

**East-wide
Watershed Assessment Protocol for
Forest Plan Amendment, Revision, and Implementation
December 2000**

The Eastern regions of the USDA Forest Service have jointly developed the East-wide Watershed Assessment Protocol (EWAP), which is a rapid characterization of landscape information based on 5th level watersheds and is designed to enhance Forest Plan decisions.

1. Purpose of this Protocol

The Forest Service is directed to:

- ***“Recognize watersheds in assessment and planning”***¹
- ***“Use a consistent and scientific approach... to assess... watersheds”***²
- ***“Use the results of watershed assessments results to guide planning and management activities”***²
- ***“Make maintenance and restoration of watershed health an overriding priority for future forest plans and provide measures for monitoring progress.”***³

The East-wide Watershed Assessment Protocol (EWAP) has been adopted to meet these expectations and the following requirements of regulations pursuant to the National Forest Management Act (NFMA). Region Eight (R8) and Region Nine (R9) have previously issued guidance related these expectations (R8 1900/2500/2600 August 11, 1998 and 1920 January 14, 2000; R9 1920/2500/2600 April 19 and May 18, 2000 letters):

1. *"The responsible official has the discretion to determine... (ii) Opportunities for the national forests and grasslands to contribute to the restoration or maintenance of ecological sustainability, including maintenance or restoration of watershed function, such as water flow regimes to benefit aquatic resources, groundwater recharge, municipal water supply, or other uses, and maintaining or restoring ecological conditions needed for ecosystem and species diversity" (219.4(b)).*
2. *"To begin the revision process, the responsible official must... (6) Identify specific watersheds in need of protective or restoration measures" (219.9(b)).*

¹ COSR 1999. Committee of Scientists Reports, National Forest Management Act.

² UFP 2000. Unified Federal policy for Ensuring a Watershed Approach to Federal Land and Resource Management Planning FR 65(202):62566-62577

² UFP 2000..

³ USDA-Forest Service Natural Resources Agenda

2. East-wide Watershed Assessment Protocol and the Relationship to Other Watershed Analysis Protocols

The East-wide Watershed Assessment Protocol (EWAP) is a rapid characterization of landscape information based on 5th level watershed (40,000 to 250,000 acres) land units. The initial protocol was developed in R8 during 1999 and evolved through application across a diversity of ecological provinces of the eastern United States. The EWAP establishes watershed health by describing natural and human-caused parameters that reflect watershed condition and vulnerability.

Condition quantifies watershed disturbances (stressors). Vulnerability denotes values at risk that could be changed (positive or negative) as a result of Forest Service management activities. For example, as the number of dams and road crossings (condition parameters) increase, there is an increased risk for adversely affecting aquatic fauna (vulnerability parameters). Watersheds with poor condition and high vulnerability have less integrity relative to those with better condition and lower vulnerability.

The EWAP is designed to enhance Forest Plan decisions. It emulates Ecosystem Analysis at the Watershed Scale (EAWS, Regional Ecosystem Office, 1995), Hydrologic Condition Analysis (HCA, Forest Service and Bureau of Land Management, 1998), and the Index of Watershed Indicators (IWI, United States Environmental Protection Agency, 1997).

Watershed assessments and analyses are an ecosystem inventory and monitoring activity (NFIM; EM-AS-WA). The EWAP approximates the six-step HCA (similar steps in EAWS). The main HCA steps and corresponding EWAP solutions are:

Hydrologic Condition Analysis (HCA)	East-wide Watershed Assessment Protocol (EWAP)
1. Characterize a watershed	Identify multiple 5 th level watersheds that contain NFS lands. Select supplemental parameters that are truly influential across all the watersheds and add to core parameters. Gather pertinent data for all watersheds.
2. Rate factors (qualitative weight)	All parameters weighted equally.
3. Select important factors by watershed	Core parameters are applied to all watersheds.
4. Establish current levels	Current levels are established for all watersheds. This allows for comparison among watersheds.
5. Establish reference levels	Reference is established based on a range of conditions among all watersheds.
6. Identify changes and interpret results	Portray watershed condition and vulnerabilities and provide objective interpretation of results. Summarize salient points that describe health of all the watersheds.

Watershed assessments that are produced by the EWAP differ from HCA, as follows:

1. The EWAP uses existing data for the primary purpose of producing results for forest plan revision and National Environmental Policy Act (NEPA) analyses, whereas HCA and EAWS may collect site specific information for implementation of forest plans and related project NEPA analyses;
2. The EWAP provides information to help address national, Regional, and forest watershed health issues;
3. The EWAP includes a strong biodiversity component;
4. The EWAP considers multiple 5th level watersheds that are assessed at the same point in time;
5. Watershed conditions (stressors) and vulnerability (risks) factors are characterized and the results enable interpretation of relative health and integrity of watersheds and cumulative watershed impacts;
6. Reference levels are relative to the existing conditions amongst the population of watersheds being ranked; they are not inferred;
7. Results, since they are available for all watersheds and are factual and verifiable, may serve as a foundation for agreeing to watershed priorities that are required by the Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management; and
8. Subjectivity is excluded through the use of data and rankings versus the use of value class assignment and opinion ratings (HCA steps 2, 3, and 6).

The East-wide Watershed Assessment Protocol, which is intended for use on 5th level watersheds, is at a finer scale than the IWI, which is applied to 4th level watersheds that are generally larger than 500 thousand acres. Like the Environmental Protection Agency's (EPA) IWI, the EWAP aggregates watershed attributes into conditions and vulnerabilities groups, however, the EWAP includes more factors that may be used at a finer scale than does the IWI. Some factors that the EPA uses as vulnerabilities are treated as conditions by the EWAP. This is due to a difference in definition for condition and vulnerability between the two processes. For example, the EWAP rates dams as conditions, and not vulnerabilities per the IWI, due to the fragmentation and alteration of flow that dams cause. The EWAP places water quality impairment (EPA 305(b) or 303(d)) waters into a vulnerability category because of the dominance of social values in setting water quality standards and the foundation of such standards in the assignment of impairment. The effect of using factors differently (in some cases) than they are used in the IWI does not affect the generalizations reached in the utility of either the IWI or the EWAP.

The direct application of watershed integrity rankings to forest plan analyses and decisions and their use for establishing watershed maintenance and restoration priorities makes the EWAP a powerful and important tool for ecosystem management.

3. Direction For East-wide Watershed Assessment Protocol

Background and Scope

The protocol for this assessment originated in the Southern Region (R8) as a process for characterizing landscape information for Forest Plan revision. The protocol, as described in *Watershed Analysis: Integration Into the Forest Planning Process, 1999*, was used by seven National Forests in R8 with the release of their reports in 2000. During 2000, the protocol was introduced into the Eastern Region (R9), slightly refined, and then utilized by seven National Forests in that Region. The development of this version of EWAP was a product of a joint effort by R8 and R9 and includes refinements to the protocol that were suggested by the participating Forests in both Regions. Participants in developing the EWAP were Jack Holcomb, Alan Clingenpeel, Ray Albright, and Kevin Leftwich of R8, and Harry Parrott and Ruth Ann Trudell of R9.

The protocol presented in this document should be followed on all National Forests in R8 and R9. The watershed assessment reports generated from the 1999 and 2000 versions are sufficient for Forest Plan revision, however there is some benefit in deriving the new parameters as supplemental information.

Objectives

This project provides an assessment of watershed health or condition for the 5th level watersheds (40,000 to 250,000 acres) that contain National Forest System (NFS) lands. This assessment allows a comparison of watershed condition and watershed vulnerability among these watersheds. From this assessment the Forest Planning Teams can:

- Incorporate watershed assessment into the Forest Plan revision process;
- Discuss desired future conditions at the watershed scale;
- Allow a discussion of effects of forest management activities at the watershed level;
- Prioritize watershed maintenance and restoration needs;
- Develop watershed-based riparian management direction;
- Recommend alternative management that emphasizes watershed health; and
- Prioritize where subsequent finer detailed watershed analysis should occur at the next lower scale.

A goal for watershed management in the East is to “save the best and restore the rest” where feasible. This assessment provides a basis for establishing management strategies that will help achieve this goal.

Overview of the Process

The EWAP is a rapid characterization of 5th level Hydrologic Units that are termed watersheds in this document. The assessment process follows a logical sequence that provides the basis for describing the existing conditions within a watershed in an objective and credible format:

- A. Develop set of watershed parameters based on core set and any supplemental parameters;
- B. Assemble pertinent data (appropriate Geographic Information System (GIS) coverages, aquatic information, etc.);
- C. Build database of information for each watershed based on a set of parameters already developed;
- D. Rank the parameter values among watersheds;
- E. Summarize ranks to derive condition and vulnerability scores per watershed; and
- F. Compile results (graphics, data, ranks) into an assessment report.

The assessment process can typically be completed for a Forest within three months. This time period is based on a two-person team working approximately 20 days per person on the project. A central project team is required to develop core databases (approximately 15 days per Forest).

Information from EWAP can be used in the Forest Plan to describe the existing condition and to craft the desired condition. Watersheds of concern should be identified in the “Analysis of the Management Situation” and further tracked through the Forest Plan document. The condition and vulnerability of all the watersheds should be discussed in the effects analysis of the Forest Plan. The results from EWAP may be used to identify relative cumulative impacts as well as identify parameters that control watershed condition and parameters that are most vulnerable within the watershed.

A. Watershed Parameters

The EWAP characterizations are based on parameters that describe the existing physical and ecological conditions within a watershed as well as the parameters that are susceptible to change as a result of Forest Service management activities. These parameters are divided into core and supplemental sets.

Core parameters are mandatory for the process and are arranged into two groups: condition and vulnerability. Condition quantifies watershed disturbances (stressors). Vulnerability denotes values at risk that could be changed (positive or negative) as a result of Forest Service management activities. Watersheds with poor condition and high vulnerability are considered to have less integrity relative to those with better condition and lower vulnerability.

The base data layers shown in **Table 1** are required for data analysis (except for mine sites and mussels) and included in the reports. These layers are not to be included in the ranking step. Forests may supplement this list of base layers with other parameters that are influential across watersheds and meet the data requirements listed in **Step B**. Definitions for the parameters are contained in **Step C** discussion.

TABLE 1. BASE DATA LAYERS FOR EAST-WIDE WATERSHED ASSESSMENT PROTOCOL

Category	Watershed Parameter	Units Expressed	Data Source
Base Data	National Forest Ownership	%	Forest Derived
	Forested land use (excluding water area)	%	EPA - Basins data
Layers	RCRIS Sites	Number	EPA - Basins data
	Superfund, CERCLA Sites	Number	EPA - Basins data
	Permit Compliance System	Number	EPA - Basins data
	Industrial Facilities Discharge	Number	EPA - Basins data
	Mine Sites (Optional)	Number	EPA - Basins data
	Mines Land Use	%	EPA - Basins data
	Urban and Industry Land Use	%	EPA - Basins data
	Agriculture Land Use	%	EPA - Basins data
	Stream and Shoreline Density	%	EPA - Basins data
	Total Fish Species	Number	Forest Derived
	Endemic and/or Native Fish Species	Number	Forest Derived
	Total Mussel Species (Optional)**	Number	Forest Derived
	Endemic and/or Native Mussel Species (Optional)**	Number	Forest Derived
	Hydrologic Modifier Group: Sum of Road Density Rank + Dam Rank	Index ^	Other Ranks
	State Priority Watersheds (Optional)**	Category	State CWAP report

** New parameter to both R8 & R9 assessment versions.

^ Refer to **Table 3** for how this index is derived.

Table 2 shows the condition parameters and vulnerability parameters. These layers are to be included in the ranking step. Forests may choose to supplement the 17 core parameters with those shown to be optional. Definitions for the parameters are contained in **Step C** discussion.

Tables 1 and 2 show some parameters that are listed as optional. Forests may elect to use the parameters if it is determined that the parameter has meaning to the assessment. For example, a Forest may decide to include mine sites as a parameter in the point source group if a preponderance of the mine sites lie within close proximity to a stream. Conversely, if the mines are represented by a scattering of sites, well-isolated from riparian areas or waterbodies, then a Forest may elect to not use the data. Lakes and wetlands are optional since the extent and relevance of these parameters vary greatly across physiographic regions. Forests should consider whether the surface area of lakes and/or wetlands are present within the watersheds or carry significance in the assessment process. Note that Forests must choose to use either a ratio of the native fish species to total fish species and /or endemic fish species to total fish species, dependant upon the availability and completeness of the data.

TABLE 2. CONDITION AND VULNERABILITY PARAMETERS FOR EAST-WIDE WATERSHED ASSESSMENT PROTOCOL

Category	Watershed Parameter	Rank = 1 [^]	Data Source
Condition	Recreation Pressure	Highest Priority	Forest Derived
	Forest Change Detection	Highest Percentage	Central Project Team
	Population Density	Highest Density	US Census Data
	Population Density Change Percent	Highest	US Census Data
	Number Stream Crossings**	Highest Number	EPA-Basins data
	Road Density (exclude water area)*	Highest Number	Tiger Census data
	Dams/Diversions	Highest Number	EPA-Basins data
	<u>Non-point Source Group excluding Forestry:</u> Agriculture + Urban + Strip Mine Land Percent**	Highest Percentage	Sum of percentages
<u>Point Source Group:</u> RCRIS + CERCLA+ PCS + IFD + Mines (mines are optional)*	Highest Number	Sum of point sources	
Vulnerability	Percent of riparian areas*	Lowest Percentage**	EPA-Basins data
	Erodible Soils*	Highest Percentage	EPA-Basins data
	Percent of Watershed in Lakes*(optional)	Highest Percentage	EPA-Basins data
	Percent of Watershed in Wetlands*(optional)	Highest Percentage	EPA-Basins data
	Aquatic PETS Species	Highest Number	Forest Derived
	State Impaired Waters	Highest Number	Forest Derived
	Outstanding Resource Waters	Highest Percent*	Forest Derived
	Municipal Water Supply	Highest Number	EPA-Basins data and/or State data
	Endemic Mussels/ Total Species**(optional)	Highest number	Forest Derived
	Native Mussels/Total Species**(optional)	Lowest Number)	Forest Derived
	Native Fish Species/Total Fish Species*	Lowest Number – either native, endemic or both may be used	Forest Derived
	Endemic Fish Species/Total Fish Species	Highest Number – either native, endemic or both may be used	Forest Derived

[^] Rank = 1 applies to ranking order among watersheds

* New parameter to R8 assessment version.

** New parameter to both R8 & R9 assessment versions

B. Data Requirements

Data used for the assessment should meet the following guidelines to ensure uniformity and replication of the process:

1. Data resolution will be at Forest Planning scale (usually 1:100,000). Finer resolution may be used if the data are available for all the watersheds.
2. Watershed boundaries follow the 5th level Hydrologic Units as defined by the NRCS/ Multi-agency Map. The Forest may choose to redefine some Hydrologic Unit boundaries as long as the watershed retained the 5th level size (40,000 to 250,000 acres). Watersheds where NFS land was inconsequential (e.g., less than 1% of the watershed) may be dropped from the assessment.

- The data must include all (including non-Forest Service) lands within the watershed. Data sources are listed in **Tables 1 and 2**.

C. Database of Information

A data file must be developed that includes the values (percentages, densities, or numbers) for each parameter by watershed. This step will require extensive GIS data manipulation, as well as gleaning data for some aquatic parameters from paper sources (e.g., state lists, books, electro shocking data sheets). See **Tables 1 and 2** for data sources.

As part of the process record it is critical that Forests document all data sources. Data assumptions should be documented as well. In order to rank the parameters, the data must be expressed as a number or percentage. The following **Tables 3 and 4** describe how the individual parameters are derived.

TABLE 3. DERIVATION OF DATA FOR BASE DATA LAYERS

Category	Watershed Parameter	Derivation
Base Data layers	National Forest Ownership	Percent of national forest ownership within the watershed (actual ownership)
	Forested Land Use	Percent of forested land use within the watershed (excluding water area)
	RCRIS Sites	Number of RCRIS sites found in the watershed
	Superfund, CERCLA Sites	Number of superfund sites found in the watershed
	Permit Compliance System	Number of permits found in the watershed for PCS Discharges
	Industrial Facilities Discharge	Number of permits found in the watershed for IFDs
	Mine Sites (Optional)	Number of mines found in the watershed
	Mines Land Use	Percent of mine land use class within the watershed
	Urban and Industry Land Use	Percent of urban, commercial, and industrial area within the watershed (excluding water area)
	Agriculture Land Use	Percent of agriculture area within the watershed (excluding water area)
	Stream and Shoreline Density	Length of stream and shoreline (grids in spatial analyst) to watershed area, including water area
	Total Fish Species	Number of fish species found in watershed
	Endemic and/or Native Fish Species	Number of endemic or native species / watershed
	Total Mussel Species (Optional)	Number of mussel species found in watershed
	Endemic and/or Native Mussel Species (Optional)	Number of endemic or native species / watershed
	<u>Hydrologic Modifier Group:</u>	Add the rankings for dams and road density for each watershed
State Priority Watersheds	Taken from State Clean Water Action Plan priority categories	

TABLE 4. DERIVATION OF DATA FOR CONDITION AND VULNERABILITY PARAMETERS

Category	Watershed Parameter	Derivation
Condition	Recreation Pressure	Index based on recreation pressure table
	Forest Change Detection	Percent of forest vegetation unchanged between 1984 and 1994
	Population Density	1990 Census data found in EPA – Basins data
	Population Density Change Percent	Percent change in population density from 1990 to 1996 – data found in EPA – Basins data
	Number Stream Crossings	Number of road segments that intersect streams and shorelines
	Road Density	Length of roads (grids in spatial analyst) to watershed area, excluding water area
	Dams/Diversions	Number of dams found in the watershed
	<u>Non-point Source Group Excluding Forestry:</u> <u>Point Source Group:</u>	Sum of percentage of agriculture, urban, commercial, industrial land use, and mining within each watershed (exclude water area) Summation of the point sources within the watershed (exclude water area)
Vulnerability	Percent of Riparian Areas	Summation of forested and wetlands along streams and shorelines
	Erodible Soils	Percent of area with a k factor times the square root of maximum slope range that exceeds a threshold value - See discussion in text
	Percent of Watershed in Lakes (Optional)	Percentage of water surface within watershed based on land use data
	Percent of Watershed in Wetlands (Optional)	Percent wetlands within watershed based on land use data
	Aquatic PETS Species	Number of aquatic protected, endangered, threatened, or sensitive plant and animal species in the watershed
	State Impaired Waters	Length of impaired streams (grids in spatial analyst) divided by total stream network in watershed
	Outstanding Resource Waters	Length of ORW streams (grids in spatial analyst) divided by total stream network
	Water Supply Watersheds and Other Source Areas	Number of drinking water sources found in the watershed

Stream network data are available in GIS format from EPA RF3 stream reach data, which is at a scale of 1:100,000. Another source of stream network data may be used if the data are at the same scale or finer, are comparable to RF3 data, and are available for all the watersheds. The stream network data source should be clearly stated in the assessment report.

Calculations by spatial analyst are based on grids rather than arcs. Therefore, density values, such as road, are the number of grids with road segments divided by the total number of grids within the watershed. This number may be slightly different than the density derived by clipping the roads in within a watershed and dividing the total road length to watershed area. At the resolution of this assessment, the difference is not meaningful.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites refer to Superfund National Priority List sites or, simply, “superfund” sites. These are heavily contaminated, toxic areas that the EPA has listed for cleanup. RCRIS sites refer to Resource Conservation and Recovery Information System sites and are hazardous waste sites and solid waste sites (landfills). Permit Compliance System (PCS) and Industrial Facilities Discharge (IFD) are National Pollution Discharge Elimination System (NPDES) permitted discharge sites, meaning that the state allows the entity (i.e., paper mill or manufacturing plant) to release a low level of contaminated water. Together, these are all called point sources of pollution.

Aquatic PETS denotes the number of potentially endangered, threatened, and sensitive aquatic species. Native fish species are those fish that naturally occur within the watersheds of interest.

Land use information comes from the United States Geographical Service land cover data files called GIRAS. Vegetation change information comes from North American Landscape Characterization Landsat Multispectral Scanner Imagery. Vegetation change essentially represents the difference between vegetated and non-vegetated which was interpreted to mean changes between a forested and non-forested condition. Human population data information came from EPA BASINS census data.

Recreation pressure is derived from an index as shown below:

Level of Use		Developed Recreation		Dispersed Recreation	
6	High – Year round	6	Several large sites (possibly day use sites)	6	Extensive trail systems of all kinds, bootleg trails
5	High - Seasonal	5	Over 2 large sites or large state park	5	Several trails of all kinds
4	Moderate – Year round	4	1 or 2 sites (medium sized campground), &/or 1-2 local “hot spots”	4	No more than 2 systems of motorized and/or non-motorized trails
3	Moderate - Seasonal	3	1-2 medium sized sites, no hot spots	3	Either horse/bike trail (no motorized)
2	Low – Year round	2	1-2 small day use sites and/or 1-2 local hot spots	2	Hunting / hiking only, state wildlife mgt. area, wilderness
1	Low - Seasonal	1	Roads only	1	Hunting only
Recreation Pressure Index = Sum of Level of Use + Developed Rec. + Dispersed Rec.					

The erodible soils index was calculated as the percentage of watershed area with a soil erodibility factor (kf) multiplied by the square root of the maximum slope range that exceeded a threshold value. In R9, the threshold values were assigned according to ecological sections, and were assigned to be 0.75 for unit 212 and 1.20 for units 212M and 222. In R8, ecological differentiation was not considered and the threshold value was assumed to be 1.20. Forests should considering selecting a threshold value based on ecological section (e.g., coastal plain). Slope and soil erodibility data were obtained from the USDA NRCS STATSGO coverage at a scale of 1:250,000. This resolution was used since there are no equivalent or better data at a finer resolution.

D. Rank the Parameter Values

A ranking scheme was developed that simply ordered the watersheds by parameter. Other ranking schemes were examined that weighted relative importance of each parameter and/or the level of response per parameter. These ranking schemes are usually very subjective or require arbitrary categorization of the data. The ranking scheme adopted for the EWAP was purposely kept simple and objective.

For each watershed parameter, the watersheds of interest were ranked from 1 to the total number of watersheds (n), based on the ranking order in **Table 2**. For example, if there are 28 watersheds of interest and road density is one of the watershed parameters, the watershed with the highest road density of the 28 would be ranked as 1, the second highest density as 2, and so on, until the watershed with the lowest road density received a rank of 28. In the case of multiple watersheds sharing the same value (i.e., three watersheds having a road density of 4.1), the rankings would be averaged and an adjusted ranking would be added to the spreadsheet.

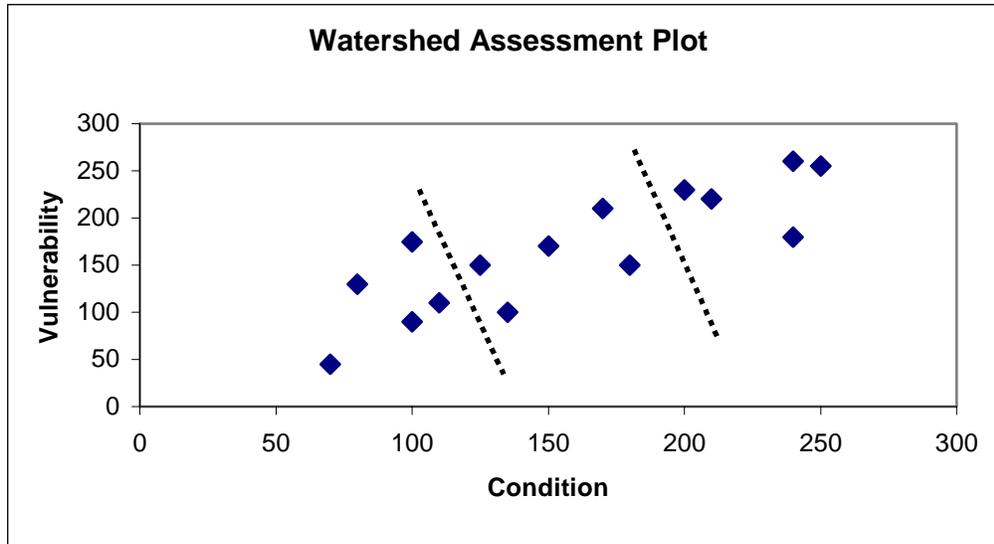
Base layer parameters do not need to be ranked.

E. Summarizing the Ranks

Overall condition and vulnerability scores are obtained by summing the ranks of all condition parameters by watershed and vulnerability parameters by watershed respectively. The relationship between condition and vulnerability may be displayed by graphing the condition per watershed (x axis) and vulnerability per watershed (y axis). This is called a *watershed assessment plot*. The implied assumption is that as the summed scores increase, the watershed condition gets better and the vulnerability lessens.

The overall condition and vulnerability scores can be partitioned to illustrate groups of watersheds. This is accomplished by summing the overall condition and vulnerability scores for a total assessment score per watershed. The total assessment scores can then be sorted and divided into three groups, with the 1/3rd highest scores in the first group and 1/3rd lowest scores in the last group. Those watersheds that fall in the first group can be considered to be in better watershed health than those watersheds in the last group. This grouping of watersheds can be displayed on the watershed assessment plot as well.

An example watershed assessment plot is shown below with three groups:



F. The Assessment Report

This watershed assessment should not be regarded as a final assessment of the status of all the watersheds, but rather, the EWAP should be considered as an evaluation which points towards the need for additional information or follow-up surveys at a finer resolution. Further detailed assessment could be done using HCA, EAWS, or a combination of both.

The EWAP report should begin with a brief introduction to the landscape setting, the objectives of the report, the parameters selected for the assessment, the data sources, a summary of the methodology used for the assessment, and a preface to the results section. Forests should consult already completed reports for format examples, however the format can be adjusted to reflect specific interests of the Forest. The results in the report should be presented in graphic and tabular form. The data values and adjusted ranks for each parameter and each watershed could be listed in an appendix. The majority of the report will be plots or figures that describe watershed condition and vulnerability. Whenever possible, the plots should portray actual value rather than ranks.

Accompanying each plot should be a brief narrative that describes the parameter and highlights the salient information. Most of the plots show the data divided into classes. These classes can be chosen according to natural breaks by the computer program (ARC/VIEW) that created the plots, or by Forest decision.

The report should conclude with a summary page that highlights the most important points derived from the assessment.

4. Application of the Assessment

A. *Land and Resource Management Planning*

Regional Foresters of the Southern and Eastern Regions have each provided guidance and expectations to Forests on watershed integration into land and resource management plans (R8 RO 1900/2500/2600 August 11, 1998, and January 14, 2000; R9 RO 1920/2500/2600 April 19 and May 18, 2000 letters). The intent of both Regions is to facilitate integration into Forest Plans recent national policies and regulations pursuant to the Forest Service Natural Resources Agenda and Strategic Plan, the Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management, and the National Forest Management Act. Watershed health and restoration, watershed assessment, identifying desired future watershed and riparian conditions, and a priority-watershed approach for allocating resources and achieving these conditions are the key elements of national direction. Regional guidance focused on landmarks and major watershed elements for implementing national direction.

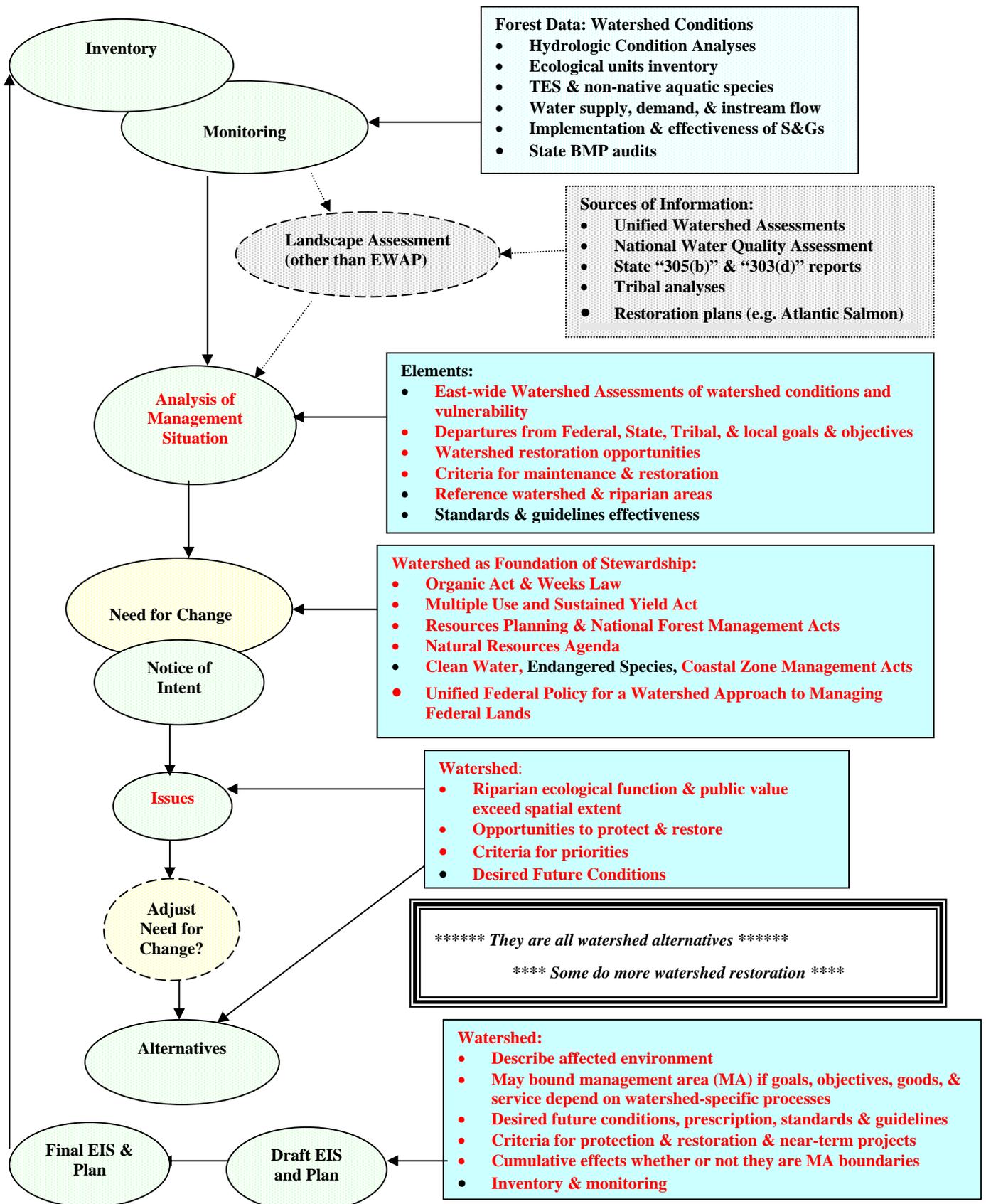
The diagram on the following page illustrates the Eastern Region's guidance.

The Southern Region has completed watershed and regional fauna assessments on southern Appalachian forests during 1999. Regional Forester Estill issued direction in January 2000 (1920) to integrate and display the results of these assessments into Forest Plan revisions. The data are to be the basis of identifying goals, objectives, standards, and guidelines that are unique to individual watersheds. Watershed "conditions, capabilities, and vulnerabilities," as characterized by assessments, will be pivotal in future direction for managing National Forest System lands of the Southern Region.

The East-wide Watershed Assessment Protocol provides a consistent, scientific, and rapid characterization of watershed conditions for the purpose of enhancing Forest Plan decisions. Application of EWAP enables National Forests to efficiently obtain the following information for "analyses of the management situation" pursuant to the National Forest Management Act.

1. Characterize all watersheds with objective data;
2. This characterization includes, but is not limited to, identifying those watersheds that:
 - a. Have a high level of disturbance and those that do not (e.g., fragmentation of riparian corridors, hydrologic modification of watershed processes, increased pollutant loading and discharges);
 - b. Are most affected by Forest Service management and those in which effects are less;
 - c. Are biologically rich and those in which aquatic species are at risk; and
 - d. Have high water quality antidegradation standards and those where water uses have been impaired.

**R9 Forest Plan Revision Landmarks: Major Watershed Elements
And Direct East-wide Watershed Assessment Linkages**



The following outlines the process for incorporating a watershed assessment into the Revised Forest Plans. Specific details regarding this process are available from the Regional Hydrologist, FS Regional Office in Atlanta.

Assumptions

1. This task will require the full participation and involvement of the Forest ID Team. It is critical to have all the resources involved to identify conditions and impacts with the potential to influence watershed conditions and riparian area management.
2. It is recommended to involve the Districts in the process to provide local information and data, and to gain ownership in using the 5th level watershed management direction.
3. There is a hierarchy of desired future conditions, goals, and standards:
 - Forest-wide
 - Management Area
 - Watershed
 - Management Prescriptions

Depending on how the Forest assigned Management Areas, this may add an additional level to the hierarchy, or the hierarchy may collapse into three levels. In the development of watershed direction, desired future conditions, goals, and standards for some of the elements may be elevated to a higher level.

Follow this seven-step process for each 5th level watershed in the watershed assessment.

1. Review information on existing conditions by 5th level watershed. Sources of information include Forest Watershed Assessment Reports, R8 Aquatic Assessment Report, The Nature Conservancy's Rivers of Life Report, any State or other local reports on watershed conditions, local information from Forest (SO, District) sources, and other publications.
2. Summarize and document a general description of each 5th level watershed on the Forest. These descriptions will become a part of the process record and be used extensively in later steps, including the effects analysis. A summary of this description will also be included in the Revised Forest Plan.
3. Identify opportunities to group 5th level watersheds where needed. Watersheds must be adjacent, be similar in conditions, and have similar management schemes. (NOTE: This is not a required step. Only group watersheds where it makes sense to do so.)
4. Develop desired future conditions for each for each 5th level watershed (or group of watersheds), and then develop the desired future conditions for the riparian areas within each 5th level watershed.
5. Given the desired conditions, evaluate the appropriateness of the proposed Management Prescription allocations by 5th level watershed in terms of State designated beneficial

uses, and compliance and compatibility with other regulatory requirements (e.g., Clean Water Act (CWA), Endangered Species Act (ESA), Wild & Scenic Rivers Act (W&SR)). Identify any conflicts and if needed, make any appropriate changes in the Management Prescription allocations.

6. Develop 5th level watershed specific and riparian area specific goals (where they are different from Forest-wide goals and objectives).
7. Develop 5th level watershed specific and riparian area specific standards (where they are different from Forest-wide standards and guidelines). Also identify any 5th level watershed specific monitoring needs.

B. Applying the EWAP to Roads Analysis and Resource Management

Depending on scale, EWAP has application to other initiatives such as the Roads Analysis. The EWAP is designed as a forest-wide assessment (the forest or watershed scales). Many of the Roads Analysis questions occur at the same scale. Using the data from EWAP provides the answers to many of the Roads Analysis questions at the forest-wide scale. At finer scales (project or ranger district), the EWAP can provide information that links the condition or vulnerability of an individual watershed to the project. In addition, the EWAP offers an added value by including non-Forest Service lands within the associated 5th level watersheds.

The table on page 17 shows how the EWAP has application to Road Analysis questions.

Overall, a great deal of information necessary for a Forest-wide Roads Analysis is collected for EWAP. In addition, the EWAP expands the Roads Analysis beyond Forest Service ownership and allows the team to address other concerns that may be found within the watershed.

The EWAP can aid in forest decisions and resource management. The results of EWAP can be tailored to provide information on local issues and at the level of detail that meets the needs of the forest. For example, a local issue may be development or expansion of a motorized trail. The results of EWAP offers a suite of existing conditions such as recreation pressure, non-point source pollution index, impaired waters, and condition of aquatic biota within the watershed from which to build the environmental analysis. The following are some examples of how EWAP can apply to forest resource management (for some items, base layers must be added that are issue-specific):

- Cumulative watershed effects for project planning
- Recreational hot spots of concentrated use that need restoration
- 10% trails and road projects
- Soils of concern on National Forest System (NFS) lands
- Riparian condition on NFS lands
- Linear disturbances (utility corridors, pipelines, etc) in the watershed

The EWAP is most effective when developed and interpreted in an interdisciplinary environment. The base layers can be supplemented to reflect forest issues making the application of EWAP both forest wide and watershed specific.

Roads Analysis Questions	Appropriate EWAP Layers
E1 Ecological attributes	Ecoregions and/or physiographic zones, Aquatic TES, Endemic fish and mussels
E2 Exotics	Introduced aquatic species, TES species, endemics
E3 Control of insects	Road crossings, dams, lakes
E4 Ecological disturbances	Streams, lakes, road crossings, dams, soils
AQ1 Modify hydrology	Stream crossings, dams
AQ2 Surface erosion	Erosive soils, streams and roads
AQ4 Stream crossings	Stream crossings
AQ6 Hydrologically connected	Roads proximal to streams
AQ7 Beneficial uses	Impaired waters (305b), TES fish and mussels, endemics
AQ8 Roads and wetlands	Wetlands from land use and roads
AQ10 Aquatic fauna movement restricted	Road crossings, dams, and species list
AQ11 Riparian communities	Roads, Riparian health from land use
AQ12 Fishing, poaching, and habitat loss	Roads, lakes, roads proximal to streams, stream crossings, TES species
AQ13 Non-native introduction	Introduced species, road crossings
AQ14 Exceptional diversity	Fish and mussel richness, TES species
WP1 Impoundments	Dams, Impaired and Outstanding Resource waters
WP2 Municipal water conflicts	Impaired and Outstanding Resource waters, Drinking water sources
PV1 TES species	Aquatic TES, endemic fish and mussels