Revised Nantahala Pisgah Forest Plan Objections

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National Forests in North Carolina
ATTN: Objection Coordinator
160 Zillicoa St., Suite A, Asheville, NC 28801

Subject: Objections to the Revised Forest Plan for the Nantahala and Pisgah Forests

Responsible Official: Forest Supervisor James Melonas, National Forests in North Carolina, 160 Zillicoa Street, Suite A, Asheville, NC 28801, and Phone: (828) 257-4200.

Objections to Plan Arising from Inconsistencies with Law, Regulation, or Policy

Due to the length and complexity of the Forest Plan the following issues were discovered after the close of public comments and only after hundreds of hours researching the plan, the EIS, and all related documents - well over 2,000 pages and hundreds of referenced sources. The length and complexity of the plan, combined with the authors lack of clarity and consistency in writing create an undue burden on the general public when trying to assess every specific aspect of the plan. Throughout the document the USFS excuses the lack of detail or specific guidelines due to 'landscape level analysis' and resorts again and again to 'site-specific analysis' at the project level to address any potential objection of concern. This is entirely counter to the intent and purpose of the 2012 Planning Rule which intended to increase the clarity and understanding of forest plans and make them more accessible to the general public. The 2012 Planning Rule also created a framework of standards and guidelines giving responsible officials greater authority at the local level to have exceptions based on need. The general meaning and intent of the Rule should be read as 'rule-out by standard' and 'rule-in at the project level' when local needs such

as restoration are carefully considered and applied. All rule-in actions require NEPA analysis and appropriate Best Management Practices. Throughout the Nantahala Pisgah Land Management Plan, the Final Environmental Impact Statement, and related documents and appendices it seems the general thought is to be as unspecific as possible and then make all decisions at the project level. So, as I read the plan - the USFS rules everything in, because the plan is at a 'landscape level,' at first and then gives the vague assurance that what cannot be done (by standard or guideline) will certainly be ruled out later. That contradicts the meaning and intent of the 2012 Planning Rule entirely.

This practice of rule-in first and rule-out later is nowhere more obvious than analysis of riparian management zones which is the basis of my objections.

I am making two objections. Objection (a) is regarding riparian management zones analysis, determination and calculation. Objection (b) is related to the Sustained Yield Limit calculation, and follows from the issues with the riparian analysis but also deals with the manner of how the limit was calculated contrary to the 2012 Planning Rule.

sincerely,

Nicholas Holshouser

Revised Nantahala Pisgah Forest Plan Objections

Objection (a) Riparian Management Zones

Objection Issue: Errors and omissions in analysis and calculation of riparian management zones impact all timber harvest impact analysis, road building, water quality and related environmental consequences in Environmental Impact Statement.

`Text in Menlo (10) typeface regular or` **`bold`** `are excerpted from the Plan, the 2012 Planning Rule, or the Land Management Planning Handbook.`
Objector text in Helvetica Neue (12) typeface regular or **bold**.
Other sources are typically in Times New Roman (10) typeface with footnotes.

Introduction

This issue causes the plan to be inconsistent with law, regulation, or policy.
Sec 219.3, Role of Science in Planning[1]

The issue was discovered after the opportunity to make comments passed. Any plan content which is inconsistent with law, regulation, or policy must be corrected regardless of who identifies the issue or when it is identified. As detailed in this objection, the calculation of riparian management zones is important for analysis of the environmental consequences across a broad range of topics.

- **Plan does not use best available science**

As a result:
- Riparian Management Zones[2] (Streamside zones) are not correct (understated)
- Analysis of Sustained Yield Limit[3] is not correct (overstated)
- Determination of Suitable Lands[4] is not correct (overstated)
- Timber Harvest Summary Values[5] are not correct (overstated)

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[1] https://www.ecfr.gov/current/title-36/chapter-II/part-219/subpart-A/section-219.3

[2] 36 CFR 219.8(a)(3), https://www.ecfr.gov/current/title-36/chapter-II/part-219/subpart-A/section-219.8#p-219.8(a)(3)

[3] 36 CFR 219.11(d)(6), https://www.ecfr.gov/current/title-36/chapter-II/part-219/subpart-A/section-219.11#p-219.11(d)(6)

[4] ibid

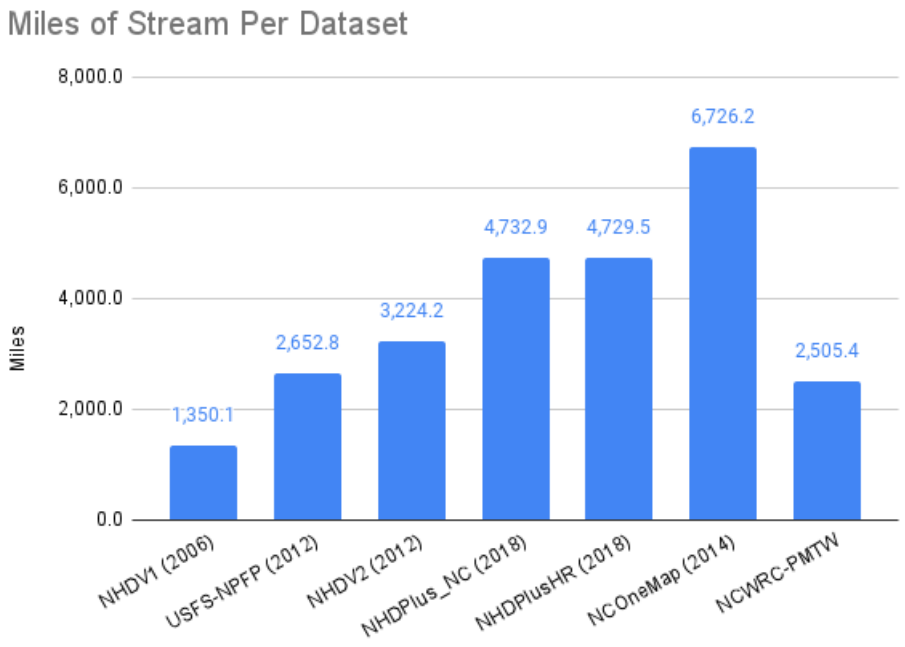
[5] Final Environmental Impact Statement, Section 3.4.10, Table 211, page 3-544

- Various environment consequences may be understated

The identified issues cause the Final Environmental Impact Statement (FEIS) to be inaccurate and therefor not a true statement of the affected environment and environmental consequences of the Land Management Plan of the Nantahala Pisgah Forest Plan.

It is important to state the scope of the errors in order to understand the impact and effect on analysis, calculations, and conclusions in the EIS. Riparian management zones for both perennial and intermittent streams are required per Sec 219.8(3)(ii)[6]. The planning rule sets a standard of 100ft for perennial streams and the Nantahala Pisgah Forest Plan sets a standard of 50ft for intermittent streams. Riparian management zones cannot be included in the Sustained Yield Calculation nor in other timber harvest calculations. All streams must be considered when determining riparian management zones, and only ephemeral streams can be excluded. We can use a single metric to understand the scope of the errors in the analysis. The total miles of mapped streams determines the amount of riparian management zone buffer.

This objection is focused on the hydrography data used and the subsequent methods of analysis used by the IDT. Sec 219.3 demands that the 'best available science' be used. The graph below shows multiple data sets available to the IDT during the time of the analysis. From left to right the x-axis progresses in time and capability



[6] 36 CFR 219.8(a)(3)(ii), https://www.ecfr.gov/current/title-36/chapter-II/part-219/subpart-A/section-219.8#p-219.8(a)(3)(ii)

of the science, spanning a period from 2005-2018. Note that the miles of streams mapped continues to increase as the technology and science to map them improves. The NPFP IDT riparian management zones is based on 2,652 miles of mapped streams. USGS National Hydrography Data (NHD) was available with more than 4,700 miles of mapped streams. The potential difference is very significant.

Per National Environmental Policy Act (NEPA) and related regulations contained in the 2012 Planning Rule and The 1909.12 Land Management Planning Handbook , the EIS must be accurate in order to comply with NEPA requirements for the EIS. As the issue causes the plan to be inconsistent with law, regulation, or policy it should not in any case be only considered if a specific comment was submitted. Any plan content, including especially the EIS, which is inconsistent with law, regulation, or policy or contains errors and omissions must be corrected regardless of who identifies the issue or when it is identified. The errors discussed in this objection are not minor or insignificant. The errors and omissions cited herein cause the riparian management zone analysis to significantly undercount thousands of miles of streams in the Nantahala and Pisgah National Forests. That understatement has ripple effects throughout the EIS, specifically with regards to Sustained Yield Limit, Timber Harvest Analysis, Aquatic Resource Impacts, Fish and Wildlife Impacts, Transportation and Roads Impacts.

Understanding and analyzing the determination of riparian management zones in the NPFP is complex and a non-trivial exercise. All required documents, project records, data, and related source materials are not provided explicitly by the planning team. Significant supporting materials were not published to the planning website and could be obtained only by request. USFS staff cooperated with requests for information used in the analysis but limited contact with the specialists who performed the analysis. To fully understand the process and the inputs has required a significant amount of time[7] and could not have been completed prior to the comment period.

Overview

Errors and omissions in the analysis of riparian management zones are contrary to;

219.3 Role of science in planning. *(emphasis added)*

The responsible official shall use the best available scientific information to inform the planning process required by this subpart for assessment; developing, amending, or revising a plan; and monitoring. In doing so, *the responsible official shall determine what information is the most accurate, reliable, and relevant to the issues being considered*. The *responsible official shall document how the best available scientific information was used to inform the assessment*, the plan or amendment decision, and the monitoring program as required in 219.6(a)(3) and 219.14(a)(3). *Such documentation must: Identify what information was determined to be the best*

[7] Objector has spent hundreds of hours analyzing the data and hundreds of hours ground truthing findings in the forest, checking headwater flows of mapped streams.

available scientific information, explain the basis for that determination, and explain how the information was applied to the issues considered.

Key Points of 219.3 - the responsible official shall…

1. *determine what information is the most accurate, reliable, and relevant to the issues being considered*
2. *document how the best available scientific information was used to inform the assessment*
3. *use the best available scientific information to inform the planning process*

Best Scientific Information Available

The primary source of hydrography science and information is the United States Geologic Survey (USGS). The Environmental Protection Agency (EPA) is a partner science organization with USGS for hydrography.

USGS National Hydrography Dataset used in the analysis was outdated.

The USFS was requested to provide the objector with all spatial data used in the analysis for review. The USFS did provide most of the used data, however the specific USGS Hydrography data used was not provided, therefor the exact version could not be determined. The National Hydrography Data (NHD) data used was possibly based on NHD Version 1. At the time of the analysis the NHD had released Version 2 and NHDPlus Version 2. Per correspondence with Inter-Disciplinary team (IDT) it was stated that the NHD data was taken 'as-of' 2012. That implies the use of NHD V1 data, but perhaps NHD V2. This should have been explicitly stated in the FEIS as part of the documentation of determination of what information is the most accurate, reliable and relevant.

The responsible official shall *determine what information is the most accurate, reliable, and relevant to the issues being considered*

The Final Environmental Impact Statement (FEIS) has sparse information on the specifics of the riparian management zone analysis and the data used. However some facts that are clear from the document.

A dataset was created by overlaying several versions of USGS Website (NHD data) to eliminate mapping inconsistencies and lack of reliability of the flow/stream origin data fields in the NHD. It represents the most current fine scale mapping of streams available to date.[8]

Here, the USFS IDT makes several claims, two of which are emphatically not true.

[8] FEIS, Appendix B, page B-47

The data contained '`mapping inconsistencies`' - the USGS NHD maps are the most accurate spatial representation of the streams and waterbodies of the United States. There can be no argument on this fact - the USGS is the primary and authoritative source of hydrography data and mapping information. The USGS data is not inconsistent, it is consistently improving.

The USFS IDT claimed their dataset 'represents the most current fine scale mapping of stream available to date.' The USFS IDT analysis identified 2,652 miles of streams for riparian management zones. Considering that USGS NHD datasets, available at the time of the analysis, mapped nearly 2,000 more miles of streams it cannot be true that the USFS mapping was 'the most current fine scale mapping', and the USFS offers no proof of that claim. The most current fine scale mapping of the streams and rivers are the NHD products published by the USGS. Several USGS NHD data sets available at the time of the analysis were certainly better.

The attributes of stream flow (perennial or intermittent) and stream order are not always provided by USGS in the NHD datasets (the inconsistency referred to as flow/stream origin data fields). This is not an impediment to using the best data currently available at the time of the analysis however. The USFS IDT does not describe the version or versions of NHD data, only a date is listed making it impossible to determine the exact version or versions used.

(correspondence from IDT, 3-7-22, attached)
Most recent NHD uses inconsistent mapping (disclaimer on USGS website); backed up several versions to improve consistency (2012 NHD) across NP (Nantahala-Pisgah)[9]

There is no citation for the 'disclaimer on USGS website'. The USGS does discuss the the important attribute values of FCode and StreamOrder and notes that these require field checks (ground truthing) in many instances, especially with newest high resolution datasets. But the USGS stands behind their mapping and there can be no argument that flowlines on USGS NHD maps are an accurate representation of the physical geography. Whether a flowline is a perennial, intermittent, or ephemeral stream may require some analysis. The USGS is the best science available. The science shows they exist definitively. Stream flow is often a matter for further analysis and the USFS IDT declined to perform the necessary analysis to actually create 'the most current fine scale mapping' of the Nantahala and Pisgah National Forests. In choosing an earlier version of NHD data the USFS IDT chose the easiest to use not the best available scientific data.

Objector attempted to clarify the NHD source datasets used in the analysis but was not provided that information and the IDT closed off communication with USFS specialists making it impossible to determine the NHD versions used in the analysis.

[9] Correspondence with Jason Rodrigue, USFS Silviculturist, 3-7-22

The USGS NHD data, at each release, is the most accurate spatial data of the hydrology of the United States that is currently available. Version 1 (NHDV1) is not inaccurate, and Version 2 (NHDV2) has improved accuracy. In 2012 the USGS released NHPPlus HR. At the time of the analysis the USGS also had available a hydrology dataset known as NHDPlus which combined multiple datasets to form an even more accurate map of the nations streams and waterbodies.

The IDT did not use 'best available scientific information' nor did they adequately explain their determination that the data they did use was better than more current information available at the time of the analysis. This is a clear conflict with the 2012 Planning Rule Sec 219.3. The attribute inconsistencies they cite are to some extent present in all versions of the NHD data. The attribute inconsistencies do not present a barrier to reasonable analysis, nor does reasonable analysis represent a burden to a planning effort that requires environmental impacts be understood for 20 years into the future. The different NHD data sets are examined in detail later in this objection. The USFS IDT chose the easiest to use dataset not the best available dataset.

In the end, the USFS dataset was the result of manual curation (analysis) and that analysis is also sparsely explained.

The responsible official shall document how the best available scientific information was used.

In the FEIS, Appendix B there is a short summary of how the data was used.

Step 2, Part 1: Riparian and Lake Buffer Areas
The shapefile was generated based on work done by the forest wildlife biologist. A dataset was created by overlaying several versions of USGS Website (NHD data) to eliminate mapping inconsistencies and lack of reliability of the flow/stream origin data fields in the NHD. It represents the most current fine scale mapping of streams available to date. The data was buffered a 100 feet per side for estimations of perennial streams and 50 feet per side on intermittent streams. This is layer is different from the draft EIS data for riparian buffers based on the increase in the stream buffer distance with plan standards for alternative E for intermittent streams (15 to 50 feet). A second layer containing a 100-foot buffer on the shoreline of reservoirs and waterbodies was also created using USGS NHD layers. This shapefile was called NHD_waterbody_buffer100.

The riparian buffer feature class called: StreamBufferRevised (GIS filename)[10]

The statement 'based on work done by the forest wildlife biologist' is not a sufficient explanation. Description of the method of manual curation of the data is not specific, nor was it provided in the EIS. Where other data sources used by the wildlife biologists? Did they reference or use other sources of hydrography data such as the North Carolina Wildlife Resource Commission Public Mountain Trout Waters map?

Objector had to request via email further clarification of the process.

[10] FEIS, Appendix B, page B-47

(correspondence from IDT, 3-7-22, attached)

The NHD is readily available from USGS and can be accessed a number different ways, the best is through their map services. Keeping in mind that USGS intermittent/perennial stream identification was not consistent, so at times we used stream order as a surrogate (e.g. 1st and some 2nd order streams = intermittent, 3+ order streams = perennial).[11]

Stream Buffer Process for Timber Suitability Analysis
(process recaptured by sbryan on 03.07.22)
1. Identify perennial and intermittent streams from USGS NHD
    a. Most recent NHD uses inconsistent mapping (disclaimer on USGS website); backed up several versions to improve consistency (2012 NHD) across NP
    b. Clip to NP ownership
    c. USGS NHD f-codes used to identify intermittent and perennial channels (categorization still inconsistent but improved. NHD is a computer model and has not been 100% ground-truthed)
    i. 46003 = intermittent
    ii. 46006 = perennial
    iii. 46007 = ephemeral
2. Buffer intermittent flowlines by 50' and dissolve into polygon. Calculate area.
a. This was originally done with smaller buffers (15') and updated to include most recent planning framework (50').
3. Buffer perennial flowlines by 100' and dissolve into polygon. Calculate area.
4. Merge buffered intermittent and perennial flowlines into single polygon. Recalculate area.
a. This is what is used in Timber Suitability Analysis (not a spatial process but uses spatial data for the math calculations).
b. This shapefile does not represent what is recognized as streamside forests on the NP—the planning framework is to be applied at the project level, as appropriate.

Here it should be pointed out that the IDT admits that NHD data is 'readily available' from the USGS but they did not, it seems, perform any sanity check of their result based on a review of the different versions available to them at the time. Later in this objection there is just such a sanity check. It shows conclusively that the USFS riparian analysis fails.

Any manual curation/analysis should have a well-defined rubric that can be applied consistently across all the data (the landscape). That rubric should be available in the FEIS for evaluation by the reader. The method 'at times we used stream order' is not a defined process nor decision matrix nor a usable and repeatable rubric. As well, 'e.g. 1st and some 2nd order streams = intermittent' is not definitive and there is no detail or explanation provided of how and when a 2nd order stream might be classified as intermittent. It is an incredible claim to consider that any 2nd order stream in the Nantahala and Pisgah Forests is anything but perennial. A quick visual check of the Stream Buffer GIS data in fact shows many named streams of 2nd order which are marked as intermittent. It was upon observing this that the objector began to question the USFS claim the the maps were the 'most current fine scale mapping'.

[11] Correspondence with Jason Rodrigue, USFS Silviculturist, 3-7-22

The USFS attempts to minimize the effect of their significant understatement of riparian zones by falling back on the excuse 'This shapefile does not represent what is recognized as streamside forests on the NP—the planning framework is to be applied at the project level, as appropriate.' Certainly at the landscape level it is understood that the maps cannot be 100% accurate at fine scale and there will always be project level checks. Those project level checks are, in fact, always required by NEPA. But especially at the landscape level it is critical to have an accurate perspective of the streams to inform subsequent environmental impacts and timber harvest levels. Recall that the suitable base of the forests, as determined per requirement of 2012 219.11 and 1909.12, amounted to 697,7511 acres. The riparian management zones were calculated to be approximately 47,000 acres, leaving 650,000 acres. Riparian zones, as calculated incorrectly, comprise 6.7% of the total lands based on the FEIS analysis. How much error would be insignificant at the landscape level? A review of the hydrography data available at the time of the analysis suggests the calculation may be as little as 1/2 of a reasonable value using better data and a better analysis. In that case the riparian management zones would comprise up to 12-14% of the lands.

It is important to go back to the claim 'most current fine scale mapping of streams available to date' made in Appendix B of the FEIS. The public expects that USFS specialists are experts. The FEIS has a complete list of the IDT and their credentials, highlighting the expertise of the team. The public and the USFS partners have an expectation that the USFS has done due diligence and that their data is reliable and accurate. The public trusts the USFS. That public trust allows the USFS to make such claims that then go un-noticed by the public and the interested partners and organizations..

The claim of 'most current and fine scale mapping' is a significant violation of that trust.

Regardless of when that claim is found to be false the USFS has an obligation to correct their error. Otherwise that trust if forever lost. If the USFS cannot be trusted to analyze the best science, using repeatable and transparent analysis methods, then in every project going forward they will face adversaries not partners. Simply stating that no error is important because riparian zone determination will be made at the project level is insufficient and insincere. If the USFS doesn't care enough about riparian zones in their analysis why should the public expect they will care enough at the project level? What maps will be used by project teams when doing original scoping of projects? At the landscape level missing a few streams may not be important. At the project level a poor map might lead to significant overestimation of timber harvest, and understatement of road requirements, etc… before anyone goes into the field to check.

This point is critical: The Plan identifies riparian management zones as '***not suitable for timber production***' in Standard SZ-S-01 of the Land Management Plan[12]. Riparian management Zones should not be 'ruled out' at the project level, rather the

[12] Land Management Plan, Chapter 2:Forestwide Plan Components Streamside Zones, page 48

specific meaning and intent of the 2012 Planning Rule is that they might only be 'ruled in' at the project level and that 'rule in' must follow strict NEPA process and be for very specific restoration needs. By understating the lands allocated to riparian management zones the USFS turns the meaning and intent of the 2012 Planning Rule on its head.

Sec 291.11 begins, 'While meeting the requirements of §§ 219.8 through 219.10'. Sec 219.8[13] is regarding Sustainability. Paragraph (3) specifically regulates riparian areas, setting a standard which must be included in every plan.

It is clear from 219.8 (3) that the riparian management zones are a standard and that standard is defined in the planning rule 219.8 (3)(ii). Riparian management zones are not a 'desired condition or objective' of the plan.

Section 219.8
(3)[14] Riparian Areas

> (i) The plan must include plan components, including standards or guidelines, to maintain or restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity, taking into account:
>
> (ii) Plans must establish width(s) for riparian management zones around all lakes, perennial and intermittent streams, and open water wetlands, within which the plan components required by paragraph (a)(3)(i) of this section will apply, giving special attention to land and vegetation for approximately 100 feet from the edges of all perennial streams and lakes.

The USFS IDT in the FEIS does not adequately 'document how the best scientific information available was used' and what documentation they do provide casts significant doubt on the process of how the data was used. This clearly violates the letter and intent of the 2012 Planning Rule 219.3.

To summarize these facts:

The responsible official DID NOT *use the best available scientific information to inform the planning process*

The responsible official DID NOT *determine what information is the most accurate, reliable, and relevant to the issues being considered*

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[13] https://www.ecfr.gov/current/title-36/chapter-II/part-219/subpart-A/section-219.8

[14] 36 CFR 219.8(a)(3), https://www.ecfr.gov/current/title-36/chapter-II/part-219/subpart-A/section-219.8#p-219.8(a)(3)

The responsible official DID NOT *document how the best available scientific information was used to inform the assessment*

Hydrography Data Review

The following section is a review of the hydrography data available from the time of the analysis and to the present. The analysis shows the continuing improvement of the data and mapping. Data is analyzed from the USGS, State of North Carolina, North Carolina Wildlife Resource Commission, spanning the time frame from 2000-2019.

Objector has reviewed the following datasets

NHD Version 1 - released 2000-2006 (NHDV1)
NHD Version 2 - released 2012-present (NHDV2)
NHDPlus Version 2 - released 2012-2018 (NC_NHD)
NHDPlusHR Version 2 - released 2018
North Carolina OneMap Western NC 19 County Hydrography Flowlines - 2018 (NCOneMap)
North Carolina Wildlife Resource Commission Public Mountain Trout Waters - unknown release (NCWRC-PMTW)

It should be noted that minor updates of the NHDPlus and NHDPlusHR continue to the current time. These updates, as documented in release notes, are not to the maps but rather to continuing improvement in attributes and associated data.

Terms

Flowline - the GIS representation of a river/stream on the map

FCode - numeric code for various feature attributes such as flowlines

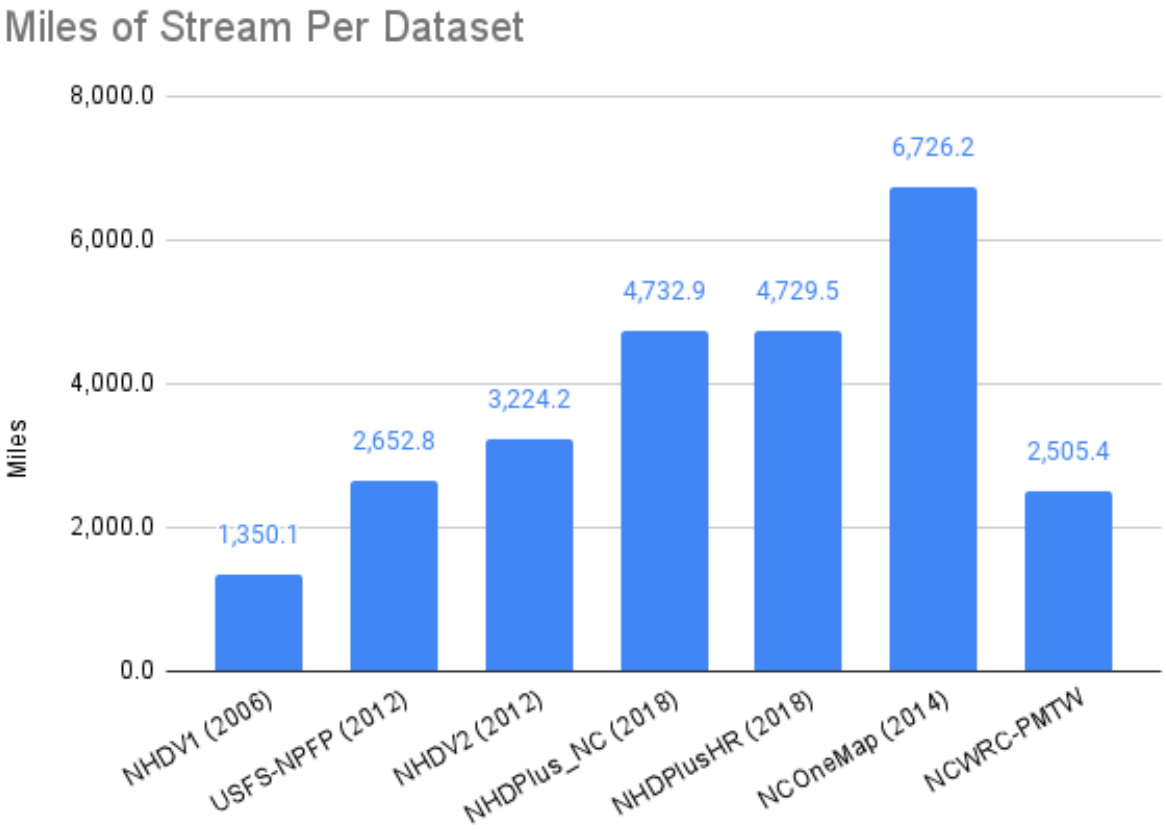
46000 Stream/River	feature type only, no attributes
46003 Stream/River	Hydrographic Category|intermittent
46006 Stream River	Hydrographic Category|perennial
46007 Stream/River	Hydrographic Category|ephemeral

see complete list: https://nhd.usgs.gov/userGuide/Robohelpfiles/NHD_User_Guide/Feature_Catalog/Hydrography_Dataset/Complete_FCode_List.htm

Stream Order
Strahler stream order are used to define stream size based on a hierarchy of tributaries. The attribute is more meaningful for more densely mapped stream networks. A stream

at its headwaters is a first order stream. Stream order increases as more flowlines join downstream. The Strahler number is mathematical measure of its branching complexity. While stream order cannot be used in every context to determine stream flow (e.g. perennial or intermittent) in mountainous terrain and where there is high rainfall it is a very strong indicator. See the technical paper Strahler Stream Order and Strahler Calculator in NHDPlus for more information.[15]

Summary of Stream Network Coverage



From the summary we can see that the stream network coverage is continually increasing as the technology and science improves. NHDPlus_NC and NHDPlusHR were available between 2012 and 2018. They comprise the same mapped streams (thus the same milage) but the NHDPlusHR adds Value Added Attributes for Stream Order. The NCOneMap, with the highest stream network density was fully available in

[15] https://www.horizon-systems.com/NHDPlusData/NHDPlusV21/Documentation/TechnicalDocs/SOSC_technical_paper.pdf

2018. The exact release date of the NCWRC PMTW data is unknown but it has been published for a number of years pre-dating 2019.

Attributes in Data

Dataset	FCode Attribute	Stream Order Attribute	Comment
NHDV1	X	X	FCode and Stream Order but for very limited data set
USFS-NPFP	X		Manual curation
NHDV2	X	X	Inconsistent FCode, limited Stream Order coverage
NHDPlus_NC	X		inconsistent FCode
NHDPlusHR	X	X	inconsistent FCode, best available Stream Order data
NCOneMap			highest stream network coverage, no attributes
NCWRC-PMTW			assume all Trout Waters are perennial no coverage of intermittent

NHD Version 1

NHD Version 1 is a minimal dataset. It covers only perennial streams. It should be noted that with such a minimal dataset the Stream Order data cannot be used as a proxy for stream flow classification. If the network is very small then even rivers may be only 1st order streams by definition.

NHDV1	Kilometers	Miles
FCode = 46000 (generic)	0.0	0.0
FCode = 46003 (intermittent)	28.4	17.6
FCode = 46006 (perennial)	2,144.4	1,332.5
	2,172.8	1,350.1

	Kilometers	Miles
Stream Order = 1	1,728.0	1,073.7
Stream Order = 2	278.3	172.9
Stream Order >2	180.7	112.3
	2,187.0	1,358.9

NHD Version 1 maps 1,358.9 miles of stream and 1,332,5 miles as perennial. With this limited data set nearly all perennial streams are of Stream Order = 1.

USFS - Nantahala Pisgah Forest Plan

The USFS calculation process has been explained, but the source data is unknown. The StreamBuffer GIS file provided by the IDT was used to calculate stream miles from the buffer acres. The StreamBuffer GIS file included areas outside of the suitable timber lands. The data was clipped to the suitable boundary prior to analysis by the objector.

USFS Nantahala Pisgah Forest Plan		
Layer StreamBuffer from Spatial Analysis		
NHD Data Source Unknown, circa 2012 per note in Appendix B		
Dataset clipped to Suitable Timber Base Shapefile from USFS (acres)	697,751	
Acres Perennial Buffer	32,034.8	
Acres Intermittent Buffer	16,068.6	
Total Acres Buffer	48,103.4	
Miles Perennial Stream	1,327.04	
Miles Intermittent Stream	1,325.79	
Total Miles Stream	2,652.83	

The IDT identified 2,652 miles of streams. The IDT classified 1,327 miles as perennial and 1,325 miles as intermittent. The total miles of perennial streams is quite close to the value of perennial streams for NHD V1, suggesting that NHD V1 was the source data. The IDT classified roughly 1/2 of the streams as

perennial and 1/2 as intermittent. A visual inspection of the GIS data reveals many curious classifications - most noticeable is that many named streams are marked as intermittent for their entire reach. Many other well-know streams are classified as intermittent when any person who has visited popular recreation areas would know they are perennial. Notable examples can be found throughout the forest, such as John Rock Branch, upper Coontree Creek (un-named side), Perry Cove, etc… These examples show that either the manual process failed due to a lack of local knowledge or it failed because there wasn't a strong directive to identify all streams accurately. As mentioned previously, the excuse that this is a landscape level analysis simply fails in this case. That should not be a reason to perform an inaccurate analysis of the streams.

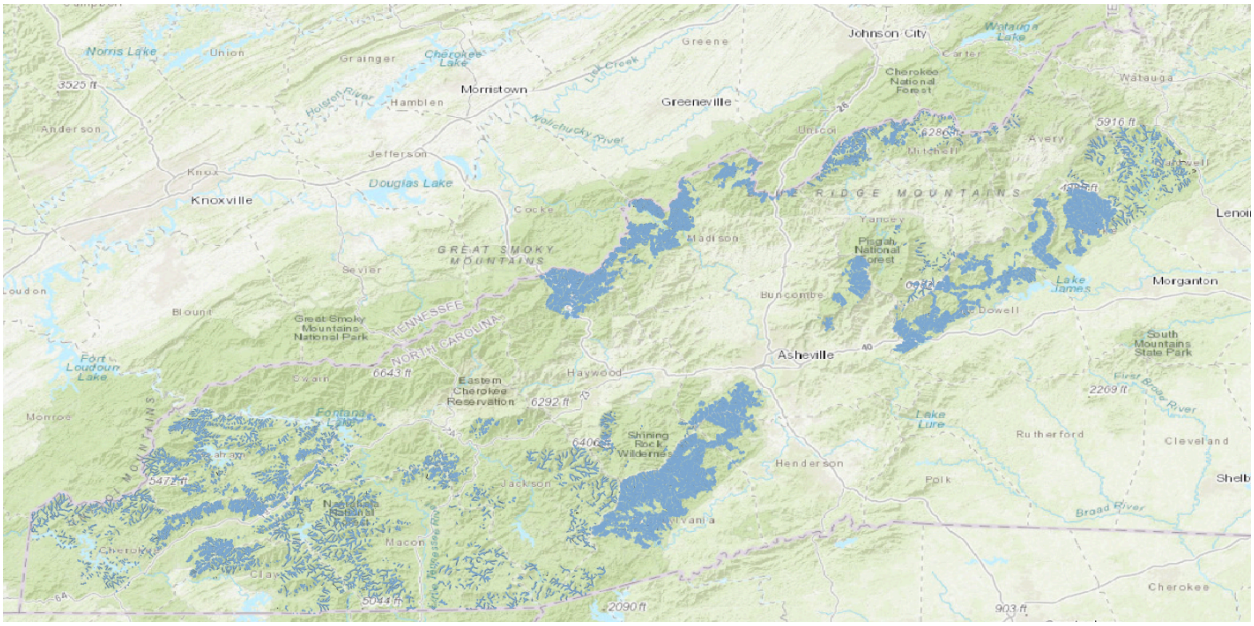
NHD Version 2

NHD Version 2 has a significantly higher mapped stream network, but the attributes are not well-maintained in the source data. This dataset was fully available at the time of the analysis and the simple fact that the mapped stream miles was so much higher should have been considered by the IDT when they classified many fewer miles of stream overall. It should be apparent from the data that the IDT missed hundreds of miles of streams, or perhaps they simply considered all the difference only as ephemeral.

USGS NHD V2, HU4 Regions 601, 602, 305, 306		
Data has varying ccoverage/density in different areas		
Predominately 2014		
Dataset clipped to Suitable Timber Base Shapefile from USFS (acres)	697,751	
Kilometers of Streams (flowlines)	5,188.9	
Miles of Streams	3,224.2	
Feet of Streams	17,023,945	
Linear Feet / Acre	24.40	

NHD V2 has FCode with large number of flowlines as 46000		
	Kilometers	Miles
FCode = 46000 (generic)	3,081.7	1,914.9
FCode = 46003 (intermittent)	134.6	83.6
FCode = 46006 (perennial)	1,879.5	1,167.9
	5,095.8	3,166.4
	Kilometers	Miles
Stream Order = 1	1077.8	669.7
Stream Order = 2	182.8	113.6
Stream Order >2	143.4	89.1
	1404.0	872.4

NHD V2 identified 513.6 additional miles of streams compared to the USFS StreamBuffer. A visual inspection of the V2 data reveals that it does not have the same density of coverage throughout western NC. The French Broad, lower Pigeon, and Catawba watersheds have much greater coverage. This means that the 512 additional miles does not fully represent the network and there is certainly many more miles overall. The solid filled areas show the much more dense network areas. Again, this type of check is easily performed at the landscape level visually in GIS.



Where the USGS marks FCode as value 46006 or 46003 it should be considered this is validated data. When the USGS has not ground-truthed the data they will mark it as 46000. In the NHD V2 data we see that the FCode 46000 represents the previously undesignated from V1 and all new miles.

NHD North Carolina V2

The NHD North Carolina State Data is more detailed than the national NHD V2. It is more current, but still pre-dates the NPFP plan analysis. The data is improved in southwestern NC where it was sparse (near V1 density) in the NHD 2. This reflects that the data is continually improving and evolving.

USGS NHD North Carolina V2		
Data has varying ccoverage/density in different areas		
Example of date: Davidson River has attribute FDate = 07/15/16		
Dataset clipped to Suitable Timber Base Shapefile from USFS (acres)	697,751	
Kilometers of Streams (flowlines)	7,616.8	
Miles of Streams	4,732.9	
Feet of Streams	24,989,494	
NHDPlus has FCode with inconsistent accuracy		
NHDPlus has Stream Order with excellent accuracy		
	Kilometers	Miles
FCode = 46000 (generic)	4,635.6	2,880.4

FCode = 46003 (intermittent)	1,008.4	626.6
FCode = 46006 (perennial)	2,058.9	1,279.3
	7,702.9	4,786.3

The North Carolina dataset totals 4,786 miles. This again increases the mapped miles of streams, adding another 1,620 miles. There are an additional 122 miles marked FCode 46006 and 543 miles marked FCode 46003. 966 additional miles are marked with the generic FCode 46000. Referring back to the USFS StreamBuffer we now have 2,134 more miles of streams. Again, this data was available at the time of the analysis and the raw difference in miles alone should have given the IDT reason to consider this as a preferred data set. This data contained sparse StreamOrder information, but there are functions and tools available in GIS that could provide those attributes without an unreasonable effort.

NHDPlus V2

Available after 2016 and released in 2018 the NHDPlus HR dataset is by far the most accurate and complete dataset available at the time of the NPFP analysis. By the time the Draft Plan and EIS were published this data was available for more than one year.

USGS NHDPlus V2 HR		
Data has varying ccoverage/density in different areas		
Dataset clipped to Suitable Timber Base Shapefile from USFS (acres)	697,751	
Kilometers of Streams (flowlines)	7,611.4	
Miles of Streams	4,729.5	
Feet of Streams	24,971,777	
Linear Feet / Acre	35.79	

NHDPlus has Fcode with inconsistent accuracy		
NHDPlus has Stream Order with excellent accuracy		
	Kilometers	Miles
Stream Order = 1	4841.6	3,008.4
Stream Order = 2	1567.9	974.2
Stream Order >2	1201.9	746.8
	7611.4	4,729.5
	Kilometers	Miles
FCode = 46000 (generic)	4,435.6	2,756.2
FCode = 46003 (intermittent)	1,006.9	625.7
FCode = 46006 (perennial)	2,054.7	1,276.7
	7,497.2	4,658.5

note that miles for Stream Order and FCode may be different as there are other FCode in the data

The NHDPlus V2 and NC NHD V2 data are essentially the same mapped stream network, the NHDPlus V2 adds the additional stream order value added attributes. The Stream Order data indicates that at least all Stream Order >=2 should be classified as perennial streams. The total of 1,721 miles of Steam Oder >=2 is about 400 miles more than classified as perennial by the USFS StreamBuffer analysis and by FCode 46006 in NHD V2 and NC NHD V2, but considering this data represents more than 1,600 more miles of mapped streams it is quite reasonable that at least 400 additional miles would classify as perennial. This dataset has 2,756 miles of Stream Order = 1. It is reasonable to assume that a portion of that is perennial and a majority of that is at least intermittent.

The next two datasets are not mentioned or discussed because they could or should have been used for the analysis. These two datasets should provide important checks for the sanity and accuracy of the analysis.

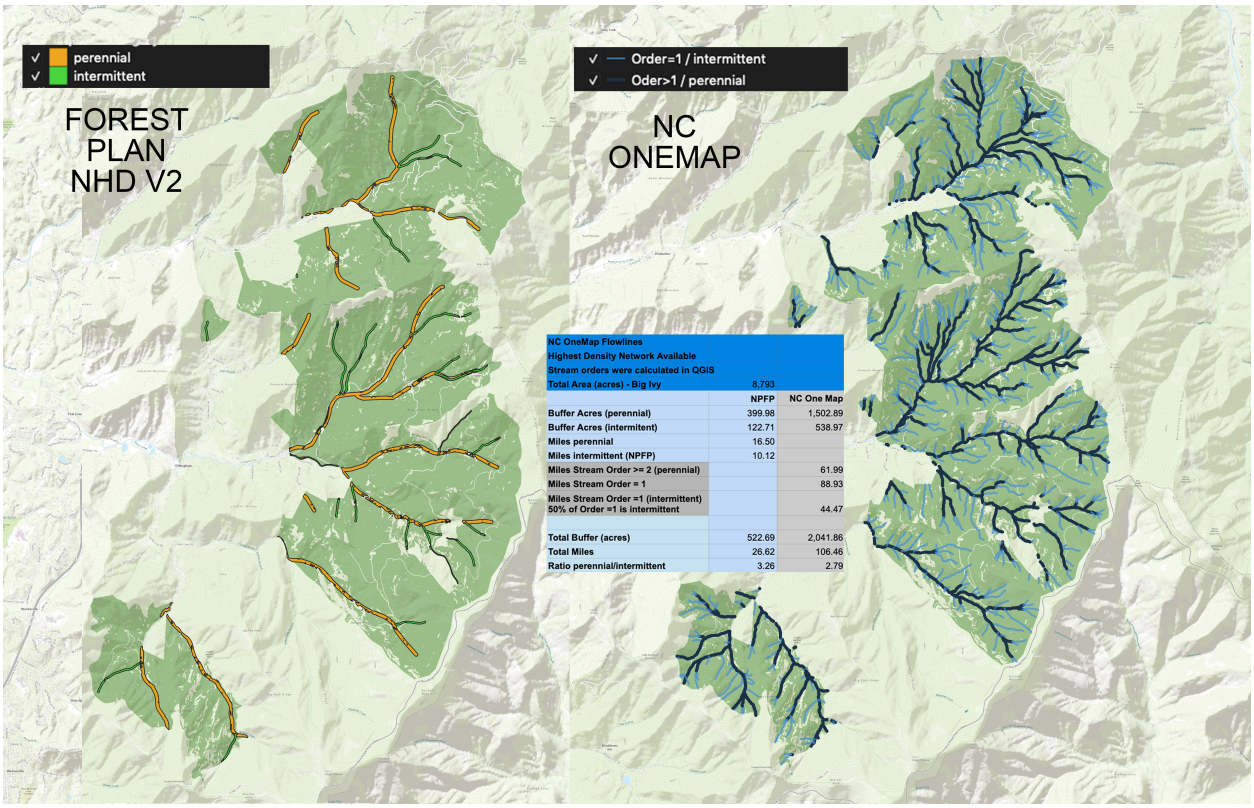
NCOneMap Western NC Hydrography Flowlines

At the direction of the NC State Legislature the streams of western NC were mapped in the early 2000s. Much of this mapping contributed to improved coverage by the USGS NHD products. This improved mapping was a direct result of improved elevation data for the western NC region. As elevation data improves so does the accuracy and level of detail of stream mapping improve. Notably, the NCOneMap data includes 6,736 miles of stream network, fully 2,000 more miles than even the NHDPlus data of USGS. This data is not yet updated in NHD because of the exhaustive quality control process of the USGS - not for mapping but rather for attributes and other critical attributes which 'connect' this data into the national network.

Western North Carolina Streams		
NCOneMap - 19 counties in Western NC, includes all of Nantahala Pisgah except for a portion of Graham County		
Publish Date: 10-28-2019		
Dataset clipped to Suitable Timber Base Shapefile from USFS (acres)	697,751	
Kilometers of Streams (flowlines)	10,824.80	
Miles of Streams	6,726.22	
Feet of Streams	35,514,425	
NCOneMap does not contain FCode or Stream Order Attributes		
The NCOneMap data should have been used as a reference dataset to check for total stream network density. It is apparent from the miles of streams mapped that the USFS Stream Buffer dataset understates the streams by a large margin - 2,652 to 6,726 miles of streams, or less than 1/2 of the mapped stream network per NCOneMap.		

This data was fully available to the IDT during the time the analysis was performed. There is the capability in GIS software (ESRI and ARCGIS) to fully determine Stream Order for this dataset. Although this is not a requirement of the 2012 Planning Rule such effort should be expected for analysis of the critical water resources of the forests. There is also no part of the 2012 Planning Rule that prohibits or inhibits such am effort. It is ultimately left up to the IDT and the responsible official to consider the effort as sufficient. But sufficient should include at a minimum sanity checks on accuracy, and even a casual review of this data would inform anyone that the USFS analysis showing 2,652.8 miles of streams to be entirely inaccurate.

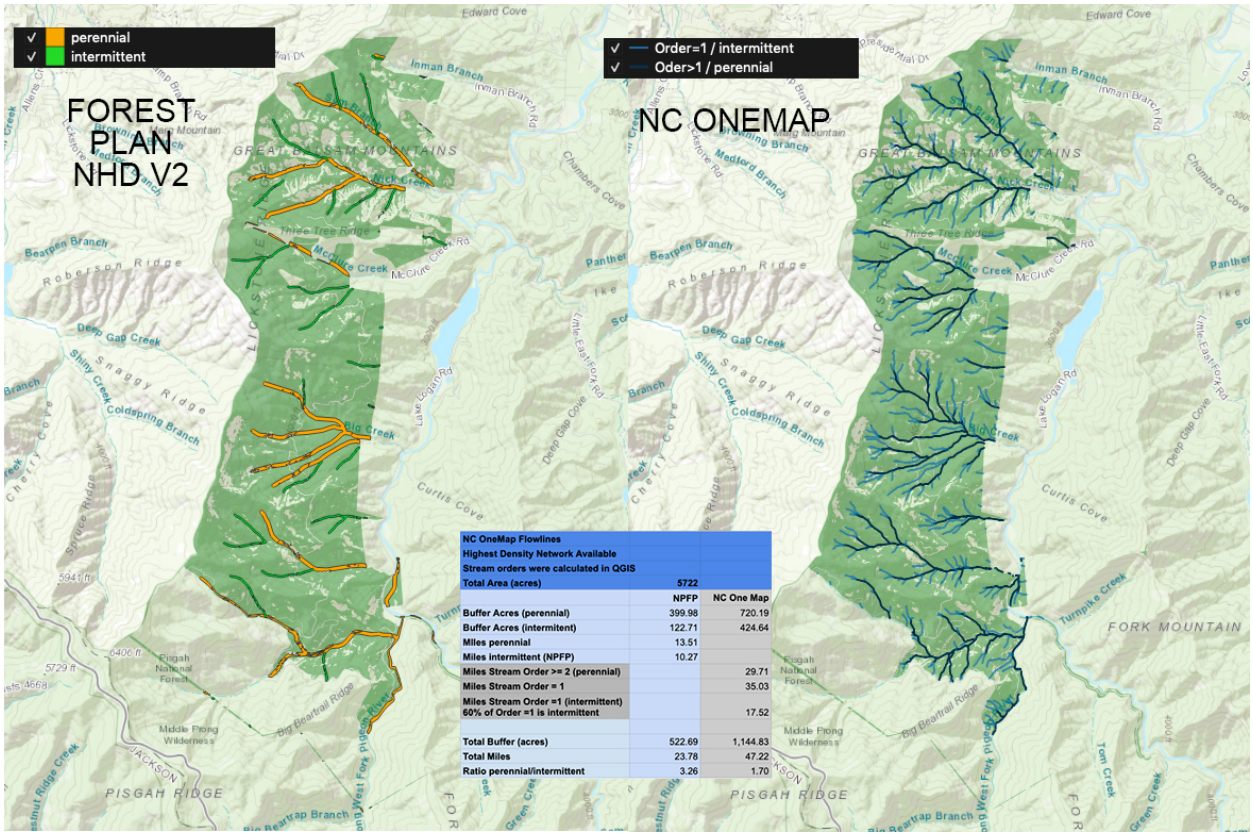
Such a visual and spatial analysis was performed in the Big Ivy area and is shown below.



NC OneMap Flowlines Highest Density Network Available Stream orders were calculated in QGIS		
Total Area (acres) - Big Ivy	8,793	
	NPFP	NC One Map
Buffer Acres (perennial)	399.98	1,502.89
Buffer Acres (intermitent)	122.71	538.97
Miles perennial	16.50	
Miles intermittent (NPFP)	10.12	
Miles Stream Order >= 2 (perennial)		61.99
Miles Stream Order = 1		88.93
Miles Stream Order =1 (intermittent) 50% of Order =1 is intermittent		44.47
Total Buffer (acres)	522.69	2,041.86
Total Miles	26.62	106.46
Ratio perennial/intermittent	3.26	2.79

Comparison of Stream Network Density and Riparian Management Zones Big Ivy Area The NC OneMap mapping is significantly more dense and accurately represents the streams.

A similar analysis was performed for the Lickstone area where there is a project currently in design.



Comparison of Stream Network Density and Riparian Management Zones in Lickstone

The NC OneMap mapping is significantly more dense and accurately represents the streams.

North Carolina Wildlife Resource Commission
Public Mountain Trout Waters

The Wildlife Resource Commission is an important partner of the Forest Service. The Public Mountain Trout Waters map identifies trout waters for fishing and also, although not the primary purpose, identifies the trout waters for habitat purposes. Although the NCWRC does not indicate whether these streams are perennial or intermittent it is hard to consider that a stream that holds the designation could be intermittent since trout would have a difficult time inhabiting intermittent streams, especially at higher elevations.

Would it have been unreasonable to simply consider all streams designated at Public Mountain Trout Waters as perennial and offer them the protection of perennial buffers? Was the NCWRC ever consulted on the topic?

Public Mountain Trout Waters		
NCOneMap - North Carolina Wildlife Resources Commission		
All Designated Trout Water should be considered perennial		
Dataset clipped to Suitable Timber Base Shapefile from USFS (acres)	697,751	
Kilometers of Public Trout Water	4,032.00	
Miles of Public Trout Water	2,505.37	
Feet of Public Trout Water	13,228,342	
Linear Feet / Acre	18.96	
Buffer (acres)	60,730	
NCWRC does not maintain FCode or Stream Order		
Given the importance of Trout Waters designation as related to Trout habitat and recreation it is reasonable to consider all such designated waters as perennial for buffer zone calculations.		

Simply considering all the identified streams as perennial would give 2,505 miles and over 60,000 acres of buffer. Thats double the perennial buffer in the USFS StreamBuffer. Again, this data should have served as an important sanity check which would have shown the StreamBuffer analysis to be insufficient and inaccurate.

What is evident when reviewing all the available science on the matter is that the USFS IDT analysis for Riparian Management Zones was entirely insufficient to be considered 'best science available' and surely it cannot be considered 'the most accurate fine scale mapping currently available.'

Impact of Errors and Omissions

Timber Calculations

In preparing the Environmental Impact Statement, 3.4.10 Timber Resources, the IDT calculated riparian management zones as a pre-requisite to timber harvest analysis and estimates. Riparian management zones are not suitable for timber production and they reduce the suitable and operable lands. The analysis and determination of lands (acres) is a spatial exercise that yields both a spatial result (a map) and a numerical result (number of acres). Both results are important. The spatial result is carried forward to further analysis of the lands that are suitable and operable for timber production and harvest. The spatial analysis is a critical input for subsequent modeling of harvest levels in SPECTRUM. The spatial analysis also allows for a visual perspective of the riparian zones in published maps. It is understood that this analysis is not a determination of final zones and at the landscape level it serves a purpose for modeling and timber harvest analysis but projects will always determine specific riparian management zones according to the standards and guidelines in the plan. The numerical result is important because it gives a perspective of the lands that are protected from timber production and allows the reader and responsible official to understand the true scope of the plan. The accuracy of the riparian management zone calculation necessarily effects the accuracy of the timber harvest modeling. If the riparian zones are underestimated then the timber harvest will be overestimated. Conversely, if riparian zones are overestimated then timber harvest will be underestimated.

The 2012 Planning Rule requires that a Sustained Yield Limit (SYL) be calculated and published. Riparian buffers are considered 'not suitable' for timber production so those lands cannot be considered in calculation of the SYL.

The 2012 Planning Rule also requires that the timber harvest output volumes sold during the plan are estimated and reported.

Under the 2012 rule, ASQ has been replaced with two more contemporary metrics that better capture the total volume of both products that meet utilization standards and those that do not. These new calculations, known as the Projected Wood Sale Quantity (PWSQ) and the Projected Timber Sale Quantity (PTSQ), are defined in Chapter 60 (FSH 1909.12). [16]

[16] FEIS, Chapter 3: Resources: Social Environment: Timber Resources page 3-536

The SYL, PWSQ, and PTSQ are important metrics that ultimately will be monitored and tracked by the USFS and the public. There are constituencies that want the highest levels of timber harvest and there are constituencies that want the lowest levels of timber harvest. The USFS has published goals and summary levels based on inaccurate calculation of suitable lands.

Analysis methods and indicators
This analysis describes how timber resources are expected to change over time under each alternative. This section focuses primarily on the social and economic aspects of timber resources. For more understanding of changes in the ecological patterns resulting from proposed harvest activities, see the "Terrestrial Ecosystem" section instead.
The information presented in the "Environmental Consequences" section comes from several analyses completed during plan revision. Further documentation of these analyses is present in appendices and the project record. Most prominently, the Spectrum model was used to estimate harvest acres as well as volumes of wood products produced. An analysis of proposed management area designation, current road system, and Spectrum outputs provided information about lands accessed now and through the planning period as well as rough estimates of potential road building. [17]

Sustained Yield

As noted in Objection (b) the Sustained Yield Limit (SYL) is based on lands not suitable for timber production. By incorrectly determining the land area of riparian management zones and thus overstating the lands that 'may be suitable' for timber production the SYL calculation cannot be correct.

All timber calculation in Sec 3.4.10 are incorrect due to errors and omissions in the determination of lands for riparian management zones. This includes the Projected Wood Sale Quantity (PWSQ) and the Projected Timber Sale Quantity (PTSQ). These metrics are required to be calculated by the 2012 Planning Rule (citation needed) and both are incorrect due to the incorrect calculation of riparian management zones.

Table 208 on page 3-537 shows these quantities. The quantities are incorrect due to errors and omission in the calculation of the lands required for riparian management zones.

Table 211 on page 3-540 shows even an more detailed Timber Harvest Summary and it too is likely to be significantly impacted by understating the riparian management zones and overstating lands suitable for timber harvest.

[17] Chapter 3.4.10 Resources: Social Environment: Timber Resources , page 3-526

Table 211 displays the harvest outputs expected in both volume and acres, including all product groups. This table also includes a comparison of actual harvest outputs from 2002 to 2018 (*first row*) in order to validate use of the SPECTRUM model volume outputs for both Alternative A and, indirectly, the action alternatives.

Table 211. Summary Harvest Information by Alternative and Tier

Tier	Alternative	CCF/yr	ac/yr	CCF/ac
Historic	2002 - 2018	18,682	813	23
	Alt A	17,414	910	19
Tier 1	Alt B	30,802	1,969	16
	Alt C	39,922	1,824	20
	Alt D	39,807	1,989	20
	Alt E	51,339	2208	23
Tier 2	Alt B	171,254	4,846	35
	Alt C	151,128	4,610	33
	Alt D	166,312	4,835	34
	Alt E	176,114	4,727	37

Other Impacts

Timber

Chapter 3 of the Final Environmental Impact Statement (FEIS) for the plan analyzes and summarizes the affected environment and environmental consequences of the Land Management Plan of the Nantahala Pisgah Forest Plan (the plan). Chapter 3 Section 3 (3.3) discusses the Biological Environment. 3.3.1 is about Aquatic Systems while 3.3.2 is about Terrestrial Ecosystems. These are the primary sections of the FEIS where the analysis of the affected environment and environmental consequences are significantly mis-stated by the errors and omissions made during determination of riparian management zones.

`Cumulative effects consider the incremental impacts of the Forest Service in the context of the broader landscape of Western North Carolina. The consequences described in this chapter are based on predicted implementing activities and are meant to compare alternatives on a programmatic level, rather than provide exact measurements of effects.` [18]

[18] FEIS, Chapter 3.1 page 3-1

For species associated with streams, small rivers, medium and large rivers, and ponds, lakes, and reservoirs, environmental consequences for each alternative considered in detail were estimated for six indicators:
1. Combined dam and stream crossing density, as an indicator of aquatic ecosystem connectivity;
2. Open road and motorized trail density (riparian), as an indicator of stream sedimentation threat;
3. Percent land use classified as urban or agricultural, as an indicator of non-point source pollution threat;
4. Percent riparian areas classified as forested, as an indicator of water temperature regime;
5. Percent suitable trout habitat occupied by nonnative trout, as an indicator of aquatic community health and composition; and
6. Presence of permitted discharges, as an indicator of point source pollution threat. [19]

It is clear from this excerpt, related to species, that riparian management zones influence a significant cross-section of the EIS analysis.

Environmental Consequences
Environmental consequences for each alternative considered in detail were estimated for a single hydrologic modification indicator for each USGS 6th level hydrologic unit on the Nantahala and Pisgah National Forests using the Ecological Sustainability Evaluation: density of known dams and road-stream intersections on Forest Service land within each watershed.[20]

It is clear from this excerpt that an underestimation of riparian management zones will cause a related underestimation of the environmental consequences related to density of road-stream intersections. The USFS IDT used a basis of 2,652 miles where NHDPlusV2 maps over 4,700 miles of streams and NCOneMap maps over 6,700 miles. Clearly this impact is understated with such a significant error in the riparian zone analysis.

Terrestrial Salamanders 3.3.5.4

Environmental Consequences
Based on forest-wide and management area direction, the best opportunity to maintain, restore, or enhance habitat for terrestrial salamanders is within mature and old growth forests, as well as management areas where less active management will occur. This will ensure the maintenance of large areas of closed canopy forest across the Forests, and an abundance of habitat

[19] FEIS Chapter 3: Biological Resources: Terrestrial Ecosystems: Background, page 3-92

[20] FEIS Chapter 3: Biological Resources: Terrestrial Ecosystems: Background, page 3-101

conditions suitable to support the diversity if terrestrial salamanders known form the Forests.[21]

Table 115 summarizes terrestrial salamander core habitat areas and least cost paths (i.e., habitat connectedness on the landscape) in relation to land ownership within the same 18-county area.

Table 115. Summary of NP Ownership Within Terrestrial Salamander Core Habitat Areas and Least Cost Path Corridors, as Identified in Apodaca and Smith (2019)

Habitat Association	Core Habitat	Least Cost Path	Core Habitat + Least Cost Path*
High Elevation	36.60%	15.51%	36.25%
Rock Outcrop	44.23%	52.71%	45.27%
Streamside	51.44%	39.87%	49.51%
Forested	37.24%	45.08%	39.98%
Total*	42.08%	42.06%	43.17%

**eliminates duplication of acres between habitat associations and model results*

Streamside and general forested habitats, in terms of terrestrial salamander habitat associations, are more likely to be included in areas planned for timber management under all alternatives than the other associations addressed in Apodaca and Smith (2019). The revised forest plan includes numerous plan components to protect and conserve streamside habitats (Forest Plan: Streamside Forests). Application of these plan components would protect and conserve terrestrial salamander habitats under all alternatives.[22]

The importance of riparian zones to the health and stability of salamander populations cannot be understated. The analysis of consequences to terrestrial salamanders cannot be correct.

Public Mountain Trout Waters

The failure to include Public Mountain Trout Waters recognized by the North Carolina Wildlife Resource Commission is quite curious, considering the NCWRC is a USFS partner. The NCWRC maps 2,505 miles of trout waters within the lands of the suitable base. These perennial flowing waters are critical to ensuring wild and stocked trout habitat and serve an important recreation purpose that contributes significant income to the region. The trout waters alone represent over 60,000 acres of perennial buffer. Consider that the plan identified only 47,000 acres of both perennial and intermittent buffers.

[21] Chapter 3: Biological Resources: Terrestrial Ecosystems: Highlighted Species of Concern page 3-356

[22] Chapter 3: Biological Resources: Terrestrial Ecosystems: Highlighted Species of Concern page 3-359

Conclusion Objective (a)

This evidence presented regarding the errors and omissions in analysis and calculation of the riparian management zones is conclusive. The USFS IDT analysis

- Did not use current data, and thus did not use the best science available
- Did not document data that was chosen (no version)
- Did not document why the chosen data was the best data
- Used data from 2012 to inform a plan that extends to 2042 when data from 2018 was available
- Grossly understated the number of miles of riparian zones, thus grossly understating the acres of land in the suitable base that are not available for timber harvest
- Overstated the timber harvests
- Understated impacts to Water Resources, Aquatic Systems, Transportation and Roads, species of concern such as Green Salamanders which rely on riparian zones, Brook trout (especially)

Within the Nantahala and Pisgah Forest lands of the suitable timber base the USFS identified only 2,505 miles of streams. Multiple other datasets available at the time of the analysis map from 4,700 - 6,700 miles of streams. The USFS has significantly understated the streams that are in their suitable base.

These are serious errors and omissions which demand a thorough review by the USFS.

Remedy Objection (a)

The USFS should perform the Riparian Management Zone analysis using the most current and best data available. The USFS must issue a supplemental EIS that correct the errors of the riparian analysis and all the related aspects and impacts.

Appendix - Objection (a)

Hydrography References / Data Sources

State of North Carolina

Public Mountain Trout Waters 2021
NC Wildlife Resources Commission Public Mountain Trout Streams
https://www.nconemap.gov/datasets/ncwrc::pmtw-streams-2021/explore?location=35.786067%2C-82.334592%2C9.08

NCOneMap Western NC Streams
Covers 19 counties, misses some of Graham, covers ~ 500-550,000 acres of Nantahala Pisgah Timber Suitable Lands.
Last Update 10/28/2019, substantially completed in 2014.

United States Geologic Survey and Environmental Protection Agency

NHD Version 1, initial release 2006
Version 1 of USGS NHD
Primary source is Digital Line Graphs (DLG) of USGS Topo Quads
NHD V1 is aka - 'blue lines on the map'
Source data for Objector Analysis: https://www.horizon-systems.com/NHDPlusData/NHDPlusV1/Mississippi/NHDPlus06V01_03_NHD.zip dated 10-17-2008

NHDVersion 2
Version 2 of NHD
First versions available (beta) in 2006
Released 2012
Significant enhancement of coverage and spatial density
Used 30m DEM products

NHDPlus High Resolution
Released in 2012, continuing updates
Version 2 of NHD and High Resolution Enhancements
Addition of Value Added Attributes (VAA)

Archival versions of NHD data were obtained through Horizon Systems, a USGS and EPA contractor that has helped develop the NHD since its inception.

Example V1: NHD data for Mississippi valley which includes HU4 region, section 601 for Western NC.
https://www.horizon-systems.com/NHDPlusData/NHDPlusV1/Mississippi/
Example V2: NHD data for Mississippi valley
https://www.horizon-systems.com/NHDPlusData/NHDPlusV21/Data/NHDPlusMS/NHDPlus06/NHDPlusV21_MS_06_06a_Hydrodem_01.7z

NHD Versions and History

NHD Version 1

The initial version of NHD was created by the USGS from digital scans of USGS topo maps beginning in 1997 and continuing though 2006. It is a Digital Line Graph (DLG) product and contains what are colloquially termed 'blue lines on the map'. It is common knowledge that topo but lines were historically a minimum of the actual flowlines (streams). The first release of NHD V1 was 2000.

In 1997, NHD production began in earnest with the automated integration of the EPA RF3 stream attributes and the USGS Digital Line Graph hydrography, a.k.a., "the blind pass". The volume of data processing stretched the server technology of the day to its limits and occasionally beyond. For the following 3 years, a nationally distributed team of geospatial analysts from EPA, USGS and key state partners reviewed and processed the data using semi-automated GIS-based editing tools, a.k.a., "the visual pass". In 2000, the last NHD reach was loaded into the Feature Operational Database (FOD), the NHD central repository hosted at the USGS EROS Data Center in Sioux Falls, SD. What were originally quadrangle-based, featureless "blue lines" from the 1:100,000-scale topographic maps were now watershed-based surfacewater features forming a seamless national digital stream network. [23]

NHD Version 2

NHD Version 2 is an update of Version 1 focusing on medium scale resolution 1:24,000 or better. The USFS partnered with USGS and EPA to develop NHD Version 2 which was completed in 2007. Continued improvements were made until the final release in 2012

In the early 2000's, when the USGS National Mapping Division (led by Keven Roth and Jeff Simley), the U.S. Forest Service (led by Brian Sanborn) and state cooperators initiated the production of the high resolution NHD (1:24,000-scale or better), EPA embarked on a joint effort with the USGS Water Division to develop streamflow estimates for the medium-resolution NHD. A fundamental

[23] Making the Digital Water Flow, Tommy Dewald, USEP, Office of Water
https://www.horizon-systems.com/NHDPlusData/NHDPlusV21/Documentation/History/Making_the_Digital_Water_Flow.pdf

requirement of this effort was to delineate the local drainage area (catchment) for each NHD stream segment so that ingredient data for estimating streamflow, such as precipitation and temperature, could be associated with each segment. Several different techniques for delineating catchments were evaluated, including Thiessen polygons, strictly elevation-based, and hydrologically-conditioned elevation-based.[3] The evaluation results showed that the hydrologically-conditioned elevation-based technique produced the best results and was feasible to implement nationally. This technique, a.k.a. the New England method, conditioned the elevation data by trenching the NHD stream lines and raising the WBD ridgelines (where they existed) in preparation for delineating catchments. [24]

NHDPlus Version 2

NHDPlus Version 2 improved on NHDPlus by integrating a suite of geospatial products including the Water Boundary Dataset (WBD) and the National Elevation Dataset (NED). Fully released in 2018, updates and improvement of attributes continues.

Since NHDPlus is produced from static snapshots of the NHD, WBD and NED, it includes the features and capabilities described above for these datasets. NHDPlus integrates the vector NHD stream network and WBD hydrologic unit boundaries with the gridded land surface as represented by the NED. This hydrologically-conditioned surface enables the delineation of a catchment (local drainage areas) for each NHD stream segment. The catchments are used to associate precipitation, temperature and runoff data with each stream segment for estimating stream flow. Elevations along each stream are used to compute stream slope for estimating velocities used in time of travel analyses. In addition to stream flow, NHDPlus provides additional value-added attributes, including stream order and a group of attributes that facilitate rapid stream network traversal and query. [25]

Like the production of the medium-resolution NHD that preceded it, the development of NHDPlus was a first-of-its-kind national effort that faced numerous challenges. The team leveraged existing tools and processes whenever possible and resorted to mailing hard drives for transporting large datasets from one member of the geographically distributed NHDPlus team to another. Many significant challenges and lessons learned are described in a National Science Foundation report released in 2009.[5]

Noteworthy applications of the initial NHDPlus include serving as the sample and analytical framework for EPA's National Aquatic Resource Surveys, regional SPARROW water quality models, and the Incident Command Tool for Drinking Water Protection (ICWATER). Another positive outcome enabled by the availability of NHDPlus catchments is the development of extensive collections of incremental and accumulated (upstream) landscape attributes associated with catchments.

In preparation for future streamflow estimation efforts, the NHDPlus team collaborated with the USGS Office of Surface Water in 2010 on a concept paper documenting recommended improvements to the techniques used for the initial NHDPlus streamflow estimates.[6] The widespread

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[24] Making the Digital Water Flow, Tommy Dewald, USEP, Office of Water

[25] Weaving the National Hydrologic Geospatial Fabric (T.Dewald, K.Hanson, S.Poppenga, K.Ries, J.Simley - May, 2011) , https://www.epa.gov/sites/default/files/2017-01/documents/weavingthenationalhydrologicgeospatialfabric.pdf

positive response to NHDPlus Version 1 is what prompted the NHDPlus team to pursue an improved NHDPlus Version 2 that was released in 2012. [26]

North Carolina OneMap Hydrography Flowlines (Western NC “Local-Res")

In 2005 North Carolina began a project to improve the mapping of surface waters. The NCOneMap service has a dedicated section for Streams, found at https://www.nconemap.gov/pages/streams. The resulting map covers a 19 county area in western NC which includes most of the lands of Nantahala and Pisgah National Forests except for the far western portion of Graham County where approximately 150-200,000 acres are not included. The data is the most dense and accurate of all the sources as it had significant manual improvement and correction[27]. The data lacks feature attributes, so it is not directly usable in the riparian analysis, but it serves as an important point of reference when checking the dataset used by the USFS. Comparing areas where the NCOneMap data overlaps with USFS StreamBuffer one can easily see how sparse the stream network is in the USFS dataset.

North Carolina Wildlife Resources Commission Public Mountain Trout Waters

The NCWRC maintains a map of publicly available mountain trout waters. Many of these waters lie on National Forest lands. As a government agency partner of the USFS this map should have been a primary reference of the riparian analysis. The map itself does not contain enough detail to be a sole source, but the map establishes some important reference points for checking the USFS data. The map is available on the NCWRC website, but it available for download and analysis through NCOneMap. As a spatial dataset the map allows for investigation and querying of features.

https://www.nconemap.gov/datasets/ncwrc::pmtw-streams-2021/explore?location=35.785292%2C-82.334592%2C8.97

The North Carolina Wildlife Resources Commission developed the Public Mountain Trout Waters (PMTW) digital data to enhance planning and management of trout waters. The GIS dataset depicts the trout regulations in effect on trout waters (streams

[26] ibid

[27] https://nconemap.maps.arcgis.com/sharing/rest/content/items/326e00aee41d412f9e002c4d241e5552/data

and impoundments) managed under the PMTW program. The data is continually updated but has been existence in some form since the mid 2010s. While it is unclear what the data looked like when the IDT was doing riparian analysis it is clear from the current data that the riparian zones are significantly understated.

Objection (b) Sustained Yield Limit Calculation

Objection Issue: Considering riparian management zones as 'may be suitable' for timber production for purposes of Sustained Yield Limit calculation

Text in Menlo (10) typeface regular or **bold** are excerpted from the Plan, the 2012 Planning Rule, or the Land Management Planning Handbook.

Objector text in Helvetica Neue (12) typeface regular or **bold**.

Other sources are typically in Times New Roman (10) typeface with footnotes.

Introduction

This issue causes the plan to be inconsistent with law, regulation, or policy.
Sec. 219.11, Timber Requirements Based on the NFMA

The issue was discovered after the opportunity to make a comment passed. It should not in any case be only considered if a specific comment was submitted. Any plan content which is inconsistent with law, regulation, or policy must be corrected regardless of who identifies the issue or when it is identified.

Overview

Riparian management zones are not suitable for timber production and the land area (acreage) associated with them should be excluded from areas used to determine the Sustained Yield Limit (SYL). The Revised Nantahala Pisgah Forest Plan considered riparian management zones as 'may be suited' to timber production which is an incorrect interpretation of multiple sections of relevant regulation and guidance found in the 2012 Planning Rule and 1909.12 Land Management Planning Handbook. By including riparian management zones in the 'may be suitable acres' the plan significantly overstates the Sustained Yield Limit of the forests. The plan identified 697,751 acres as 'may be suitable' for timber production. Riparian management zones were calculated as 47,333 acres for stream and 4,662 acres for lakes and waterbodies.[28] Including riparian management zones as 'not suitable', reduces the 'may be suitable' base to 645,576 acres which is a reduction of 7.5%. Riparian management zones cannot be considered as 'may be suitable' for timber production. Thus, calculation of SYL is not in accordance with the 2012 Planning Rule and as SYL is a core requirement this renders the plan inconsistent with law, regulation, or policy.

[28] FEIS - Appendix B. Analysis Methods page B-47

Calculation of SYL is a non-trivial exercise to analyze and check. The planning team has, in numerous public statements, expressed that the plan contains highly technical information. All required documents, project records, data, and related source materials are not provided explicitly by the planning team. Significant supporting materials were not published to the planning website and could be obtained only by request. Terms used in the plan differ from those used in the 2012 Planning Rule and the Forest Handbook, which further confuses the reader and obfuscates the plan description of the SYL calculation. To fully understand the process and the inputs has required a significant amount of time and could not have been completed prior to the comment period. As the issue causes the plan to be inconsistent with law, regulation, or policy it should not in any case be only considered if a specific comment was submitted. Any plan content which is inconsistent with law, regulation, or policy must be corrected regardless of who identifies the issue or when it is identified.

Summary of Sustained Yield Calculation

The sustained yield is calculated from all lands which are not deemed 'not suitable for production.' Sec. 219.11 of the Planning Rule instructs the responsible official to determine all lands which are not suitable for timber production. There are six factors to use in this determination. The six factors (i-vi) are definitive, and any one of the factors is sufficient to determine the land is not suitable for timber production.

2012 Planning Rule[29] , CFR Title 36, Chapter II Part 219

§ 219.11 Timber requirements based on the NFMA.[30]

While meeting the requirements of §§ 219.8 through 219.10, a plan developed or revised under this part must include plan components, including standards or guidelines, and other plan content regarding timber management within Forest Service authority and the inherent capability of the plan area, as follows:

(a) Lands not suited for timber production.

(1) The responsible official shall identify lands within the plan area as not suited for timber production if any one of the following factors applies:

[29] https://www.ecfr.gov/current/title-36/chapter-II/part-219?toc=1

[30] https://www.ecfr.gov/current/title-36/chapter-II/part-219/subpart-A/section-219.11

(i) Statute, Executive order, or regulation prohibits timber production on the land;

(ii) The Secretary of Agriculture or the Chief has withdrawn the land from timber production;

(iii) Timber production would not be compatible with the achievement of desired conditions and objectives established by the plan for those lands;

(iv) The technology is not currently available for conducting timber harvest without causing irreversible damage to soil, slope, or other watershed conditions;

(v) There is no reasonable assurance that such lands can be adequately restocked within 5 years after final regeneration harvest; or

(vi) The land is not forest land.

Factor (iii) is a factor that is discretionary to the plan itself.

(iii)[31] Timber production would not be compatible with the achievement of desired conditions and objectives established by the plan for those lands;

All other factors are out of the scope of the responsible officials decision and discretion.

The sustained yield calculation includes only lands that 'may be suitable' for timber production and these are the lands that fall under factor (iii). The intent is clear - lands whose suitability is determined by a plan decision (e.g. by Management Area designation or a specific desired condition or objective) MAY BE SUITABLE for production. Factor (iii) applies ONLY to lands where it is the plan itself that deems the lands unsuitable.

Sec 291.11 begins, 'While meeting the requirements of §§ 219.8 through 219.10'. Sec 219.8[32] is regarding Sustainability. Paragraph (3) specifically regulates riparian areas, setting a standard which must be included in every plan.

Section 219.8
(3)[33] Riparian Areas

[31] 36 CFR 219.11(a)(1)(iii), https://www.ecfr.gov/current/title-36/chapter-II/part-219/subpart-A/section-219.11#p-219.11(a)(1)(iii)

[32] https://www.ecfr.gov/current/title-36/chapter-II/part-219/subpart-A/section-219.8

[33] 36 CFR 219.8(a)(3), https://www.ecfr.gov/current/title-36/chapter-II/part-219/subpart-A/section-219.8#p-219.8(a)(3)

> (i) The plan must include plan components, including standards or guidelines, to maintain or restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity, taking into account:
>
> (ii) Plans must establish width(s) for riparian management zones around all lakes, perennial and intermittent streams, and open water wetlands, within which the plan components required by paragraph (a)(3)(i) of this section will apply, giving special attention to land and vegetation for approximately 100 feet from the edges of all perennial streams and lakes.

By regulation, riparian management zones are required around 'all lakes, perennial and intermittent streams, and open water wetlands' and that zone is required to be '100 feet from the edges of all perennial streams and lakes'. The responsible official has no discretion on this matter, the 100ft zone is a required standard. Further, the regulation requires that there be a defined riparian management zone on intermittent streams but does not set a minimum. The responsible official is required to set a standard for intermittent streams. Standards are not desired conditions and objectives.

This regulation and the required standard satisfies factor (i), Statute, Executive order, or regulation prohibits timber production on the land;

Riparian management zones are not suitable for timber production.

Sec 219.8 recognizes the importance of riparian areas by setting a standard and requiring a buffer. Factor (iv) of Sec. 219.11 regards technical limitations to timber harvest.

> (iv)[34] The technology is not currently available for conducting timber harvest without causing irreversible damage to soil, slope, or other watershed conditions;

By setting a standard buffer for riparian management zones in 219.9 (3)(ii) the Planning Rule acknowledges such a technical limitation and restricts the responsible official from even considering whether there is technology currently available. This satisfies Factor (iv) by inference and prohibits timber production on the lands of riparian management zones.

Riparian management zones are not suitable for timber production.

[34] 36 CFR 219.11(a)(1)(iv), https://www.ecfr.gov/current/title-36/chapter-II/part-219/subpart-A/section-219.11#p-219.11(a)(1)(iv)

Riparian management zones satisfy two of the six factors. Lands are deemed not suitable if they satisfy any one of the factors.

Riparian management zones could only be considered as 'may be suitable' for timber production if they came under Factor (iii)

(iii) Timber production would not be compatible with the achievement of desired conditions and objectives established by the plan for those lands;

It is clear from 219.8 (3) that the riparian management zones are a standard and that standard is defined in the planning rule 219.8 (3)(ii). Riparian management zones are not a 'desired condition or objective' of the plan. Riparian management zones are not established by the plan, they are required by the planning rule. The responsible official has no discretion in the standard for perennial streams and lakes and no discretion to exclude intermittent streams from a standard. The responsible official is required to set a standard for intermittent streams.

Riparian management zones cannot be considered under Factor (iii) as 'may be suitable'.

Riparian management zones are not suitable for timber production.

The Plan identifies riparian management zones as 'not suitable for timber production in Standard SZ-S-01 of the Land Management Plan[35]. The SYL calculation in the plan thus contradicts the plan's own determination of riparian management zones as 'not suitable' for timber production. Note importantly also that this is a standard and not a desired condition or objective.

SZ-S-01 Vegetation management activities within streamside zones of perennial and intermittently flowing streams must contribute to ecosystem restoration and not compromise aquatic system and riparian structure and function with the exception of short term impacts for long-term improvements. For example, water temperature regulation, sediment transport, streambank stability, and recruitment of large woody debris must exhibit natural dynamics after treatment. In these areas other objectives must be secondary to ecosystem restoration. Streamside zones are delineated as:

- Within 100 feet of either side of (or perimeter around) perennial waterbodies (streams, ponds, and reservoirs);
- Within 100 feet of perennial springs, bogs, and other wetlands;
- Within 50 feet of either side of (or perimeter around) intermittent streams

[35] Land Management Plan, Chapter 2:Forestwide Plan Components Streamside Zones, page 48

Narrowing of the above widths are allowed in special circumstances when the project IDT determines that within "shallow valleys", where a break in topography occurs within the streamside zone, water flow is directed away from the protected waterbody. The IDT shall also consider potential changes in shading, subsequent stream temperature changes, and wildlife habitat connectivity. Any alteration to streamside zones shall be documented in the project record. Additionally, all activities must be in compliance with NC Best Management Practices and Forest Practice Guidelines related to water quality. ***While vegetation management is allowed within streamside zones, as described above, this area is not suitable for timber production.***

note: Streamside and riparian should be considered equivalent terms. Zone and buffer should also be considered equivalent terms. The Planning Rule 'riparian management zone' is interchangeable with the Land Management Plan term 'streamside management zone'. It is important to point out that the use of streamside rather than riparian in the Land Management Plan is unnecessary and likely to cause confusion for the reader.

Riparian management zones are not suitable for timber production.

Plan Determination of Sustained Yield Limit

The SYL is described in the Land Management Plan, Sec 3.4.10 Timber Resources.

The process followed for identification of lands suitable and not suitable begins on page 3-538. The plan refers to the factors i-vi as Steps, where Steps 1-4 correspond to i & ii, iv, v, and vi and are used to determine lands not suitable for timber production. Step 2 takes into account the desired conditions and objectives of the plan and determines lands that may be suitable for timber production.

Step 2 takes into account compatibility with desired conditions and objectives of the forest plan. During the plan revision process, the completion of Step 2 must be completed for each alternative analyzed separately. [36]

Riparian and lake buffer zones were considered under Step 2, thus they were considered by the planning team as Desired Condition or Objectives although they are in fact Standards as required by the 2012 Planning Rule. This is clearly wrong.

Riparian management zones are not suitable for timber production.

[36] Final Environmental Impact Statement Chapter 3 Resources Timber Resources page 3-539

Definition of Sustained Yield Limit

FSH 1909.12 – LAND MANAGEMENT PLANNING HANDBOOK
CHAPTER 60 – FOREST VEGETATION RESOURCE MANAGEMENT
60.5 Definitions

(emphasis added)

Sustained yield limit (SYL). The amount of timber, meeting applicable utilization standards, "which can be removed from [a] forest annually in perpetuity on a sustained yield basis" (NFMA at section 11, 16 USC 1611; 36 CFR 219.11(d)(6))). It is the volume that could be produced in perpetuity on lands that may be suitable for timber production. Calculation of the limit ***includes volume from lands that may be deemed not suitable for timber production after further analysis during the planning process.*** The calculation of the SYL is ***not limited by land management plan desired condition, other plan components***, or the planning unit's fiscal capability and organizational capacity. The SYL is not a target but is a limitation on harvest, except when the plan allows for a departure.

The definition of Sustained Yield Limit as given in the Land Management Handbook clearly states they are determined 'after further analysis during the planning process.' It is clear that riparian management zones are not determined 'during further analysis' they are a Standard required by regulation as stated in the 2012 Planning Rule 219.8(3)(ii). Further, riparian management zones are not 'limited by the land management plan.' As they are not a determination made after further analysis and they are not limited by the land management plan they cannot be included in the Sustained Yield calculation.

Riparian management zones are not suitable for timber production.

Conclusion Objection (b)

Riparian management zones clearly satisfy two factors that conclude they are 'not suitable for timber production' and they cannot be considered under the only factor that could deem them as 'may be suitable'. Further, based on plan's own standard SZ-S-01, the plan itself recognizes that riparian management zones are 'not suitable for timber production'. The SYL calculation must be therefor be corrected. The plan considered riparian management zones as desired conditions and objectives in contradiction of the 2012 Planning Rule which requires them as a standard.

Remedy Objection (b)

Timber Suitability and Sustained Yield Calculation should be recalculated in compliance with both the regulations and process of 2012 Planning Rule and 1909.12 Forest Handbook Chapter 60. Riparian management zones for all perennial streams and lakes and all intermittent streams are considered not suitable for timber production and should be excluded from the acres used to determine SYL. SYL should be recalculated based on riparian values as determined after consideration of Objection (a) and using an accurate value of the riparian management zones per best available science and most current data.