitat types: low gradient riffles, rapids, and cascades. Pools are divided into seven types: secondary channel pools, backward pools, trench pools, plunge pools, lateral scour pools, dammed pools, and beaver ponds. Glides, the third habitat type, are intermediate in many characteristics between riffles and pools. It is recognised that as aquatic habitat types occur in various parts of the country additional habitat types may have to be described. If that becomes necessary it will be the responsibility of the regional fishery biologist to describe and define the additional habitat types (Bisson *et al.* 1989).

Arid, Semiarid and Dry Sub-humid Areas – Areas other than polar and subpolar regions in which the ratio of annual precipitation to potential evapo-transpiration falls within the range from 0.05 to 0.65 (COD).

Assessment – The act of officially estimating the value or character of property. It is the process of estimating or determining the significance, importance or value of something.

Attribute – A trait, quality, inherent characteristic, or property describing or belonging to a specific thing or required to describe a variable (such as 'species' and 'height' are attributes of the variable 'tree').

Authorised Use – Specific activity or occupancy, such as ski area, historical marker, or oil and gas lease, for which a special authorisation is issued. Observed from the source document authorising the use.

Bark Thickness – A measure of the thickness of the bark at d.b.h., unless otherwise specified. Radial bark thickness is determined at a level slightly below the d.b.h. to prevent callusing. It is measured from the inside of the cambium layer to the outside of the exterior bark. At least two measurements of bark thickness should be taken in order to obtain an average reading. Avoid areas of abnormal bark thickness (callous, scars, etc.). A bark thickness gauge should be used whenever possible.

Basal Area – The cross section area of the stem or stems of a plant or of all plants in a stand, generally expressed as square units per unit area.

Bed Grounds – Exposed, bare mineral soil areas of 10 to 225 square meters which show persistent use by deer or elk. Generally, bed grounds often occur in stands consisting of an overstory and understory having greater than 70% crown cover. Bed grounds are often observed on cooler, heavily timbered ridge tops, and north slopes. Bed grounds are also areas in which grass/forbs are matted, but these may not be used on a continuous basis.

Benefit – Something that promotes well being.

Bias – Systematic distortion of a statistic as a result of sampling, measurement, or estimation procedures.

- Biological Diversity* – The variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (CBD).
- Biological Resources* – Genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity (CBD).
- Biomass (Tree)* – The oven dry weight of all trees to a minimum d.b.h. of 10 cm, above ground only, and includes main stems, branches, twigs, leaves, and fruits (FRA).
- Bole Top Diameter* – The diameter outside bark (d.o.b.) of the tree stem at a point on the bole above which no merchantable product section exists. See BOLE LENGTH.
- Browse* – New growth on shrubs and hardwood sprouts or conifer seedlings that can be or has been eaten by big game animals.
- Butt Log Grade* – The condition of the bottom log in a sawlog tree, or estimate of potential sawtimber quality for hardwood poletimber.
- Calving Areas* – Areas where cow elk give birth to calves and maintain them during the first few days or weeks. Calving sites are usually associated with upland topographic land types of mid to lower elevations. Habitat characteristics of calving sites include warm exposures, associated benches or areas of gentle terrain, in close proximity to hiding cover and adjacent to succulent forage.
- Canopy Cover* – The percent of a fixed area covered by the crown of an individual plant species are delimited by the vertical projection of its outermost perimeter; small openings in the crown are included. Measured on fixed plots or transects. Estimate in percent (or class group by percent) by *plant species*. May also be computed from *crown width*. If foliage is not present because of seasonal variation or temporary defoliation, visualise the amount of live crown that would normally be present. The sum of the canopy cover across individual plant species may exceed 100% in a given area.
- Canopy Layer* – A roughly horizontal stratum of more or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth. Canopy layers may be distinguished and used to describe the vertical position of a group of trees related to other trees in a stand. A multi-storied forest stand will have a canopy layer associated with each story. Three layers are often recognised for tropical forests – emergents, main canopy, and understory.
- Cation Exchange Capacity* – The sum of exchangeable cations that a soil, soil constituent, or other material adsorbs at a specific pH. Cation exchange capacity is a laboratory analysed value.
- Cause of Death/Injury* – The nominal most obvious cause of death for mortality trees or the most important cause of injury to live trees. To be judged as important, the injury must be serious enough now or in the future to (1) ultimately cause death, (2) predispose the tree to fatal attack by another agent, or (3) significantly reduce diameter or height growth.
- Caves* – Underground chambers that are open to the ground surface. These also include chambers in cliff faces or rock outcroppings.
- Channel Depth* – The average depth of channel from mean high water mark to mean high water mark. Used to define STREAM TYPE, instream flow calculations, and riparian management. Measured in the field or from maps or aerial photographs.
- Channel Stability Rating* – A rating of a stream channel's resistance capacity to the detachment of bed and bank materials.
- Channel Substrate* – The composition of the channel substrate (stream channel bed materials). Categorisation of substrate is accomplished by visual analysis or by sieving samples obtained by the manual or freeze core sampling methods. Visual categorisation of the surface is usually adequate for basic habitat analysis.

Channel Roughness – A channel roughness coefficient (Manning Coefficient: symbol, n) used in the equation proposed in 1889 by Manning to determine stream flow velocity (Barnes 1967).

Channel Gradient – The slope of the stream channel expressed on a percent of rise per unit length. A measure of the drop in water surface elevation per unit length of channel. Used in model building, channel hydraulics and flow response water yield, water use, instream and flood hazard. Measure channel elevations for a representative channel length. Channel gradient is an important variable in regulating stream velocity. Stream gradient is the difference in water surface or streambed elevation of two study sites on a stream divided by the distance between the study sites.

Channel Entrenchment – A measure of channel confinement and entrenchment of the channel within a valley. Used to define STREAM TYPE, riparian management, flood forecasting, etc. Categorisation of the entrenchment and confinement is accomplished by visual analysis or by aerial photos.

Chemistry, Atmospheric – The chemical composition of ambient air. Ambient levels of fine particulates in the size ranges Total Suspended Particulate, less than 10 microns and less than 2.5 microns and ozone.

Chemistry, pH Dry Deposition – The pH of particles and aerosols deposited at the surface.

Chemistry, pH Wet Deposition – The pH of precipitation.

Chemistry, Snowpack – Chemical composition of undisturbed accumulated snow.

Chemistry, Water – This variable includes all the chemical constituents of water, including BOD, DO, nutrients, trace metals, and other organics and inorganics. Used to measure and evaluate suitability of water for various beneficial uses.

Classification – The process of assigning objects to categories based on their natural affinities to one another.

Cliffs – Steep vertical or overhanging faces of rock.

Climate Change – A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (FCCC).

Climate System – The totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions (FCCC).

Climate Type – The classified prevailing weather condition of a region.

Comparability – The ability to combine data collected from different methods, from different locations, or different instruments.

Completeness – The amount of valid, useful data points that a method provides.

Co-ordinated Inventories – Data collection efforts by different sectors but done so effectively. Collecting information needed by a number of resource functions co-ordinated either spatially or temporally or both.

Correction – The analysis and interpretation of data quality information collected during prevention, assessment, and appraisal to modify any aspect of the measurement process to ensure data quality requirements.

Cost Effective – Achieving specified outputs for objectives under given conditions for the least cost or maximising outputs or their precision for a specified cost.

Criterion – A category of conditions or processes by which sustainable forest management may be assessed. A criterion is characterised by a set of related indicators which are monitored periodically to assess change.

- Crown Class* – The relative position of the tree or shrub crown with respect to competing vegetation surrounding the tree or shrub. Crown class for each tree or shrub is judged in the context of its immediate environment; that is, those trees or shrubs which are competing for sunlight with the subject tree. Differentiation into crown classes is intended for application in even-aged stands and within small even-aged groups in which trees of an uneven-aged stand are often arranged. Although crown classes were originally conceived to classify trees in even-aged or storied stands, they can be a useful descriptor of competitive status of trees in all structural types of stands. Crown class is essentially a classification of competition for light and is aimed at separating trees that are growing freely from those that are not. It designates trees or shrubs with crowns of similar development and occupying similar positions in the crown canopy. This is an ocular classification of trees or shrubs based on dominance in relation to adjacent trees or brush as indicated by crown development and amount of sunlight received from above and on the sides.
- Crown Closure (Cover)* – The percentage of the ground covered by a vertical projection of the outermost perimeter of the natural spread of the foliage of plants. See also CANOPY COVER. Used to map and stratify stands of vegetation and as a measure of protection of a site or stream. Use a line intercept or observe on a plot or area basis. Size and number of plots and/or length and number of line intercept transects vary according to the kind of vegetation measured and the precision required. May be also estimated from aerial photographs or other remotely sensed images. Small openings in the canopy are included. The total coverage on an area may not exceed 100%. Overlapping plants are only counted once. Crown closure above streams requires special techniques. A concave spherical densitometer model B is used on permanent points to estimate relative crown closure.
- Crown Foliage Density* – A visual index of the amount of foliage per unit of crown. Used to calculate foliage structure and a measure of the severity of defoliation and disease.
- Crown Form (Shape)* – The configuration crown of a standing tree or shrub. Used to model vegetation structure and to determine foliage volume and percent growth cover by height.
- Crown Length (Depth)* – The vertical distance from the top of the leader to the base of the crown, measured to the lowest live branch-whorl with live branches in at least three quadrants, and continuous with the main crown. This information is used to develop horizontal-vertical profiles and biomass estimates. Crown length is used in a number of growth and yield simulation models. Irregular crowns must be ocularly "adjusted" to estimate the corresponding position of the base of a normally formed crown of the same volume.
- Crown Ratio* – The percent of the compacted portion of the tree bole or shrub supporting green, live, healthy foliage when compared to the total length or height. Used to develop horizontal-vertical profiles and phytomass estimates, estimate relative vigour of tree species, and some growth and yield simulation models. Crown ratio is usually ocularly estimated but may be calculated. Ocularly transfer lower branches to fill in large holes in the upper portion of the tree until a full, even crown is visualised. Compressing the crown because the crown appears sparse is not appropriate. Do not compact branches to form an unnaturally dense crown.
- Crown Width (Diameter)* – The span of the crown of a tree or shrub. Used to determine foliage area, foliage structure, and phytomass. Also, useful in studies of competition. First measure the maximum crown width through the plant centre. Measurements can be made using a tape or poles. Measure through the geographic centre of the plant if multi-stemmed. Then measure the "minimum" crown width at a right angle to the maximum crown width. Finally, average the maximum and "minimum" crown widths and record this as the crown width.
- Crown Volume Percent* – The percentage of a given space occupied by live foliage. Used for phytomass estimates, calculation of foliage structure, vegetation classification foliage stratum volume and space occupancy. Usually an ocular estimate, but may be computed from *crown length*, *height to crown*, *canopy cover*, and *crown foliage density*. Assess all or a portion of each individual plant occurring within the plot from both the horizontal and vertical standpoint. Without compressing or packing the foliage, try to put an imaginary box around each plant. Add all the space taken up by all the plants in a zone and express this as a percent of the total volume in the plot.

Cultural Sites – Areas showing the presence of indicators of cultural resources. These may include chips/flakes of chert, trails, shelters, cabins, homesteads, good or likely camping areas, springs, telephone lines/insulators, tree blazes, charcoal lenses in cutbanks, chert outcrops. Root wads and rodent burrows/gopher mounds are good places to look.

Data Element – A basic unit of information built on standard structures having a unique meaning and distinct units or values.

Database – A collection of interrelated data, often with controlled redundancy, organised according to a scheme to serve one or more applications. The data are stored so they can often be used by different programs with little or no restructuring or reorganisation of the data. A successful database is one that provides the principal users and stakeholders with the economic, social, and environmental information that they need to make sound and timely decisions and in formats they understand and use.

Depth to Mottling or Water – Mottling is the occurrence of small spots of color which contrast with the general matrix color of the soil. These spots of color, or mottles, commonly appear as small spherical splotches. Mottle colours are either: (1) grey on a matrix subsoil color of yellowish-brown, or (2) reddish-brown on a matrix subsoil color of grey or greyish-brown. The shorter the depth to mottling, the more poorly drained the soil. Measure and record to the distance from the base of the organic layer to the highest point that obvious mottling is observed in the soil and to standing water in soil bore hole, if present.

Depth to Bedrock or Restriction – The vertical distance from the mineral soil surface to unbroken solid rock or restriction. Measure and record the depth of the soil beginning at the base of the organic layer (O layers), to bedrock (lithic contact, R horizon).

Deforestation – The removal of tree cover and change of land use to non-forestry purposes. Deforestation, in itself, may not necessarily be undesirable. The clearing of land for agricultural purposes, for example, may be needed and may justify deforestation.

Desertification – Land degradation in arid, semiarid and dry sub-humid areas resulting from various factors including climatic variations and human activities (COD). Desertification is the continuous and sustained decline in the amount and quantity of biological productivity of arid and semiarid lands generally stimulated through land-use practices such as deforestation, devegetation, over-grazing, and cultivation.

Detrimental Soil Disturbance – The condition where established threshold values for soil properties are exceeded and result in significant change.

Devegetation – The removal of vegetation and exposure of bare soil throughout at least one growing season. Both deforestation and devegetation may lead to desertification.

Diameter, Basal (Diameter at Root Collar) – The straight line passing through the centre of a cross section of a bole measured at the root collar of a shrub or tree. Used for calculation of total phytomass and volume of shrubs or deliquescent trees.

Diameter, Stump – The diameter of a tree inside or outside bark at stump height. Used to determine d.b.h. for cut trees and to develop volume equations for uncut trees. Use in conjunction with *stump height*.

Diameter at Breast Height (d.b.h.) – Tree d.b.h. is outside bark diameter at breast height. Breast height is defined as 1.37 m above the forest floor on the uphill side of the tree. Note that the location of tree d.b.h. varies by jurisdiction. In some places it may be 1.3 m above the forest floor and in others 1.37 m. For the purposes of determining breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

Domesticated or Cultivated Species – Species in which the evolutionary process has been influenced by humans to meet their needs (CBD).

Down Material Condition – The deterioration of state trees lying on the ground or across a stream. Used for the determination of wildlife habitat potential and fire hazard.

Drought – The naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems (COD).

Duff – Fresh or partly decomposed organic material on the surface of the mineral soil, including needles, leaves and twigs. These materials usually form an intertwined mat whose depth can be determine.

Ecological Status – The degree of similarity between the present community and the potential natural community on a site. Ecological status is rated irrespective of management objectives. Ratings are based on the floristic similarity of the current vegetation to the potential natural community. The similarity can be expressed on a relative scale ranging from zero to 100 with adjective ratings assigned as low, moderate or high similarity.

Ecological Type (Habitat Type) – A category of land having a unique combination of potential natural community; soil, landscape features, climate, and differing from other ecological types in its ability to produce vegetation and respond to management. Classes of ecological types include all sites that have this unique combination of components with the defined range of properties.

Ecological Unit – The map unit developed for an *ecological type* or types. This unit often includes a complex of small and intricately associated ecological types too small to delineate separately.

Ecosystem – A dynamic complex of plant, animal and micro-organism communities and their nonliving environment interacting as a functional unit. A dynamic complex of plant, animal, fungal and micro-organism communities and the associated nonliving environment with which they interact. The interacting system of a biological community and its nonliving environment; a biological community, together with its environment.

Ecosystem/Cover Type – The native vegetation ecological community considered together with nonliving factors of the environment as a unit and, the general cover type occupying the greatest percent of the stand location.

Effective Rooting Depth – The depth of the soil that accounts for 80 percent of the roots. These data will help to identify the presence of a water table or hardpan or other root limiting layers, which severely restrict site productivity. Measure and record the depth of the soil beginning at the base of the organic layer (Oi, Oe, and Oa), to the level that accounts for 80% of the roots in the soil pit.

Elk Wallows – Disturbed areas present during the rut and in moist areas. Wallows are used primarily by mature rutting bulls and may also be associated with antler rubbing on nearby trees. Bulls dig up moist ground with front hooves and will also "horn" the ground with antlers. Wallows are used by the bulls to spread mud and urine over their body and thus wallows receiving use will likely smell of urine.

Embeddedness – A rating of the degree that larger substrate particles (boulder, rubble, or gravel) are surrounded or covered by fine sediment. A parameter used in model building and monitoring. Embeddedness measures the amount of surface area of the larger particles (boulder, rubble, or gravel) that are surrounded or covered by fine sediment. This aids in evaluation of the channel substrate's suitability for spawning and egg incubation, and as habitat for aquatic invertebrates and young overwintering fish (Platts *et al.* 1983).

Emissions – The release of greenhouse gases and/or their precursors into the atmosphere over a specified area and period of time (FCCC).

Erosion Severity – The degree of erosion taken place on the site. Indicate the class of eroded soils including whether eroded by wind or water.

Ex-situ Conservation – The conservation of components of biological diversity outside their natural habitats (CBD).

Fire Evidence – Any visible evidence of fire, including charred logs/trees/stumps/soil surface debris.

Fisheries Classification – Water bodies and streams classed as having either a cold water or warm water fishery (USDA Forest Service 1989).

Forage Utilisation – The proportion of current year's forage production that is consumed or destroyed by grazing animals. Forage is all browse and herbage that is available and acceptable to grazing animals.

Forest (Tree Land) – Land with tree crowns (or equivalent stocking level) of more than 10 percent and area of more than 0.5 ha. The trees should be able to reach a minimum height of 5 m at maturity in situ. May consist of either closed forest formations where trees of various stories and undergrowth cover a high proportion of the ground, or of open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 percent. Young natural stands and all plantations established for forestry purposes which have yet to reach a crown density of 10 percent or tree height of 5 m are included under forest, as are areas normally forming part of the forest area which are temporarily non-stocked as a result of human intervention or natural causes but which are expected to revert to forest. Includes: forest nurseries and seed orchards that constitute an integral part of the forest, forest roads, cleared tracts, firebreaks and reserves and other protected areas such as those of special environmental, scientific, historical, cultural or spiritual interest, windbreaks and shelterbelts of trees with an area of more than 0.5 ha and a width of more than 20 m. Rubber plantations and cork oak stands are included. Excludes lands predominantly used for agricultural practices (UN-ECE/FAO 1997).

Forest Floor (Litter) And Humus – The freshly cast (Oi), partly decomposed (Oe), and fully decomposed (Oa) vegetative material on the soil surface.

Forest Type – A category of forest defined by its vegetation, particularly composition, and/or locality factors, as categorised by each country in a system suitable to its situation.

Fuel Model – Mathematical descriptions of fuel properties (such as fuel load and fuel depth) that are used as inputs to calculations of fire danger indices and fire behaviour potential.

Fuel Moisture – The extent to which fuel will burn is largely determined by the amount of water in the fuel. Fuel moisture is a dynamic variable controlled by seasonal, daily and immediate weather changes. Fuel moisture is used for the development of fire prescriptions, for estimating expected fire behaviour and for calculating fire danger indices. Fuel moisture, expressed as a percent, is computed from the weight of contained water in fuel divided by the oven dry weight of the fuel.

Genetic Resources – Genetic material of actual or potential value (CBD).

Genetic Material – Any material of plant, animal, microbial or other origin containing functional units of heredity (CBD).

Geologic Formation – A mappable body of rock identified by distinctive characteristics, some degree of internal homogeneity, and stratigraphic position. The name normally consists of two parts. The first is the name of the geographic locality where the formation was first identified and described. This is followed by a descriptive geologic term, usually the dominant rock type. General use is to provide a common reference for a "time-lithologic" unit used in mapping.

Geologic Hazards – A natural condition that poses some risk to human health or safety. Used to identify lands that may require special management to protect human safety or capital investment.

Geologic Time Unit – A division of time traditionally distinguished on the basis of observable changes in world-wide life forms as represented in the fossil record in sedimentary rocks.

Goods – Things that are useful, beneficial, and has intrinsic value. Things that have economic utility or satisfy an economic want. *Forest goods* include all flora and fauna, mineral, and water resources occurring on or originating from the forest. The use of the term *goods* implies that the resources will be used for

economic needs and includes direct consumption, barter, and gift exchanges as well as buying and selling in the market place. The resource will be consumed directly or used for economic needs.

Greenhouse Gases – Those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation (FCCC).

Ground Water Aquifers – A geologic formation that is sufficiently permeable to conduct ground water and has the potential to yield economically significant quantities of water to wells and springs. Used to identify areas important to the proper management, including protection of quality and quantity, of the ground water resource. Recorded from drill logs.

Habitat – The place or type of site where an organism or population naturally occurs (CBD).

Height Growth – The increase in height over five years or the period between measurements. Compute by subtracting previous height from current height on remeasurement plots or measure internodes if the species is suitable and the situation allows (USDA Forest Service 1989).

Height to Crown, Compacted – The vertical distance in feet from the ground to the base of the compacted live crown. Use to compute *crown ratio*. Measure from the ground up to the point where live, clustered, green branch material is found. Disregard single limbs or forks below the main crown.

Height to Crown, Uncompacted – The vertical distance in feet from the ground to the base of the live crown, measured to the lowest live branch-whorl or lowest live branch excluding epicormics. This information is useful for determining browse availability, crown phytomass, and foliage structure. Measure up to the point where the first live limb is found.

In-situ Conditions – Conditions where genetic resources exist within ecosystems and natural habitats, and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties (CBD).

In-situ Conservation – The conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties (CBD).

Indicator – A measure (measurement) of an aspect of the criterion. A quantitative or qualitative variable which can be measured or described and which when observed periodically demonstrates trends. Key actions, functions, elements, or objects which, by virtue of their physical, biological, economic, or organizational attributes, are so closely associated with the system in which they are found as to be indicative of the state or trends (improvement or deterioration) of the system (Weber 1991).

Instream Cover – The amount of vegetation and organic debris within a stream channel capable of providing protection for fish (Platts *et al.* 1983).

Integrated Inventories – Data collection efforts designed to link multi-sectors, data collectors, and decision levels over time (Lund 1986). Data collection efforts may be separate, but are designed and implemented so the resulting information can be brought together. An inventory or group of inventories designed to meet multiple needs for information. Integrated inventories are planned as a whole and the various functions rely on one another.

Inventory (Survey) Unit – The land unit containing the population of objects or attributes for which information is to be summarised and analysed. For national assessments and land and resource management planning, the inventory unit is usually the planning area, Forest, or State. For local projects or other planning needs, the unit may consist of any area of land such as grazing allotments, compartments, watersheds, lakes, 10 hectare, or discrete vegetative stands.

Inventory – An accounting of goods or services on hand. An inventory may establish a baseline for monitoring. We conduct inventories to provide decision-makers with the information they need to secure or maintain a healthy and sustainable flow of goods and services for the people they represent.

Internet – A world-wide “networks of computer networks” presently connecting more than 40,000 networks and 40 million users. Common applications include electronic mail.

Land – The terrestrial bio-productive system that comprises soil, vegetation, and other biota, and the ecological and hydrological process that operate within the system (COD).

Land Cover – That which overlays or currently covers the ground, especially vegetation, permanent snow and ice fields, water bodies, or structures. Barren land is also considered a ‘land cover’ although technically it is lack of cover. The term land cover can be thought of as applying to the setting in which action (one or more different land uses) takes place.

Land Degradation – The reduction or loss, in arid, semiarid and dry sub-humid areas, of the biological or economic productivity and complexity of rain-fed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or a process or combination of processes, including processes arising from human activities and habitation patterns, such as: soil erosion caused by wind and/or water; deterioration of the physical, chemical and biological or economic properties of soil; and long-term loss of natural vegetation (COD).

Land Use Class – The predominant purpose for which an area is employed.

Landforms – Any physical feature of the earth's surface having a characteristic, recognisable shape and produced by natural causes. A criterion to be used in determining the capability and suitability of lands to produce resources and accommodate management activities.

Lithologic Unit – A system of rock classification based on manner of origin, composition, and texture (or grain size).

Macroinvertebrate Biotic Condition Index – An index that compares the tolerance or sensitivity to pollution of an existing community of macroinvertebrates, to the predicted potential tolerance of a community in undisturbed conditions for a given stream. An indication of macroinvertebrate community tolerance which reflects the condition of the aquatic ecosystem. Used in model building and monitoring.

Map Unit – See Sampling Unit.

Mapping – The process of determining and graphically portraying the distribution of variables in geographic relation to one another.

Market – The number of potential customers which have in common one or more easily identifiable characteristics that affects their wants. A market results whenever the forces of supply and demand operate.

Mass Stability – The existing condition of the soil mantle related to the potential for land mass failure such as landslides, mud flows, and debris slides.

Mean Water Depth – A measure of the average vertical height of the water column from the existing water surface level to the channel bottom. A parameter used in model building and monitoring. Depth is the vertical height of the water column from the existing water surface to the channel bottom. Depth is measured along each cross section at five locations: the two margins, and one-fourth, one-half, and three-fourths of the width across the stream or habitat unit. The total of the measurements is divided by a five, even when depth is zero at one or both margins (Platts *et al.* 1983).

Mineral Licks – Exposed soil and/or rock used by animals (such as ungulates) as a mineral source. Likely will occur in moist areas such as seeps, and the immediate area will probably be tracked up. Rocks may be somewhat smoothed from licking.

Mineral Resource – A known or undiscovered concentration of naturally occurring solid, liquid, or gaseous material in or on the Earth's crust in such form and amount that economic extraction of a commodity from the concentration is currently or potentially feasible.

Mistletoe Infection Rating – The relative abundance of mistletoe in the crown of a tree or shrub (Hawksworth 1977).

Mixing Height – The height above the surface (m) defining a boundary layer, within which pollutants are free to mix.

Modelling – The development of formulas that predict the variables found under certain conditions or predict responses to natural or human-induced disturbances.

Monitoring – The periodic and systematic measurement and assessment of an indicator to detect changes in resources or environmental trends. The process of detecting change over time with the intent of recommending management adjustments if needed.

Most Hazardous Pest – The principal natural agent operating in the vicinity of the sample point, which presents the greatest threat to realising stand goals of stocking, growth and structure.

Multi-product Inventory – A cataloguing or listing of geographic areas for different commercial commodities, for example, an inventory of forest land for commodity products such as timber, pulp, and fuel wood or non-timber products such as edible plants, nuts, medicinal plants, genes, floral products, animal and animal products, fodder, cork.

Multipurpose Inventory – A cataloguing or listing of geographic areas for different uses, for example, an inventory of forest land for timber production and for watershed stability.

Multipurpose Resource Inventories (MRI) – A cataloguing or listing of geographic areas for different resources. Data collection efforts designed specifically to meet all or parts of the information requirements for two or more products, services, functions, or sectors such as forestry and wildlife. The objective is to collect the needed information at least cost and present it in such a way so it is available and useful to the maximum number of decision-makers. An inventory designed to describe two or more components of the total resources (1) in a single data collection effort (co-ordinated inventory) or (2) with a sample design which permits the description of two or more resources (integrated inventory).

Odour Type and Concentration – The threshold ambient concentration at which certain pollutants are odoriferous to humans.

Output – The product (goods, services, or on-site use) from forest and rangeland resources.

Ownership – The identification of the legal owner/administrator (Federal, State, Local, Private) on both the surface and subsurface estates.

Overstory – The uppermost canopy layer.

Overstory Canopy Closure – The total canopy closure of the overstory layer, all species included, determined by ocular estimation.

Paleontological Resources – Any remains, trace, or imprint of a plant or animal that has been preserved in the Earth's crust since some past geologic time.

Parameter – A quantity (as a mean or variance) that describes a statistical population.

Parent Material – The unconsolidated organic and mineral material in which soil forms. Some soils have formed from the weathering of bedrock in place; however, other soils have formed from material that has been transported from the site of the parent rock and redeposited at a different location through the action of glacial ice, water, wind or gravity.

Particle Size – The effective diameter of a particle measured by sedimentation, sieving, or micro metric methods. Particle size distribution is the percent by weight of sand, silt, and clay in a soil sample of a soil horizon excluding coarse fragments. Used for erosion hazard models, soil classification, and moisture holding capacity. Determine percent composition by weight for each size class for specific soil horizons. Use established laboratory procedures.

Partnership – A co-operative effort among two or more survey programs or data sources to which all stakeholders contribute and from which all stakeholders benefit based upon common needs or goals.

Permanent Sample – A plot or transect established and documented so as to permit repeated measurements of the same variables at the same exact places.

Plant Species – The major subdivision of a genus or subgenus of a plant being described or measured.

Plantability – A percent of plantable area for the plot or stand. If there are no obstructions (such as rock outcrops, heavy concentrations of downed woody material, or soil less than 0.5 m deep) to the planting of at least one tree in a quadrant, the quadrant may be considered plantable.

Plot – The earth cover area for which a sample observation or measurement is made.

Pollutant Loading – Amount of pollutants in a unit volume of air.

Pool Quality – A rating of the capability of a pool to provide fish survival and growth requirements. Pool quality estimates the capability of a pool to meet requirements for survival and growth of fish. The rating system requires that direct measurement of the greatest pool width and depth be combined with a cover analysis (Platts *et al.* 1983).

Pool-riffle Ratio – The ratio of the length or percent of pool habitat divided by the length or percent of riffle habitat. To calculate the pool-riffle ratio, sum the length of pool habitat within a stream reach and divide by the length of riffle habitat within the same reach (Platts *et al.* 1983).

Pond – Any standing body of water, either seasonal or permanent, natural or manmade.

Potential Natural Community – The biotic community that would be established if all successional sequences of its ecosystem were completed without additional human-caused disturbance under present environmental conditions. Grazing by native fauna, natural disturbances, such as drought, floods, wildfire, insects and disease are inherent in the development of potential natural communities which may include naturalised non native species. The potential natural community and its environmental characteristics provide a reference standard to which existing serial communities can be related.

Precipitation, Average Annual – The amount of rainfall (or equivalent snowfall) expected in the area over a calendar year.

Precipitation, Hourly – Hourly amount of liquid equivalent precipitation. Precipitation measurements made using a tipping bucket or weighing rain gauge.

Precision – The ability of a method to reproduce the same value within a narrow range. The clustering of sample values about their own average.

Prevention – The major activity that attempts to ensure that "good" data are collected prior to the collection of actual data.

Principal Defect – The most significant defect that reduces *tree volume* and *tree class*.

Product – Anything produced or obtained as a result of some operation of work, as by generation, growth, labour, study, or skill. One may derive products from animal, vegetation, mineral *resources*, or a combination. Thus the term *forest product* is a sub-category of *goods* and *resources*. We may use the resources directly or we may have to do some processing before use. The conversion of plant or animal material into a form suitable for human use constitutes an example of production. Products usually have an economic implication.

Non-timber products – Any from forest lands other than those used for building or structural purposes. Non-timber products may include those parts of trees used for fuelwood, roots, limbs, as well as things that are not woody.

Non-wood forest products – Products which exclude timber and all other potential wood products. This includes large-scale industrial plantations that supply either primary consumer goods or raw materials for further processing using non-wood forest resources (Leakey *et al.* 1996).

Production, Forage – Annual production of herbage, shrubs, woody vines, and trees which may provide food for grazing animals or harvested for feeding.

Property – The quality or trait belonging and especially peculiar to an individual or thing (such as a tree's height).

Protected Area – An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means (IUCN 1994). The World Conservation Union (IUCN) has defined a series of protected area management categories based on management objective as follows. Where the site does not meet the internationally recognised definition of a protected area, application of a management category is not appropriate.

Strict Nature Reserve – Area managed mainly for science. Area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.

Wilderness Area – Area managed mainly for wilderness protection. Large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.

National Park – Area managed mainly for ecosystem protection and recreation. Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.

Natural Monument – Area managed mainly for conservation of specific natural features. Area containing one, or more, specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.

Habitat/Species Management Area – Area managed mainly for conservation through management intervention. Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.

Protected Landscape/Seascape – Area managed mainly for landscape/seascape conservation and recreation. Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.

Managed Resource Protected Area – Area managed mainly for the sustainable use of natural ecosystems. Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

Protocol – A fixed set of rules to specify the format of an exchange of data.

Public Access – An indication if the property is posted or restricted from public use.

Quality Assessment and Appraisal – The activities conducted during data collection (measurement) process that monitor and document data quality.

Radial Growth (Increment) – The increase in tree radius over a period of time (such as 10 years or period between measurements) at breast height or occasionally at the base.

Rangeland – Open expanses of land over which animals (such as livestock) may roam and feed.

Recreation Use – The primary type of recreation use observed in the vicinity of the sample unit.

Recreation Opportunity Class – An assessment of the potential of a site for a range of outdoor recreation experiences from few to many conveniences, such as motor vehicle access, human control.

Relative Humidity – A ratio, expressed in percent, of the amount of moisture in a volume of air to the total amount which that volume holds at the given temperature and atmospheric pressure. Used for developing fire prescriptions, calculation of fire danger rating indices in predicting fire danger, and for making fire behaviour predictions.

Reservoir (Greenhouse Gas) – A component or components of the climate system where a greenhouse gas or a precursor of a greenhouse gas is stored (FCCC).

Resource – An object valued because it is important to an influential group of people, such as government agencies, nongovernment organizations, and it is used and consumed by the public. A source of supply or support. An asset or material used to accomplish a goal or task.

Natural resource – Things occurring in nature that can be used as wealth.

Renewable resource – A resource that will replenish itself over time. This may be in a natural situation or in a plantation.

Resource Inventory – The planning and collection of data for description and analysis of the status, condition, production, or quantity of resources for planning and implementing protection and management activities. Inventories usually include some descriptive data, numeric data, and some means of relating that information to specific geographic locations.

Resources – The elements of supply inherent to an area within the scope of responsibilities and authorities of the agency including lands, soils, timber, forage, water, air, fish and wildlife, aesthetics, recreation, wilderness, and energy and minerals. Natural resources are often divided into two categories, renewable and non-renewable.

Sampling Error – The standard error (square root of the variance) of the sample estimate, expressed either absolutely or as a percentage of the estimate.

Sampling Unit – The basic unit of observation. The inventory unit is divided into sampling units such as a prism point, line transect, a fixed-area plot, or a mapped unit such as a stand. Each sampling unit is regarded as individual and indivisible when the sample selection is made. By knowing the probability of selection, data collected from the sampling unit can be expanded to the inventory unit.

Sawlog Top Diameter – The span of the tree stem outside bark (d.o.b.) at the top of the sawlog length of the bole. Used to determine sawtimber volume. Use relascope, callipers, or other devices to measure the diameter outside bark. Measure to the point on the bole where the sawlog limit occurs. If the sawlog length is taken to the bottom of a fork or the flare from a limb, the smallest diameter immediately below the swell is recorded.

Seeps/bogs – Discharges smaller than springs are called seeps or bogs. Riparian vegetation is a good indicator.

Serpentine – A dark, greenish rock that is usually fairly soft and rather greasy looking in appearance. Many specimens feel soapy because they contain some talc. Plant communities are distinctive where serpentine exists.

Service – A contribution to the welfare of others. *Forest services* include the roles or functions forests play. These may be economical, environmental, ecological, cultural, or political.

Economical Services – The production of goods or products that one consumes directly or sells.

Environmental Services – Functions that maintain or protect the general stability of the landscape. They include such things as watershed protection, soil stabilisation, and carbon sequestration. We can maintain environmental functions naturally or through plantations of many kinds of vegetation. These things are vital to human survival.

Ecological Services – Functions providing of biodiversity and maintaining of ecosystems. Management requires maintaining a naturalness to the forest.

Cultural Services – Include recreation, spiritual uplifting, and just peace of mind in knowing that some wild and natural places exist on Earth. These most frequently take place in *natural areas*, but we can find beauty and recreation in human-influenced areas as well.

Political Services – These are the roles that natural resources play in helping to get people elected or kept in power. Very often our natural resources are political pawns at times of re-elections. People may take a certain stance on natural resources because it looks good rather than because it is ethically or morally the right thing to do.

Shore Depth – A measure of the water depth at the shoreline. The water depth at the stream shore is measured on each cross section at the shoreline or at the edge of a bank overhanging the shoreline. If the angle formed by the bank as it meets the stream bottom is greater than 90 degrees the reading for shore depth is always zero. If the angle is 90 degrees or less, the water column goes under the streambank and the measurement of the shore depth is greater than zero (Platts *et al.* 1983).

Single-function (Resource) Inventory – An inventory describing only one component of the total resource available, such as a stand examination or a timber cruise.

Sink (Greenhouse Gas) – Any process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere (FCCC).

Sinuosity – The ratio of the channel length to valley length. Use for channel classification, fisheries, and channel morphology.

Site Index – Height of a tree at a specified index or base age. Used as an indicator of site quality.

Site Productivity Class – A classification of forest land's inherent capacity to grow crops of industrial wood. The class identifies the potential growth and is based on the age of culmination of mean annual increment of fully stocked natural stands.

Site Tree Quality – A classification of sample tree according to how well the tree reflects the productive potential of the site.

Smolt – A stage of downstream migration for fish such as salmon. Fish are usually 10-15 cm in length and one to two years old.

Snag Condition – A description of the deterioration of a standing dead tree (Thomas 1979).

Soil Bulk Density – The mass of undisturbed or disturbed dry soil per unit bulk volume. The bulk volume is determined before drying to a constant weight at 105° c. The value is expressed in grams per cubic centimetre (g/cc).

Soil Cover – The type of cover on the soil surface.

Soil Drainage Class – Natural soil drainage refers to the rapidity and extent of the removal of water from the

soil, in relation to incoming water. This is especially true of water by surface runoff and by flow through the soil to underground spaces. Soil drainage, as a condition of the soil, refers to the frequency and duration of periods when the soil is free of saturation or partial saturation.

Soil Erosion Type – Soil erosion is the process of removal of soil material by running water, wind or gravitational creep. Factors that affect soil erosion are climate, nature of the soil, slope, vegetation and cultivation practices.

Soil Structure – Structure is described by grade, class and type. Terms are used to describe natural aggregates in the soil called peds in contrast to clods caused by disturbance, fragments by rupture of peds, and by local concentrations of compounds that irreversibly cement the soil grains together.

Soil Texture – Texture refers to the relative proportions of clay, silt, and sand (less than 2 mm in diameter). Clay particles are the smallest, silt particles are intermediate, and sand particles are the largest. Loams contain various mixtures of the three basic particle sizes. Rock fragments in the soil modify textural names depending on size and amount. Stones and boulders on the surface affect use and coverage should be estimated.

Source (Greenhouse Gas) – Any process or activity which releases a greenhouse gas, an aerosol or a precursor of a greenhouse gas into the atmosphere (FCCC).

Species Percent Composition – The percent composition of each species in any given layer of the stand or area. The sum of all percent values within a given layer must equal 100%. Generally obtained by ocular estimation.

Spring – Any surface discharge of water large enough to flow in a small rivulet.

Stand Age – The mean age of the dominant and co-dominant trees in the stand.

Stand Condition – A classification of forest stands based upon the age of maturity and structure of the overstory and understory (Delfs 1986).

Stand History – The kind of disturbance (prior to plot establishment) on the sample location.

Stand Origin – The apparent source of vegetation on the location whether natural, seeded, or planted.

Stand Size Class – A classification of land based on the stocking of all live vegetation of various sizes. This is usually computed from other field data, but it may be estimated in the field.

Stand Structure – A description of the distribution and representation of *stand age* and *stand size classes* within a stand. An ocular classification reflecting the form of the stand rather than its actual composition by age groups.

Stand Year of Origin – Year the stand was planted or created. Determine from historical records where available.

Statistically Valid Design – An inventory design with known probabilities of selection which permits the calculation of sampling error.

Stream Azimuth – Direction of streamflow, looking downstream.

Stream Gradient – The percent slope of the streambed, average for both upslope and downslope.

Stocking Percent – The amount of live trees on a given area in relation to what is considered the optimum. A calculation using either the total number of trees, total basal area, or total volume per unit area divided by the optimum total number of trees, optimum total basal area or optimum total volume for a particular species and management objective, expressed as a percent.

Stratification – The division of an inventory unit into homogeneous subunits to improve the efficiency of the

inventory, and can be used to ensure certain segments of the population are sampled.

Stream Channel-bank Angle – A measure of the angle formed by the downward sloping streambank as it meets the more horizontal stream bottom (Platts *et al.* 1983).

Streambank Undercut – A measure of the furthest point of protrusion of the bank to the furthest undercut of the bank (Platts *et al.* 1983).

Streamflow – Measure of the volume of water passing a given point in a stream channel at a given point in time (Buchanan and Sommers 1969).

Stump Height – The vertical distance from the ground on the uphill side to the top of the stump on cut trees. Vertical distance from the ground to a stump height set by study objectives or local utilisation practice for uncut trees.

Suspended Sediment – Sediment which remains in suspension in water for a considerable period of time without contact with the bottom. Depth integrated water samples are collected. Sediment content is measured in the Laboratory and reported as parts per million or milligrams per litre.

Sustainable Use – The use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations (CBD).

Talus – Dislodged rock fragments that accumulate at the base of steep slopes of cliffs.

Temperature, Water – A measure of water temperature heterogeneity.

Temperature, Ambient – The hourly air temperature of the surrounding area.

Time since Disturbance – The number of years between when the most recent disturbance took place (*stand history*) and the time of plot measurement.

Tolerance – The maximum permissible range of variation in an individual measurement or observation (USDA Forest Service 1989).

Tree – An erect woody perennial having generally one well-developed main stem (except in coppice management systems) and of a species, which is usually capable of reaching a height of 5 meters at maturity in most of its distribution areas (ECE/FAO 1993).

Tree Age: The total age of the above ground stem of the tree in years (not the age of the rootstock or the total age from seed). Total age is usually the annual ring count to the pith of the tree at breast height plus an estimate of the number of years it took the tree to reach breast height. This must be an estimate based on local knowledge.

Tree Class – The overall quality of live trees.

Tree History – A classification of the change in status (living or dead) of a tally tree. Determined by comparing previous status with current status.

Tree Length (Height) – The total span of a tree from ground level along the bole to tip of tree. Height measurements are necessary for access to volume references. Errors in measurements will have a direct effect on final volumes. Total height measurements are used in many growth and yield models, and site estimates are increasingly being based on height-diameter curves and diameter distributions rather than selected individual site trees.

Tree Top Condition – An indication as to whether or not the top of the tree is intact.

Tree Volume – The amount of wood in a tree. It may be gross volume or net volume (gross less defects). For most trees, volumes are computed via existing equations using *d.b.h.* and *tree length*.

Trend – The direction of change in ecological status observed over time.

Turbidity – A measure of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines.

Update – A method used to make inventory estimates current by manipulation of the inventory database through accounting procedures or projection models, or by taking a subsample and estimating the current values for the whole.

Utility – The ability of a good or service to satisfy human wants.

Value – The monetary or relative worth, utility or importance of something. It is the quality of an asset which people think as being desirable, useful, and important. In short, value is the worth of direct consumption or the sum of money a buyer is prepared to pay for a product or service.

Variable – A quantity that may assume any one of a set of values.

Vegetation Density – Number of individual plants of a given species in a unit of area. The relative density of a species is the number of its individuals as a percentage of the total number of individuals of all species in the sample. Count of individuals of a species by plot or transects.

Vegetation Height – The vertical distance from ground level to the top of an individual plant or canopy. Usually measured with ruler, poles, or clinometer. May be done for individual plants or groups of plants.

Visibility Sensitivity – The determination of how rapidly visibility can be reduced.

Visual Quality – Degree of obstruction or contrast degradation of viewing scene due to air contaminants or weather.

Visual Range – The distance at which a large (half a degree) black or a dark object disappears from view. Visual range is normally measured directly using a teleradiometer or indirectly by scanning 35 mm slides of a scene using a scanning densitometer.

Water Flow Velocity – The average velocity of water flowing through a cross-section of a stream. Used in calculating stream flow, engineering design, and almost all evaluations of hydrology, channel morphology and fisheries. Measured in the field by using a velocity meter, surface float, vertical float, or tracer.

Wildlife & Fish Habitat Capability – The ability of a specified area to support a species expressed in terms of numbers of an animal or habitat capability index. Wildlife and fish habitat relationships program models are used to predict habitat capability. For wildlife, the predictive models estimate capability considering vegetation, structure, arrangement, succession, and composition.

Wildlife/Fish/Threatened & Endangered Abundance – The population levels of wildlife, fish, and threatened or endangered (T&E) species for a given geographic area.

Wind Speed – The wind speed at the height of interest (surface, plume height, or upper air). Wind speed may be measured directly or indirectly in any of a variety of ways. These parameters may also be estimated using a power law relationship dependent on height above the surface and the surface wind speed. Direct measurements include the use of sensors on towers, tethered balloons, free rise balloons, constant volume balloons, and aeroplanes. Indirect measurements include the use of Doppler acoustic sodar, Doppler lidar tracking of aerosols and profilers.

Withdrawals – Lands that have been removed or segregated from the operation of some or all of the public lands through Executive or Congressional action.

Windthrow Potential – An assigned low, medium, or high rating. Windfall potential may be considered high where stands are near ridgetops or ridge saddles, near large adjacent openings or harvest areas, where evidence of blowdown occurs near the stand, on extremely shallow soils, in wet areas, or on steep slopes exceeding 90%. A low rating is assigned on flat topography, in areas protected from direct effects of wind, at a low slope position, or when well within a stand. All other locations are rated as medium.

APPENDIX 4. LETTER AND QUESTIONNAIRE FOR MRI SURVEY

INTERNATIONAL UNION OF FORESTRY RESEARCH ORGANIZATIONS WORKING PARTY 4.02 MULTIPLE RESOURCE INVENTORY GUIDELINES PROJECT

12 May 1997

Dear Friend:

As you may know, the International Union of Forestry Research Organizations (IUFRO) Working Party on Forest Resource Inventory and Monitoring is in the process of developing a World Series Report – *IUFRO Guidelines for Designing Multipurpose Resource Inventories*. This work is a follow-up to recommendations made at the IUFRO Monte Verità' Conference on Forest Survey Designs for Non-Timber Resources held in Ascona, Switzerland 2-4 May 1994 and from the International Conference on Multiple Resource Inventory and Monitoring of Tropical Forests held in Seremban, Malaysia, 21-24 November 1994. The project is supported in part with grants and in-kind services from the City of Joensuu, Finland, the European Forest Institute, and the USDA Forest Service.

Multipurpose resource inventories (MRI) are data collection efforts designed to meet all or part of the information needs for two or more products, functions, or sectors - e.g., forestry and agriculture, wildlife and forestry, wildlife and grazing, etc. In theory, MRI should reduce inventory costs and provide more comprehensive and complete information needed by today's land manager.

In order to complete the Guidelines, we are conducting a survey of World Forestry Organizations to learn what kinds of multipurpose resource inventories are being conducted. Would you please take a few minutes to complete the enclosed questionnaire and return it to me in care of the European Forest Institute, Torikatu 34, FIN 80100 Joensuu, Finland? Responses are desired by 15 July 1997. Your contribution will be acknowledged in the final report. Thank you in advance for your kind cooperation.

Sincerely,

H. GYDE LUND
MRI Project Leader

Enclosure

IUFRO 4.02.02 QUESTIONNAIRE ON MULTIPURPOSE RESOURCE INVENTORIES

The International Union of Forestry Research Organizations (IUFRO) Group 4.02.02, the European Forest Institute (EFI), and the USDA Forest Service are developing a proposed IUFRO World Series Volume - IUFRO Guidelines for Designing Multipurpose Resource Inventories. As part of that project we are doing a survey and comparison of existing multiple resource inventories (MRI). For purposes of this survey, *a multipurpose resource inventory is a data collection effort that is designed to meet all or part of the information requirements of two or more resource products, functions or sectors such as forestry and wildlife, forestry and range, and forestry and agriculture.* If you have completed or are conducting such a survey, would you please take a few minutes to answer the following questions? Your contribution will be acknowledged in the Guidelines.

1. Are you conducting multipurpose resource inventories?

If yes, please complete rest of form.

If no and you are interested in receiving information about the IUFRO Guidelines for Designing Multipurpose Resource Inventories once they are complete, please complete part 2 and return.

2. Your Name:

Organization:

Street Address:

City, State:

Country:

Telephone number:

Fax number:

Email:

3. What area is surveyed (geographic location - state, province, country)?

3.1 What is the size of the area (inventory unit) in hectares?

3.2 What is the primary purpose (objective) of the inventory?

Local land management

State/Provincial assessments

International assessments

Other - please specify

3.3 What resources are being surveyed? Check those that apply

Agricultural Crops

Grazing/Range

Non-timber Forest Products, Goods, and Services (fruits, forage, biodiversity, etc.)

Recreation

Timber

Water

Wildlife

Other - please specify

3.4 What attributes are being assessed?

3.5 What groups are involved in the design/ data collection/ interpretation?

3.5.1 Who has leadership, how and why?

3.5.2 How are decisions reached?

4. What is the sample design?

Systematic sample

Stratified sample (what are the strata?)

Enumeration

Remote sensing/mapping based

Other - please specify

4.1 Is remote sensing used?

4.1.1 What type (scale, media) and in what way?

4.1.2 What information is obtained from the remote sensing?

4.2 If field plots are used, what is the plot configuration (fixed area, variable radius, combination, nested plots)? Please describe or provide a diagram with dimensions, etc.

4.2.1 What is the sampling intensity (number of plots established in the inventory unit)?

4.2.2 What data are collected on the plots? Please provide definitions of variables.

5. Were the objectives of the inventory met? If no, why not?

5.1 What are the advantages of the inventory?

5.2 What are the obstacles?

5.3 What are your recommendations for changes?

6. Are copies of the following documentation available? Please enclose copies if possible. If you cannot enclose, how can we obtain copies?

Inventory/monitoring plan

Remote sensing interpretation instructions

Field measurement procedures

Forms for recording data

Glossaries, definitions, standards

Analytical procedures

Final reports on the outcomes or results of the inventories

Please send your responses to the following address NO LATER THAN 15 JULY 1997:

H. Gyde Lund

European Forest Institute

Torikatu 34

FIN 80100 Joensuu, Finland

Tel: 358-13-252-0241, Fax: 358-13-124-393, Email: gyde.lund@efi.joensuu.fi

Thanks in advance for your kind cooperation.

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