NATIONAL CATTLEMEN'S BEEF ASSOCIATION
CENTER FOR PUBLIC POLICY

September 3, 2021

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Submitted via *Regulations.gov*

Comments on the Environmental Protection Agency and Army Corps of Engineers' Request for Recommendations: Waters of the United States 33 CFR Part 328.

The National Cattlemen's Beef Association and the undersigned groups (NCBA) appreciate the opportunity to comment on the Environmental Protection Agency's (EPA) and U.S. Army Corps of Engineers' (Army Corps) request for input related to the agencies' definition of "Waters of the United States" (WOTUS). NCBA is the nation's largest and oldest trade association representing American cattle producers, with over 25,000 direct members and 44 state affiliate associations. America's cattlemen need an easy-to-understand "Waters of the United States" (WOTUS) definition that allows for straightforward implementation, and the agencies have taken significant strides toward achieving this goal.

The Clean Water Act (CWA or the Act) impacts all segments of the beef supply chain. Ranchers across the country send their cattle to graze on pastures or rangeland with ephemeral streambeds and water their cattle using stock ponds. Animal feeding operations are frequently permitted under the CWA as point sources and integrate waste treatment systems to effectively manage manure. Most American cattle producers are multi-generational, having dealt with every iteration of CWA jurisdiction since its passage in 1972. After nearly 50 years of jurisdictional tug-of-war between the Supreme Court and the agencies, regulated stakeholders want nothing more than consistency in the Act's application. In the final rule, cattle producers need a practical and interpretable WOTUS definition.

NCBA generally supports the Navigable Waters Protection Rule (NWPR) because it rightly excludes ephemeral features and isolated waterbodies from federal jurisdiction, while providing clear exclusions for agricultural-specific features including prior converted cropland (PCC) and stock ponds. As the agencies move forward with revisiting the definition of WOTUS, NCBA

cautions against the creation of new burdens or jurisdictional expansions that cut against the language or spirit of existing Supreme Court precedent.[1] In these comments, NCBA addresses four of the topics presented in the request for input: jurisdictional tributaries, jurisdictional ditches, the scope of "adjacency," and exclusions.

NCBA understands that the U.S. District Court for the District of Arizona just days ago "vacated and remanded [the NWPR] for reconsideration."[2] The NWPR is the rule of law in all 50 states, apart from tribal land at dispute in *Pasqua Yaqui Tribe v. EPA.*[3] This recent decision in the U.S. District Court of Arizona does not impact the agencies' obligation to use the Navigable Waters Protection Rule as a basis for determining CWA jurisdiction on lands not expressly considered in this case. In 2018, the Department of Justice adopted Litigation Guidelines stating that "universal vacatur is not contemplated by the APA" and that "the APA's text does not permit, let alone require, such a broad remedy."[4] To obtain judicial relief, a party must demonstrate it has the "irreducible constitutional minimum of standing," which the Supreme Court has made clear is "an essential and unchanging part of the case-or-controversy requirement of Article III."[5] The standing requirement "would hardly serve [its] purpose … of preventing courts from undertaking tasks assigned to the political branches, if once a plaintiff demonstrated harm from one particular inadequacy in government administration, the court were authorized to remedy all inadequacies in that administration."[6] Yet injunctions that reach beyond the litigating parties "often afford relief not only to persons who are not parties to the case"— and thus have not demonstrated standing— "but even to those who would have had no standing to seek an injunction in the first place."[7] As the Agencies reconsider the NWPR, we urge that they retain various aspects of the NWPR discussed in these recommendations for the reasons provided below.

Jurisdictional Tributaries

The Navigable Waters Protection Rule limits regulated (a)(2) waters to "channels that contribute perennial or intermittent flow" to an (a)(1) water. One of NCBA's largest contentions with the 2015 Rule was the agencies' assertion of jurisdiction over ephemeral features. The agencies

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[1] *United States v. Riverside Bayview Homes, Inc.*, 474 U.S. 121 (1985); *SWANCC v. United States Army Corps of Eng'rs*, 531 U.S. 159 (2001); *Rapanos v. United States*, 547 U.S. 715 at 769 (2006).
[2] See *Pasqua Yaqui Tribe v. EPA*, No. CV-20-00266 (D. Ariz. order dated Aug. 30, 2021).
[3] Id.
[4] See Memorandum from the Office of the Att'y Gen. to the Heads of Civil Litigating Components U.S. Attorneys, Litigation Guidelines for Cases Presenting the Possibility of Nationwide Injunctions 7–8 (Sept. 13, 2018) [hereinafter Litigation Guidelines] (emphasis added), https://www.justice.gov/opa/press release/file/1093881/download [https://perma.cc/VE7K-6LWB]; see infra note 35 (collecting examples of DOJ raising this argument).
[5] *Lujan v. Defenders of Wildlife*, 504 U.S. 555, 560 (1992).
[6] *DaimlerChrysler Corp. v. Cuno*, 547 U.S. 332, 353 (2006). See also *Town of Chester v. Laroe Estates, Inc.*, 137 S. Ct. 1645, 1650 (2017) ("standing is not dispensed in gross," and a "plaintiff must demonstrate standing … for each form of relief that is sought"); *Gill v. Whitford*, 138 S. Ct. 1916, 1931 (2018) (the remedy "must of course be limited to the inadequacy that produced the injury in fact that the plaintiff has established").
[7] Sessions Memo, *supra* note 7, at 3.

acknowledged concerns presented by the Scientific Advisory Board (SAB) in their 2014 letter regarding the categorical inclusion of all tributaries as jurisdictional waters, when the Connectivity Report clearly indicated a gradient of connectivity. The SAB recommended that ''the interpretation of connectivity be revised to reflect a gradient approach that recognizes variation in the frequency, duration, magnitude, predictability, and consequences of physical, chemical, and biological connections."[8] This gradient of connectivity ultimately means that tributaries with perennial or intermittent flow have a greater impact on downstream water quality than those which only flow following a precipitation event.

As stated above, NCBA's principal concern with the 2015 Rule was the agencies' attempt to assert jurisdiction over ephemeral features. Both the "significant nexus" and "typical year" standards provide little in the way of regulatory certainty for everyday landowners. Thus, NCBA provides the following recommendation to combine elements of the 2015 Rule and NWPR in order to maximize the agency's impact on environmental health while simultaneously increasing stakeholder certainty.

NCBA suggests the jurisdictional determination for (a)(2) waters be a two-step process. In previous rulemakings, NCBA opposed the use of physical indicators for jurisdictional purposes because they were employed without a necessary flow metric. At its foundation, a rule that sets jurisdictional boundaries for the federal government concerning water regulatory jurisdiction should consider where water *actually* flows. The 2015 Rule failed to take this important factor into account, requiring the existence of flow, but positing that flow could be demonstrated through the presence of physical indicators. Rather than keeping the two elements (flow and physical indicators) distinct, the agencies instead propped one element on another, the result of which was only one element needing to be satisfied – the presence of physical indicators. Though different on its face, the Tributaries ((a)(2)) category of the NWPR puts regulated stakeholders in a similar predicament by only requiring the presence of flow. Distinct consideration of both flow and physical indicators is necessary to determine the presence of a jurisdictional tributary, but the (a)(2) definition fails to provide any standard for visible indicators. Fortunately, the problem has a simple solution, and NCBA believes that the (a)(2) category can be bolstered with visible indicators, just as the 2015 Rule could have been bolstered with a standalone flow requirement.

To find an (a)(2) water jurisdictional, regulators must show both (1) the existence of visible indicators *and* (2) satisfaction of the regulatory flow metric. Without distinct consideration of both visible indicators and flow, EPA will establish federal regulatory authority over areas like the one captured in Attachment (1), a drainage feature in the Rocky Mountain region. NCBA suggests that the agencies include the presence of a bed, banks, point bars, and cut banks as required visible indicators for jurisdictional tributaries, making clear that without these visible indicators, a

[8] Letter to Gina McCarthy. October 17, 2014. SAB Review of the Draft EPA Report *Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of the Scientific Evidence*.

jurisdictional tributary is not present. The most effective way to accomplish this task is by defining the term "surface water channel," a term used in both the 2015 Rule and NWPR. Though the agencies presently define an (a)(2) water as a "naturally occurring surface water channel," the agencies take no effort to define this term. "Surface water channel" is a critical element of the jurisdictional tributary definition and should be defined in the regulatory text. NCBA suggests the following definition:

Surface water channel. The term surface water channel is the geographic feature in which surface water flows, as defined by a bed and banks. A surface water channel is accompanied by the physical features of point bars and cut banks where the flow of water turns directionally due to topographic change in elevation.

Webster's Dictionary defines "channel" as "the bed where a natural stream of water runs."[9] Further, the International Glossary of Hydrology (IGH) defines "channel" as a "clearly defined watercourse which periodically or continuously contains moving water."[10] If visible indicators exist, regulators move on to determining whether the tributary meets the necessary flow metric. The flow metric is a standalone requirement, separate from physical indicators. A tributary should only be jurisdictional if it satisfies both the physical indicator and flow metric requirement. Both the flow metric and physical indicators are necessary to ensure that the federal government is regulating those water bodies that are contributing to downstream water quality and are more than "the merest trickle."[11] The IGH defines "bank" as the "rising land bordering a river, usually to contain the stream within the wetted perimeter of the channel."[12] Point bars and cut banks are likewise suitable indicators of mature tributaries which contribute significantly to downstream water quality. These easy-to-identify characteristics would allow cattle producers to visually identify characteristics that are indicative of a surface water channel, as a "first cut" of determining the existence of a WOTUS. The NRCS WI Companion Document 580-5, "Stream Classification Using the Rosgen System" (Attachment 2) includes a helpful visual for point bars and cut banks.[13]

Jurisdictional Ditches

NCBA is concerned about renewed interest in the establishment of federal jurisdiction over ditches. Most ditches have not historically been regulated as "waters of the United States" under the CWA. The 2015 Rule, for the first time, expressly included "ditches" in the definition of "tributary," meaning that ditches with a bed, bank, and ordinary high water mark that contributed flow will be categorically jurisdictional unless they meet one of two narrow exclusions. The categorical regulation of ditches is an expansion that impinges on traditional State and local

[9] Webster's Dictionary, p. 245 (4th ed. 1999).
[10] U.N. Educational, Scientific, and Cultural Organization and World Meteorological Organization, *International Glossary of Hydrology*, ISBN 978-92-63-03385-8 at p. 60 (2012).
[11] *Rapanos v. United States*, 547 U.S. 715 at 769 (2006) (Kennedy, J., concurring).
[12] *Glossary of Hydrology* at 38.
[13] *See* Attachment (2).

authority over water and land use. The 2015 Rule's ditch-related exclusions are unclear and unlikely to provide meaningful relief. Ditches are regulated in other ways under the CWA (e.g., as point sources); they do not need to be regulated as "waters." The establishment of federal jurisdiction over ditches is particularly concerning in conjunction with proposed jurisdiction over ephemeral tributaries. While the NWPR does not specifically call out ditches as a standalone category of jurisdictional waters, the agencies make clear that ditches which look and act as a jurisdictional tributary will be treated as such. In short, the regulation of ditches without proper exclusions and as a larger effort to establish jurisdiction over ephemeral features reaches far beyond the limits of the Clean Water Act.

The Scope of "Adjacency"

NCBA is pleased with the NWPR's definition of (a)(6) jurisdictional waters. By limiting jurisdictional adjacent wetlands to those that (1) abut or (2) have a direct hydrological surface connection to a jurisdictional water, the agencies follow Supreme Court precedent while ensuring that wetlands vital to downstream water quality are protected. This standard is in line with the precedent set by *Riverside Bayview, SWANCC,* and *Rapanos*.

As the agencies look to the Supreme Court for guidance, they perhaps receive the most pointed direction when it comes to wetlands jurisdiction. Every seminal CWA case that has come before the Supreme Court dealt with wetland jurisdiction in some form. *Riverside Bayview* first required the Court to consider the breadth of the Act's jurisdiction, ultimately leading to affirmation of the Army Corps' position that wetlands which are "inseparably bound up" in navigable waters are also subject to federal protection under the CWA.[14] However, this federal protection was narrowed by the Court's holding in *SWANCC*, when it determined that use of a waterbody or wetland by migratory birds was insufficient for CWA regulation. The Migratory Bird Rule expanded the agencies' jurisdiction to wetlands and waterbodies far beyond those that were merely adjacent to isolated ponds and wetlands.[15] The *Riverside Bayview* and *SWANCC* courts provided an answer, yet courts across the nation continued to grapple with the question – where does the CWA draw the jurisdictional line for wetlands? While *Rapanos* provides two potential standards for consideration, their implementation becomes nearly synonymous when effectively considered alongside Riverside Bayview and SWANCC. The Supreme Court gives us clear limitations: CWA jurisdiction is based on hydrology alone, and hydrology establishes an outer limit – not a baseline – for what may be regulated. The 2015 Rule included numeric distance limitations that allowed the agencies to potentially regulate isolated wetlands within 4,000 feet of TNWs and their tributaries. Such a standard would have gone far beyond the *Riverside Bayview* or *Rapanos* precedents. NCBA supports the adjacency definition as defined in the NWPR.

[14] *Riverside Bayview*, 474 U.S. 121.
[15] *SWANCC*, 531 U.S. 159.

While the agencies request input related to regional waterbodies within the scope of adjacency, the 2015 Rule acknowledged that these waterbodies were not "adjacent," but categorized them as "other waters." The agencies' proposed "other waters" category is designed to capture any wet feature that cannot be found jurisdictional under the "tributary" or "adjacent water" categories. Under the proposed rule, the agencies will assert jurisdiction over "other waters, including wetlands" that "alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus" to a TNW, interstate water, or territorial sea.[16] As with "adjacent waters," the agencies do not explain which "waters" may be considered (a)(7) "other waters." The preamble simply states that "other waters" "do not meet the criteria of any of the categories of waters in (a)(1) through (a)(6), and also are not one of the waters and features excluded . . . in section (b)."[17] As discussed in the Appendix to these comments, the proposed rule's "other waters" category violates *SWANCC* by allowing for assertion of jurisdiction over isolated waters, such as prairie potholes or industrial ponds, that have little or no connection to TNWs. The science does not support the proposed assertion of jurisdiction over these "other waters." Regional significance does not a jurisdictional water make.

Exclusions

NCBA supports the agencies' continued effort to provide a clear list of exclusions in addition to the above jurisdictional categories. The NWPR did not provide exclusions from jurisdiction, but rather a list of features not considered WOTUS. This created substantial confusion throughout the rulemaking process. The exclusion provision in the 2015 Rule contained a disclaimer, stating that features expressly excluded under (b) "are not [WOTUS] even where they otherwise meet the terms of" the WOTUS definition in (a). This is necessary to ensure that exclusions have the full force of law, rather than becoming mere suggestions. NCBA addresses specific exclusions included in the NWPR, that have not been previously discussed, below.

Waters not identified in paragraphs (a)(1) through (6)

Perhaps most important is the agencies' catch-all exclusion, stating that any water not explicitly included as a jurisdictional water is excluded. This provides certainty for stakeholders and ensures continuity in implementation by state departments of environmental quality and Corps districts across the nation.

Groundwater

The agencies have long taken the position that groundwater is not a medium subject to federal regulation. Rather, it is an intrastate resource left to the states to manage, either alone or regionally. NCBA appreciates the agencies' continued commitment to the CWA's cooperative federalism approach. This sentiment extends to subsurface drainage, including tile drains.

[16] 79 Fed. Reg. at 22,263.
[17] *Id.* at 22,211.

Ephemeral features

NCBA supports the NWPR's categorical exclusion of ephemeral features. As stated above, the assertion of categorical federal jurisdiction over ephemeral features was NCBA's most significant issue with the 2015 Rule. Specifically, NCBA appreciates the NWPR's exclusion of diffuse stormwater run-off and sheet flow from jurisdiction, as these exclusions directly align with the *Rapanos* plurality. However, as the agencies consider the typical year standard as a way to differentiate between intermittent and ephemeral features, the agencies must keep in mind that this exclusion is only as effective as the typical year standard is practical.

Prior converted cropland

While the Prior Converted Cropland (PCC) exclusion has existed since 1993, producers have dealt with a moving target for over twenty-five years. The NWPR's PCC definition is the first time that the agencies have provided stakeholders with a regulatory definition and concrete standards. The PCC exclusion is integral in allowing agricultural producers to effectively implement voluntary conservation practices through USDA-NRCS. Additionally, the joint memorandum entered into by USDA-NRCS, EPA, and the Corps is an important step toward government-wide implementation of the One Federal Decision policy. Cattle producers, and all agricultural producers, need a concrete definition of PCC in order for it to provide any real value or protection.

Artificial lakes and ponds constructed in upland (including farm and stock ponds)

The 2015 Rule's numeric distance limitations put many cattle producers on edge, wondering if their isolated stock ponds would become subject to federal jurisdiction. NCBA appreciates not only the NWPR's general exclusion of artificial lakes and ponds, but the stated exclusion of farm and stock watering ponds. However, as currently drafted, the regulatory text suggests that the exclusion is incredibly narrow, because the text refers only to those features constructed in upland. For this exclusion to be meaningful to cattle producers, it is important that it not be limited to features constructed on dry land. The very purpose of ponds is to carry or store water, which means that they are not typically constructed in upland. Often, the only rational place to construct a farm or stock pond is in a naturally low area, capturing stormwater that enters the ditch or pond through sheet flow and ephemeral drainages. Depending on the topography of a given patch of land, pond construction may be infeasible without some excavation in a natural ephemeral drainage or a low area with wetland characteristics.

NCBA additionally supports the NWPR's intent to exclude farm and stock watering ponds created with non-jurisdictional impoundments. These features are heavily relied upon by cattle producers across the country. However, NCBA recommends that the agencies revise the exclusion to explicitly exclude lakes and ponds "constructed by impounding non-jurisdictional waters or features."

Waste treatment systems

Cattle feeding operations and dairies implement waste management systems to store and effectively recycle animal waste. NCBA supports the agencies' definition of "waste treatment systems, as well as the exclusion of waste treatment systems from federal jurisdiction. These systems are point sources under the Clean Water Act and are managed as such.

Climate-Related Considerations

In August 2021, NCBA announced the development of sustainability goals for the U.S. cattle industry, which highlight our commitment to continuous environmental, social, and economic progress. Chief among those goals is our targeted achievement of climate neutrality by 2040. Reaching this goal largely relies on cattle producers remaining not only environmentally sustainable, but economically and socially sustainable as well. Increased regulatory burden does not promote the success of small businesses, especially in the agricultural industry. Instead, small farms and ranches go out of business when forced to hire attorneys and consultants to manage complex jurisdictional issues. Far too often, when ranches go out of business, vital grasslands are paved or plowed, significantly reducing the carbon sequestration potential that will be vital to curb climate-related environmental impacts. Rules like WOTUS, when constructed in an overly broad manner, do more environmental harm than good.

Further, the agencies should not design rules solely through a climate-focused lens without first ensuring that they are utilizing accurate methodologies to measure the climate impact of all Greenhouse Gas (GHG) emissions. The 100-year variant of the Global Warming Potential (GWP_{100}) has been formally adopted in international climate policy (currently as established in the Kyoto Protocol, and in the draft text of the Paris Agreement[18]) and standardized Life Cycle Assessment (LCA)/carbon-footprinting approaches[19]). Subsequently, GWP_{100} has become the de facto standard for expressing emissions in the scientific literature and general media, having essentially become shorthand for the relative climate impacts of a given product or activity. Despite its ubiquity, the relationship between aggregate CO_2 Equivalent (CO_2-e). emissions calculated using GWP_{100} and global warming itself is ambiguous. Fundamentally, many of the shortcomings of the GWP_{100} calculation as a universal climate metric arise because it cannot sufficiently differentiate the contrasting impacts of long- and short-lived climate pollutants (SLCPs). In previous reports, the International Panel on Climate Change (IPCC) has acknowledged the shortcomings of current methods of reporting methane impacts, including GWP_{100}. GWP* was first reported by the Climate Dynamics research team at the University of Oxford in 2018, led by Myles Allen (commonly referred to as "the physicist behind net zero") and has been gaining acceptance in the scientific community as a GWP calculation that more effectively measures the global warming impact of methane.[20] In fact, GWP* was referenced in

[18] UNFCCC 2018 Presidency consultations on modalities, procedures and guidelines under the Paris Agreement with a focus on transparency Draft Report Version 1.

[19] *ISO 14044 2006 Environmental Management—Life Cycle Assessment—Requirements and Guidelines.*

[20] Allen, M. et al, A solution to the misrepresentations of CO_2-equivalent emissions of short-lived climate pollutants under ambitious mitigation, Climate and Atmospheric Science 1, 16 (2018).

the latest IPCC report as a methodology that more accurately accounts for the long-term climate impact of short-lived GHG emissions.[21]

Under the United Nations Framework Convention on Climate Change (UNFCCC), reporting of GHG emissions has been standardized in terms of CO_2-equivalent (CO_2-e) emissions using Global Warming Potentials (GWP) over 100 years, but the conventional GWP_{100} methodology does not adequately capture the different behaviors of long-lived climate pollutants (LLCPs) and SLCPs. The atmospheric lifetime and radiative impacts of different GHGs differ dramatically. Acknowledgement of this reality led to the widescale adoption of the GWP_{100} methodology. GWP_{100} equates emissions using a scaling factor – CO_2-e. GHGs are assigned a GHG equivalency, then that number is used to determine the emissions' potential impact. Following GWP_{100}, a pound of methane equates to 25 pounds of CO_2. Thus, methane is calculated as $25CO_2e$. However, this simplified scaling factor fails to recognize the amount of time emissions remain in the atmosphere – an equally important factor in determining potential atmospheric impact. The GWP* methodology seeks to remedy this oversight.[22]

Anthropogenic warming estimations are largely determined by the cumulative total emissions of LLCPs and the emission rates of SLCPs. GWP* equates an increase in the emissions rate of an SLCP with a single "pulse" emission of CO_2, and thus considers not only the initial intensity of GHGs, but also the amount of time that they remain in the atmosphere. This approach is a significant improvement on the conventional GWP_{100} methodology. Further, the GWP* methodology modifies the conventional GWP definition to consider CO_2 warming equivalents (CO_2-we) rather than CO_2-e. Following GWP*, SLCPs can be incorporated directly into carbon budgets consistent with long-term temperature goals, because every unit of CO_2 we emitted generates approximately the same amount of warming, whether it is emitted as a SLCP or a LLCP. This is not the case for conventionally derived CO_2-e measurements.

NCBA cautions the agencies against using climate change as a basis for any rulemaking, including the definition of WOTUS, without the effective application of relevant science. Science cannot be used solely as a tool to expand jurisdictional authority— its findings must be considered objectively. And as previously stated, NCBA further cautions the agencies against policy decisions that are not rooted in the text of the CWA and existing Supreme Court precedent.

Conclusion

[21] IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

[22] Cain, M., Lynch, J., Allen, M.R. et al., *Improved calculation of warming-equivalent emissions for short-lived climate pollutants*, Climate Atmosphere Science 2, 29 (2019). https://doi.org/10.1038/s41612-019-0086-4.

Thank you for allowing NCBA the opportunity to provide input as the agencies reconsider the Navigable Waters Protection Rule. NCBA fully supports the NWPR, but looks forward to working with the agencies to ensure that any definition of WOTUS provides adequate protections for our nation's waters while promoting the success of farms, ranches, and all small businesses.

National Cattlemen's Beef Association
Public Lands Council
American National CattleWomen
American Quarter Horse Association
American Sheep Industry Association
Alabama Cattlemen's Association
Arkansas Cattlemen's Association
Arizona Cattle Feeders' Association
Arizona Cattle Growers' Association
California Cattlemen's Association
Colorado Cattlemen's Association
Colorado Livestock Association
Colorado Wool Growers Association
Florida Cattlemen's Association
Georgia Cattlemen's Association
Hawaii Cattlemen's Council
Idaho Cattle Association
Illinois Beef Association
Indiana Beef Cattle Association
Indiana Sheep Association
Iowa Cattlemen's Association
Kansas Livestock Association
Kansas Sheep Association
Kentucky Cattlemen's Association
Kentucky Sheep and Wool Producers
Louisiana Cattlemen's Association
Maryland Cattlemen's Association
Michigan Cattlemen's Association
Minnesota State Cattlemen's Association
Mississippi Cattlemen's Association
Missouri Cattlemen's Association
Montana Stockgrowers Association
Montana Wool Growers Association
Nebraska Cattlemen
Nevada Cattlemen's Association

New Mexico Cattle Grower's Association
New York Beef Producer's Association
North Carolina Cattlemen's Association
North Dakota Lamb and Wool Producers Association
North Dakota Stockmen's Association
Ohio Cattlemen's Association
Oklahoma Cattlemen's Association
Oregon Cattlemen's Association
Pennsylvania Cattlemen's Association
South Carolina Cattlemen's Association
South Dakota Cattlemen's Association
South Dakota Sheep Growers Association
Tennessee Cattlemen's Association
Texas and Southwestern Cattle Raisers Association
Texas Cattle Feeders Association
Utah Cattlemen's Association
Utah Wool Growers Association
Virginia Cattlemen's Association
Washington Cattle Feeders Association
West Virginia Cattlemen's Association
Wisconsin Cattlemen's Association
Wyoming Stock Growers Association
Wyoming Wool Growers Association

Attachments:

(1) Photos: Hydrologic Feature – Rocky Mountain Region

(2) NRCS WI Companion Document 580-5, Stream Classification Using the Rosgen System

Attachment (1): Hydrologic Feature – Rocky Mountain Region (Photo 1)

Attachment (1): Hydrologic Feature – Rocky Mountain Region (Photo 2)

STREAM CLASSIFICATION USING THE ROSGEN SYSTEM

1. Identify bankfull elevations and mark cross-sections.

   Identify the bankfull elevation by walking along a reach that is 20-30 times the bankfull width long, marking bankfull indicators with flags. This usually includes at least three meander bends. Choose three locations to measure cross-sections, placing them at crossovers, where the thalweg switches from one bank to the other. The flags help identify bankfull elevation even when indicators are not present at selected cross-sections.

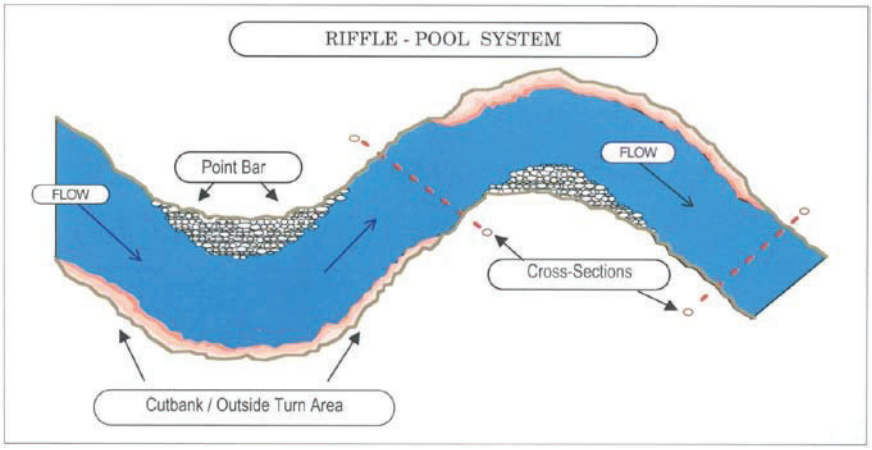

Figure 1: Recommended cross-section locations for bankfull stage measurements in "riffle/pool" system

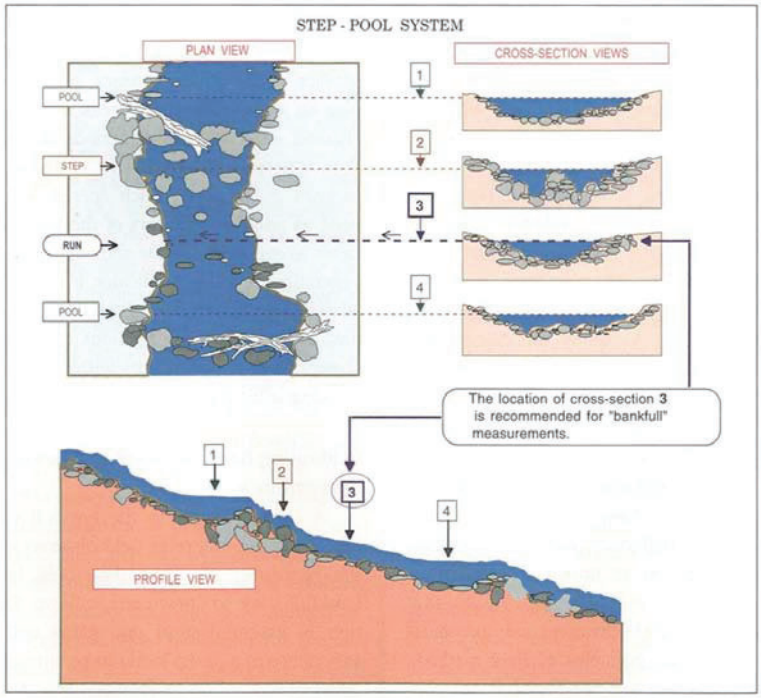

Figure 2: Recommended location for measurement of bankfull stage in "step/pool" system

2. Survey cross-sections.

Measure a stream channel cross section. This means surveying the cross section from bankfull elevation on one bank to the other bank. You will need to survey up into the flooplain as well (see step 3). Wisconsin Job Sheet 811, Stream Channel Classification, may be used to aid in classification.

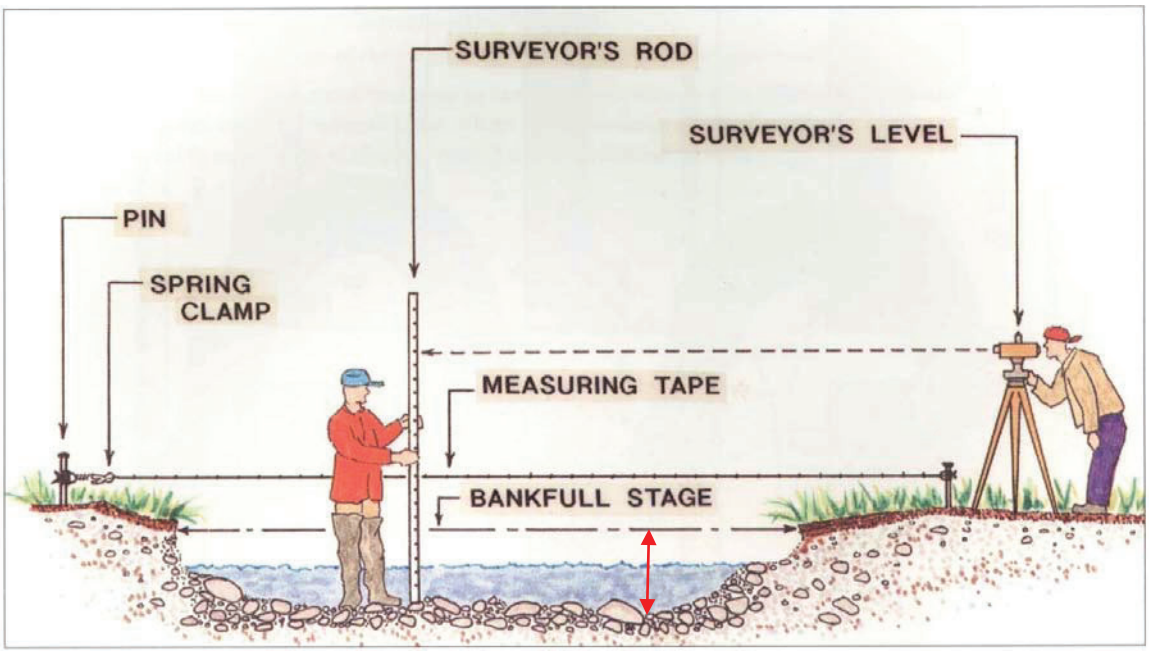

Figure 3: Measuring a stream channel cross-section

In the above diagram:
bankfull width is the distance between the banks at bankfull stage (dashed arrow)
maximum bankfull depth is the difference in elevation between the bankfull stage and the deepest part of the cross section (red arrow)
bankfull depth or *mean depth* is the cross sectional area at bankfull divided by the bankfull width. See step 7 for detailed instructions on calculating mean depth.

In Wisconsin, the bankfull elevation is roughly the water elevation during the 1.2 year discharge. The bankfull elevation is the same as the ordinary high water mark (OHWM). In many channels this is the point where water begins to flow out onto its floodplain. Since floodplains may be small or inconspicuous in some stream types where the floodplains are naturally indistinct, it is important to verify correct identification of the bankfull surface by checking it against the 1.2 year discharge. Your geologist or engineer can provide assistance in determining the bankfull elevation and bankfull discharge and return interval. Several methods of determining bankfull discharge are provided in NEH 654, Stream Restoration Design, Chapter 6, Stream Hydraulics, Wisconsin Supplement, **Hydraulics for Design.**

Discharge can also be found indirectly by using Manning's equation to find the velocity and then multiplying that by the cross sectional area. Several methods of determining Manning's n are provided in NEH 654, Stream Restoration Design, Chapter 6, Stream Hydraulics, Wisconsin Supplement, **Hydraulics for Design.**

3. Determine the entrenchment ratio.

Determine the floodprone elevation and measure the width. To find the floodprone elevation, take the maximum depth from the bankfull elevation to the stream bed and multiply by 2. Measure the width at the floodprone elevation. Divide the width at the floodprone elevation by the width at bankfull elevation to determine the Entrenchment Ratio. The floodprone elevation roughly represents the water elevation during the 50 year discharge.

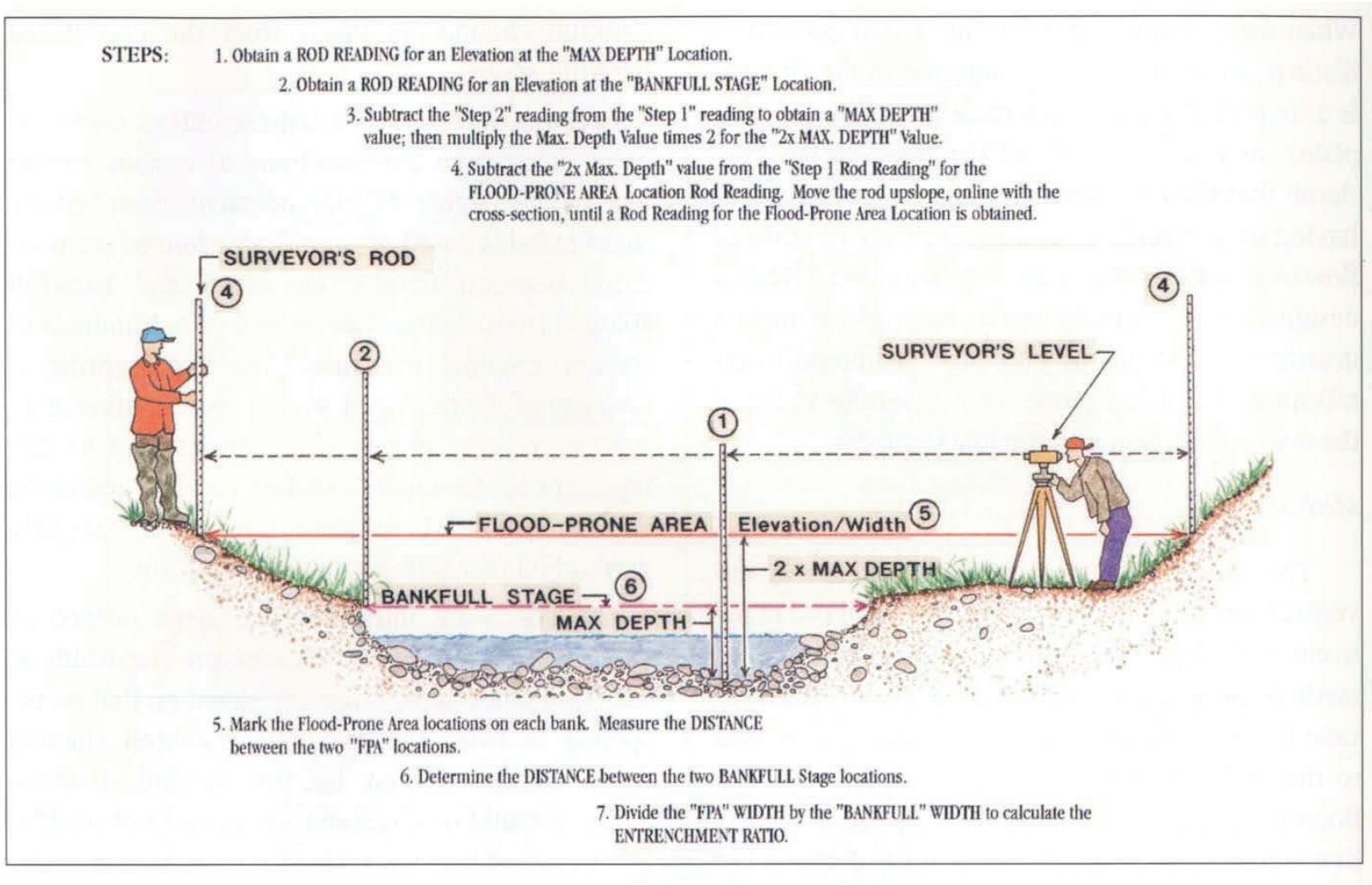

Figure 4: Floodprone width and Entrenchment Ratio

4. Measure the water surface slope (gradient).

Slope is measured between two bed features of the same type (top of riffle to top of riffle or center of pool to center of pool). Measurements should be accurate to the hundredths level because stream gradients are often low. Wisconsin has many “C” and “E” stream types which tend to have flat gradients in the range of 0.001 to 0.0001 feet/feet. Be sure to measure a reach that is long enough - at least 20 times the width at bankfull.

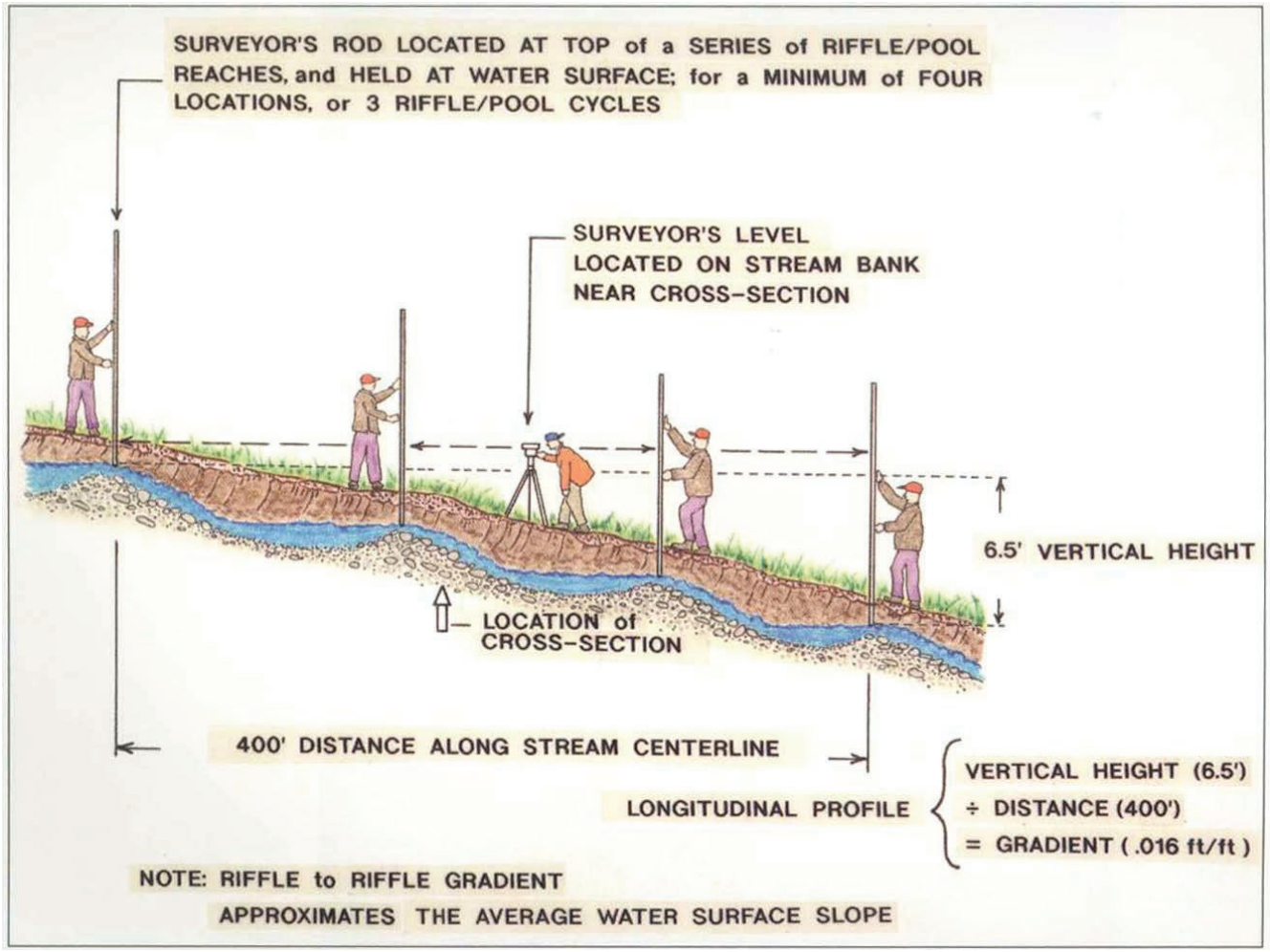

Figure 5: Measuring stream gradient through a typical riffle/pool sequence

5. Measure the sinuosity of the stream.

For small streams, this can be done with a tape measure. Measure the length along the stream and measure the length of the valley for the same reach of stream. In other cases, these measurements can be made using an aerial photo.

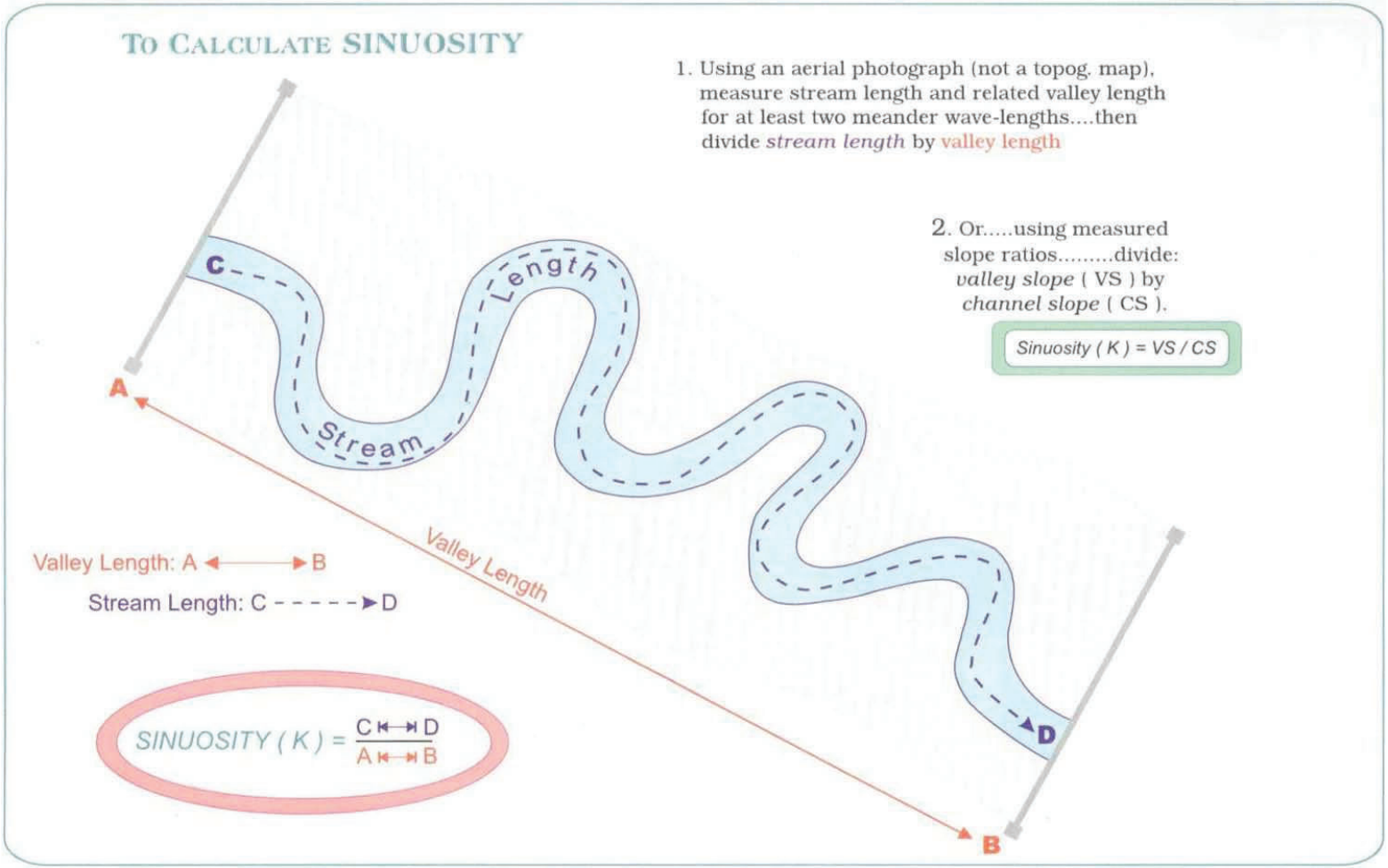

Figure 6: Channel Sinuosity Calculations

6. Pebble Count.

Take a pebble count of the material in the active channel. First, determine the percentage of the reach in pools and the percentage that is riffles. Take ten measurements at ten different locations as shown below. Calculate the D50 particle size.

Pebble count data can be taken on Wisconsin Job Sheet 810, Pebble Count ftp://ftp-fc.sc.egov.usda.gov/WI/jobsheets/js-810.pdf. If desired, pebble count data can be entered into the free Ohio DNR STREAM Modules developed by Mecklenburg and others Stream Morphology - Modules. The spreadsheet will plot the pebble count and determine D50 for you.

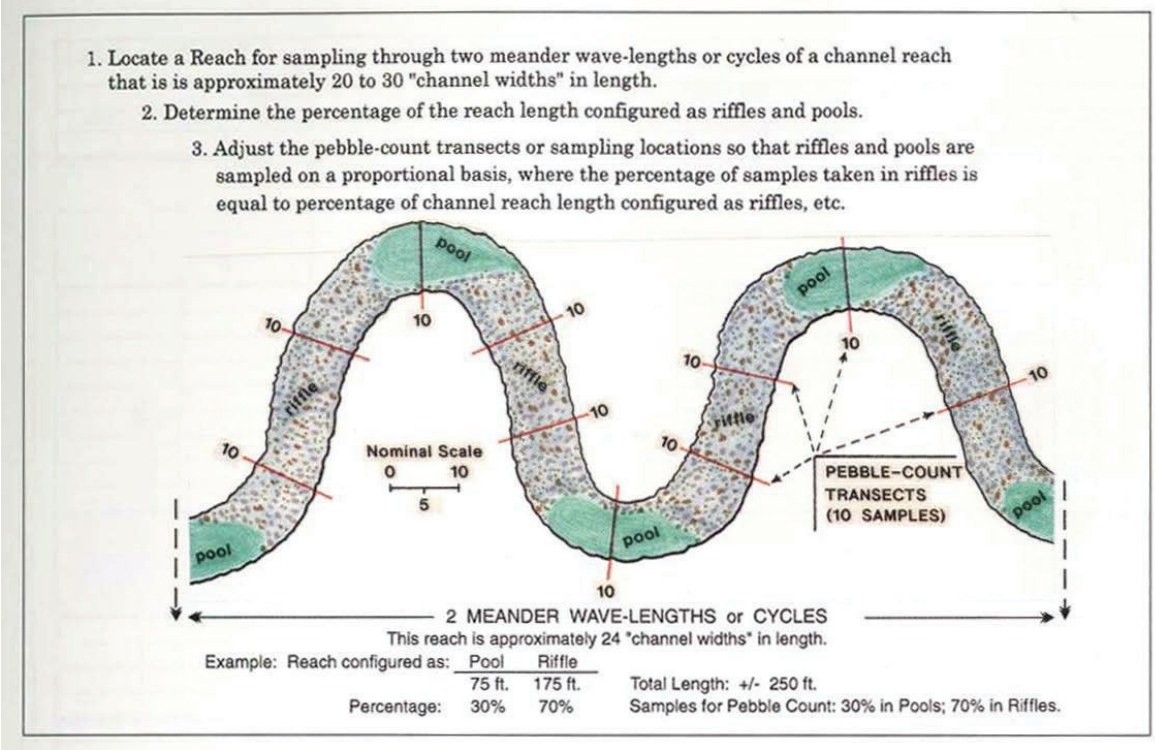

Figure 7: Pebble count procedure

Figure 8: sand gage

7. Mean Depth (Bankfull Depth)

Find the mean depth at bankfull. Determine the area of the cross section. It may be easiest to divide the cross section into cells and compute the area of the cells and then add the areas of the cells together. Area can also be found by plotting on grid paper and counting squares or calculating on a CAD system or using the Wisconsin spreadsheet Area By Coordinate Method . ftp://ftp-fc.sc.egov.usda.gov/WI/engcad/Spreadsheets/Area-By-Coordinate-Method.xls. Divide the area by the width to get mean bankfull depth (d_{bkf}).

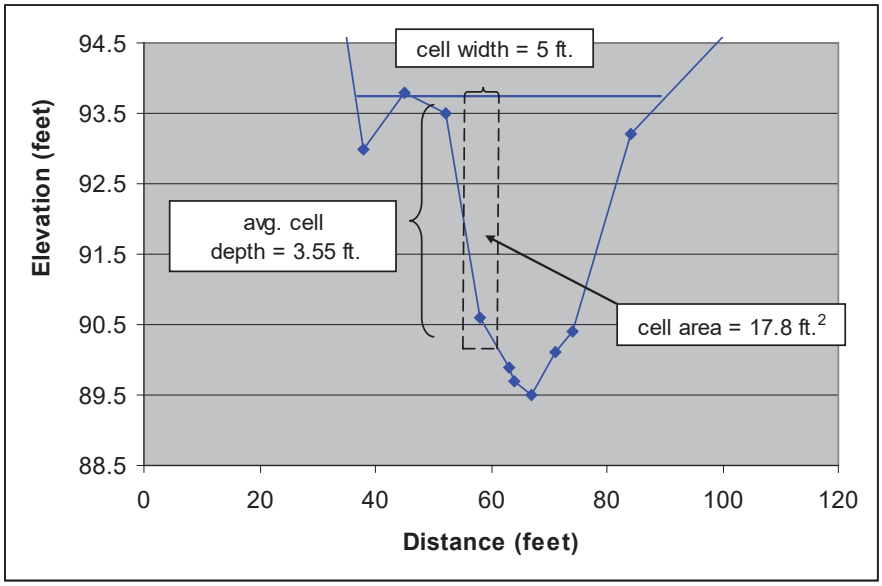

Figure 9: Area calculation of an individual cell

8. Use the key to classify the stream.

Wisconsin Job Sheet 811 Stream Channel Classification can be used to enter reach data for classification js-811.pdf on ftp-fc.sc.egov.usda.gov.

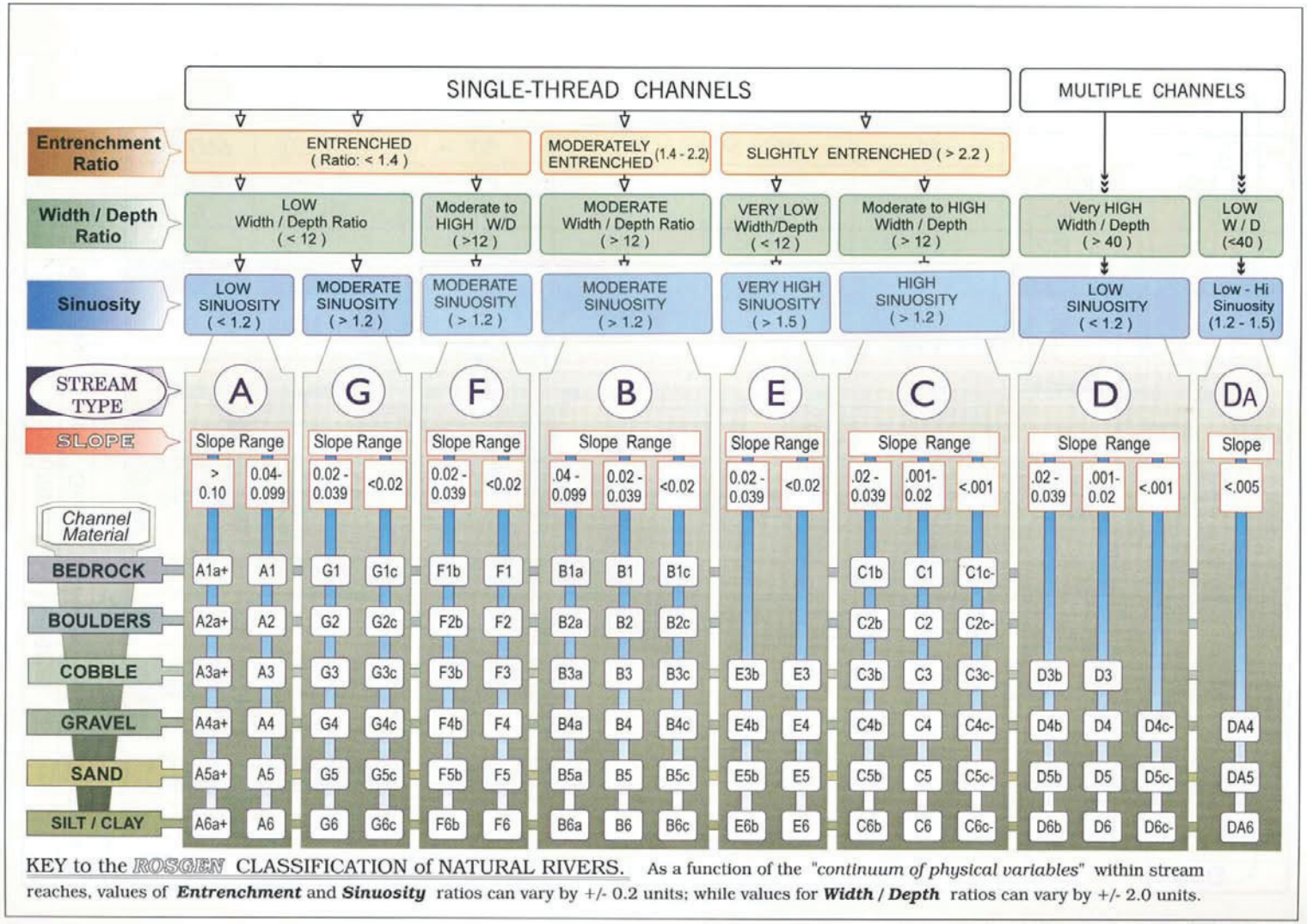

Figure 10: Stream Classification Key