Significant Nexus Determinations:
Documenting Stream and Wetland Functions

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Appendix A, Memorandum Re: Jurisdiction Following The U.S. Supreme Court Decision In *Rapanos v. United States* and the U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook, require a significant nexus determination (SNX) for non-navigable, non relatively permanent waters (non-RPW), wetlands adjacent to such tributaries and wetlands not directly abutting non-navigable but relatively permanent waters (RPW) before asserting jurisdiction. A SNX exists when it is demonstrated that the tributary and/or wetland along with any other, similarly situated wetlands, has "more than a speculative or insubstantial effect on the chemical, physical and biological integrity of a traditional navigable water."[1]

This document does not attempt to establish any threshold criteria for making that decision. Rather, it is to assist the project manager with identifying those factors pertinent to the chemical, physical and biological integrity of the aquatic ecosystem. The project manager must then weigh all the corroborating evidence and determine if more than a speculative or insubstantial nexus exists with downstream navigable waters.

In making a SNX determination, consideration is given to the "flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical and biological integrity of the downstream traditional navigable waters."[2] A SNX determination includes the following:[3]

- Volume, duration, and frequency of flow, including consideration of certain physical characteristics of the tributary
- Proximity to the traditional navigable water
- Size of the watershed
- Average annual rainfall
- Average annual snow pack
- Potential of tributaries to carry pollutants and flood waters to traditional navigable waters
- Provision of aquatic habitat that supports a traditional navigable water
- Potential for wetlands to trap and filter pollutants or store flood waters
- Maintenance of water quality in traditional navigable waters

[1] Appendix A, Memorandum Re: Jurisdiction Following The U.S. Supreme Court Decision In *Rapanos v. United States*, June 5, 2007, page 10.
[2] Ibid., page 7.
[3] Ibid., page 10.

The SNX determination emphasizes stream and wetland functions and the role those functions have in maintaining the health of downstream navigable waters. Functions have been defined as the characteristic activities that take place in aquatic ecosystems.[4] Examples of functions include floodwater detention and attenuation, nutrient cycling and pollutant removal.

Direct measures of specific stream and/or wetland functions are both costly and time consuming and generally beyond the scope of routine field investigations. For example, measurements of floodwater detention and attenuation functions involve complicated instrumentation capable of measuring daily flows, creating a daily hydrograph, determining water surface elevation, peak discharge, flood frequency and duration and stage/discharge relationships. In addition, one must also determine floodplain elevation, area, and slope and floodplain roughness. Such investigations are not practical within a regulatory framework.

As an alternative, indirect measures based on the presence of certain physical and/or biological characteristics can indicate that specific functions are occurring even when the function itself is not directly observable.[5] Such indicators are valuable when it is easily observed in the field and there is a known correlation between the surrogate and its function. In the above example, indicators of floodwater detention and attenuation might include the presence of sediment deposits, debris dams and wrack-lines on the floodplain as evidence of overbank flooding, and the presence of large woody debris, such as logs and stumps, as indicators of floodplain roughness. Similarly, the three-parameter approach to wetland determination relies on indicators of reduction and oxidation processes (redox potential) that take place in saturated soils and anaerobic conditions. Because direct measures of redox potential are difficult, readily identifiable field characteristics such as gleyed soils and soils with low chromas and/or mottles, serve as surrogates to the processes of reduction and oxidation.

The relationship between indicators of function and the functions themselves is well documented in the literature. Therefore, identifying specific field indicators can help determine which functions are occurring within a particular stream or wetland. Table 1, Field Form 1 and Attachment 1 list stream indicators, functions and references while Table 2, Field Form 2 and Attachment 2, list those for wetlands.

Documenting specific functions does not mean a SNX exists; only that certain biogeochemical processes are occurring in a given stream or wetland. The project manager must still determine whether or not those functions have more than a speculative or insubstantial effect upon a traditional navigable water.

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[4] R.D. Smith, A. Ammann, C. Bartoldus, M.M. Brinson, An approach for assessing wetland functions using hydrogeomorphic classification, reference wetlands, and functional indices, U.S. Army Corps of Engineers, Technical Report WRP-DE-9, October 1995, page 21.

[5] M.M. Brinson, A hydrogeomorphic classification for wetlands, U.S. Army Corps of Engineers, Technical Report WRP-DE-4, August 1993, page 51.

Table 1: Indicators of Stream Function

Indicator	Function	References
Channel Volume (WxDxL)	Water storage, Flood desynchronization, Pollutant removal, N & P transformation (hyporheic zone)	3, 8, 9, 10, 18
Number of Other Headwater Streams in Drainage Area	Additive functional capacity - Cumulative water storage volume, Water supply, Flow attenuation, Pollutant removal, N & P transformation (hyporheic zone)	3, 8, 9, 10, 18
Large Woody Debris, Roots, other Barriers	Flood desynchronization, Flow attenuation, Sediment trapping & storage, Organic debris trapping and storage, Macroinvertebrate support	4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18
Leaf Litter in Channel	Breakdown of Coarse Particulate Organic Matter (CPOM), Sink and source of organic carbon, Macroinvertebrate support, Nutrient cycling	1, 4, 5, 7, 10, 12, 14, 15, 16, 18
Debris/Sediment Dams	Sediment storage, Flow attenuation, water storage, Flood desynchornization, Sink and source for CPOM, Pollutant removal, N & P transformation, Macroinvertebrate support,	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18
Sediment Deposition in channel	Sediment storage, Nutrient cycling, Pollutant removal, N & P transformation	2, 3, 4, 8, 10, 11, 12, 13, 18
Wrack Lines, Debris Dams, sediment deposits on floodplain, Water marks, Water lines, Standing water	Overbank flooding, Flood storage, Flood desynchronization, Flow attenuation, Nutrient cycling, Pollutant removal, N & P transformation	2, 7

NOTES

FIELD FORM 1

SIGNIFICANT NEXUS DETERMINATION

Non-RPW Tributaries or Seasonal RPW Tributaries

Project No. _____

Location: _____

Stream Name: _____

Date: _____

Rapanos Classification

- ☐ Non-RPW Tributary – Flows less than 3 months a year
- ☐ Seasonal RPW – Flows at least 3 months a year but less than perennial

Approximate Channel Volume: width, depth and length of Relevant Reach

W x D x L = _____

Biological/Physical Characteristics - Check all that apply:

- ☐ Large woody debris present in channel (tree limbs, logs, twigs, etc)
- ☐ Leaf litter in channel and in various stages of decomposition
- ☐ Leaf packs present in channel
- ☐ Debris and/or sediment dams in channel
- ☐ Other natural channel obstructions (rock, tree roots, etc)
- ☐ Obvious sediment depositional areas
- ☐ Obvious connection to floodplain: wrack-lines, debris dams, sediment deposits, water-borne debris, water marks, water lines, etc.
- ☐ Number of other headwater tributaries in drainage area (if known) = _____
- ☐ Other indicators – Explain _____
- ☐ Evidence of wildlife/aquatic organisms – Describe:_____

Significant Nexus Determination: _____

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Attachment 1: Indicators of Stream Function
Selected References

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Table 2: Indicators of Wetland Function

Indicator	Function	References
Geomorphic Setting	Water storage, groundwater recharge, Baseflow augmentation, Nutrient cycling, Pollutant removal, particulate retention,	1, 4, 5, 6, 15, 17, 20, 21, 30
Ratio of Wetland Area to Drainage Area = Section III.B.2.(i)(a)+3/III.B.1.(i) of Approved JD Form	Water storage, Flood desynchronization, Retention of particulates, Pollutant removal	1, 5, 6, 7, 8, 11, 14, 20, 21, 24, 29
Vegetation Strata	Flood desynchronization, Flow attenuation, Energy dissipation, Organic Carbon source and sink, Nutrient cycling, Wildlife habitat, Retention of particulates, Pollutant removal	2, 3, 8, 14, 16, 20, 23, 24, 28
Redoximorphic concentrations: mottles with halos and/or soft, diffuse edges	Dentitrification	12, 13, 18, 19, 22, 26, 27
Coarse/large woody debris, Leaf litter, Sediment/silt deposition, Water marks, Water lines, Standing water	Flow attenuation, Energy dissipation, Nutrient cycling, Organic Carbon source and sink, Wildlife habitat, Retention of particulates, Pollutant removal	3, 8, 14, 16, 23, 25, 28, 29
Surrounding Land-use	Pollutant removal, particulate retention, Nutrient cycling, Flood attenuation, Water storage, Wildlife habitat	4, 6, 7, 8, 9, 10, 20, 23, 24

NOTES

FIELD FORM 2

SIGNIFICANT NEXUS DETERMINATION

Wetlands Adjacent to Non-RPW, Seasonal RPW And Non-abutting Wetlands to RPW

Project No. _____

Location: _____

Date: _____

Rapanos Classification

- ☐ Wetlands Adjacent to Non-RPW
- ☐ Non-abutting Wetlands to RPW
- ☐ Wetlands adjacent to Seasonal RPW (flows at least 3 months a year but less than perennial)

Geomorphic Setting

- ☐ Riverine – Subject to overland flooding at least once every five years
- ☐ Depressional
- ☐ Slope
- ☐ Other – Explain _____

Ratio of Wetland Area to Drainage Area

- ☐ Wetland Acreage/Drainage Area Acreage [Sections III.B.2.(i)(a)+3/III.B.1(i)] = _____

Biological/Physical Characteristics - Check all that apply:

- ☐ Tree stratum
- ☐ Sapling stratum
- ☐ Shrub stratum
- ☐ Herbaceous stratum
- ☐ Coarse/large woody debris
- ☐ Leaf Litter
- ☐ Sediment/silt deposits
- ☐ Waterlines/watermarks/standing water
- ☐ Redoximorphic concentrations: mottles with halos and/or soft, diffuse edges
- ☐ Other – Explain _____

Surrounding Land-use - Check all that apply:

- ☐ Commercial/Industrial
- ☐ Residential
- ☐ Agricultural
- ☐ Forested
- ☐ Other – Explain _____

Significant Nexus Determination:_____
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Attachment 2: Indicators of Wetland Function
Selected References

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