United States Department of Agriculture

Natural Resources Conservation Service
CONSERVATION PRACTICE STANDARD

STREAMBANK AND SHORELINE PROTECTION

CODE 580

(Ft.)

INITIAL REVIEW – Comments and Responses

Drafted technical standard text (as sent for Initial Review) is in black and blue fonts. National minimum requirements are in black font; Wisconsin specific criteria is denoted with blue font.

Comments are in red, preceded by comment number (**C#**). To find a specific comment number, search for that number using "Ctrl + F" (Windows) or "Command + F" (Mac).

Responses to comments are in green italics.

Changes to standard text are in tracked changes.

General Comments

C1: I think there needs to be more explicit discussion that streambank stabilization can mean different things and that lateral migration is a natural process and response to flooding and upstream inputs and changes. Clearly there is a need to have engineering standards where there is a clear goal of no lateral migration due to infrastructure/landowner constraints. But in all other cases, there should be encouragement for dynamism and - at the very least - design for an erodible stream corridor.

RESPONSE: Thanks for your comments, this has been discussed by the team and has also been an issued addressed by a subcommittee of the NRCS State Technical Committee. These are technical criteria that lead up to a practice implementation. This standard is for design guidance for the streambank protection practice once that is the chosen alternative.

C22: I am not certain how the process of lateral migration should be viewed and managed. Loss of structures and land need to be addressed. Streams laterally migrate. We armor bends and anchor stream sites or reaches. Perhaps from a watershed-scale perspective this is insignificant. Presumably hydrogeomorphologists have reported on this issue and I wonder if there is some degree of consensus and this understanding is recognized in NRCS policy. Having walked many stream miles across the state I see what seems to me a significant number of rip-rap efforts that have failed in various ways or just moved the problem downstream to the next unprotected bank.

It's understood that bank erosion is commonly a symptom of often more diffuse upstream problems. Addressing symptoms may sometimes be necessary, but I believe more thought should be given on trade-offs of treating symptoms versus root problems or using preventative measures, not only from cost and environmental perspectives but also long-term efficacy to respond to changing meteorological and resulting hydrological and hydraulic conditions.

Seems like the primary tool identified in this guidance is rip-rap. If this is the only guidance on shoreland protections it would be good to promote opportunities to apply natural/native upstream practices in additional to traditional soil and water conservation practices to reduce downstream stormwater volumes and velocities. I think stormwater infiltration and resulting soil conservation practices should be employed to the greatest extent practical first to address the problem and if needed some lesser amount of spot treatment of symptoms. Are assessment tools available to identify at-risk waters before they reach the point of needing bank armoring.

The land-water interface highly biologically-rich environment and needs to be given disproportionately greater attention in reducing human disturbance. As our wild lands dwindle and become more fragmented, riparian corridors become increasingly important wildlife pathways, another reason these ectones should be given much greater attention and afforded protection.

RESPONSE: See response to Comment C1. There are a lot of good points from a planning perspective that should be discussed outside of the 580 standard. This practice design standard cannot address policy or planning of other upland conservation practices or watershed approaches.

C57: [Same comment to CPS 582] There is variability with NRCS engineers and Techs as to whether projects qualify, design modifications and adaptability to conditions not addressed through Rosgen adherence. As with any water project there are many variables to consider not addressed within a manual that can impact a projects' success and longevity.

RESPONSE: The team recognizes the variability in staff experience and site conditions. Attempts were made to identify critical sites for additional evaluation along with providing guidance that is thorough yet not so rigid to allow some flexibility in design procedures to account for this variability.

DEFINITION

Treatment(s) used to stabilize and protect banks of streams or constructed channels and shorelines of lakes, reservoirs, or estuaries.

PURPOSE

This practice is used to accomplish one or more of the following purposes:

- Prevent the loss of land or damage to land uses or facilities adjacent to the banks of streams or constructed channels and shorelines of lakes, reservoirs, or estuaries. This includes the protection of known historical, archaeological, and traditional cultural properties.
- Maintain the flow capacity of streams or channels.
- Reduce the offsite or downstream effects of sediment resulting from bank erosion.
- Improve or enhance the stream corridor or shoreline for fish and wildlife habitat, aesthetics, or recreation.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to streambanks of natural or constructed channels and shorelines of lakes, reservoirs, or estuaries susceptible to erosion. It does not apply to erosion problems on main ocean fronts, beaches, or similar areas of complexity.

This standard does not apply to protection along open and unprotected shorelines of the Great Lakes.

~~This standard does not apply to protection of streambanks with watersheds greater than 390 square miles under NRCS programs. Refer to the Wisconsin NRCS supplement to the National Engineering Manual, Part 503.71.~~

C53: This appears to be a policy statement and I recommend that it be removed. This statement will affect landowners previously served by this standard, why the change? What is the significance of this that would prohibit technical assistance to landowners in these situations?

*RESPONSE: This is NRCS national policy and applies to projects **under NRCS programs**. This paragraph will be moved to an NRCS policy document.*

C62: This refers to an agreement between the Army Corps and NRCS. Dams with watersheds that are greater than 390 square miles are US Army Corps jurisdiction and dams/impoundments with less are NRCS. How does this apply to rivers and streams? Does this mean that we would not be able to work on the larger and slower moving bodies of water like the Pecatonica, the Rock, the Fox or the Chippewa? If so, please remove those lines.

*RESPONSE: This is NRCS national policy and applies to projects **under NRCS programs**. This paragraph will be moved to an NRCS policy document. NRCS programs cannot be used for sites on the larger rivers mentioned. The policy originated in the watershed manual, but a WI NRCS management decision has been made not to work on rivers with drainage areas that exceed our statutory watershed authority of 250,000 acres. Watershed activities that exceed 250,000 acres are deferred to the Army Corps of Engineers. We are using the authorities above to draw a line in addressing resource concerns under Farm Bill programs.*

If a single site exceeds 500 feet, or the combination of existing and planned protection exceeds 1,000 feet in a ¼ mile reach (includes both sides of the stream), complete the additional site assessment found under Open Channel (Code 582), Additional Criteria for Stream Restoration. Apply this practice as a component of stream restoration and address all identified channel impairments to the extent practicable.

C9: Does the 500 ln ft and 1,000 ln ft in a ¼ mile include both banks treated with protection such as rock rip rap and those that are shaping only to slopes at 3:1 and flatter? For example 300 ln ft of rock riprap and 200 ft of shaping would be a total of 500?

RESPONSE: Yes. It includes both banks; clarification added. the team spent time trying to make this clear. The 500'/1000' applies only to banks with structural protection (not just vegetation).

C23: Is this ["1,000 feet in a ¼ mile reach"] linear feet or area? What does "reach" mean here?

RESPONSE: 1000' feet in this case is linear feet of protected bank. The ¼ mile reach refers to the linear stream length measured at the stream/river centerline in the area of the project.

CRITERIA

General Criteria Applicable to All Purposes

Plan, design, and construct this practice to comply with all Federal, State, and local laws, rules, and regulations. The landowner must obtain all necessary permissions from regulatory agencies, or document that no permits are required. The landowner and/or contractor is responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

C24: Add that landowner "must attest and certify" that no permits are required.

RESPONSE: This is similar to national language in multiple standards but not "attest and certify". The requirement is there to comply with all rules and regulations and NRCS plan drawings have notations to put that burden on the landowner.

The landowner is responsible for ~~addressing pollutant or~~removing hazardous materials or point source~~s~~ pollution (e.g. septic discharge ~~systems~~) within the work limits and attaining regulatory compliance prior to the construction of stream and shoreline protection.

C25: This is worthy of an example, or of specific listings of regulatory agencies that could demand compliance. Further, it seems that one of the more common development pitfalls occurs when a

regulatory agency – not initially identified in the project interdisciplinary team – requires a habitat study, that was not originally anticipated at project onset.

RESPONSE: Some text was clarified and the septic system discharge provided as one example. The intent was to not ignore blatant or obvious violations such as a discharge pipe directly to the stream.

C54: Consider rephrasing ["pollutant or point sources"].

RESPONSE: Thank you, text was clarified.

C63: Does this include nutrients from crop fields? How are pollutants and point sources to be addressed? How is this to be assessed? Who specifically is this regulatory compliance referring to? (DNR, NR151, septic systems, etc)?

RESPONSE: Nutrient runoff from crop fields is considered non-point source pollution. This is intended to address obvious point sources.

Do not use construction demolition for streambank and shoreline protection, e.g. concrete, asphalt, blocks, bricks, etc.

C31: Why no heading called site assessment?

RESPONSE: The site assessment and management assessment are familiar sections of many of our practice standards. Because of the new standard formatting, it isn't as easy to edit or add sections, and is often not possible. The new standard criteria is less extensive than the previous standard and the additional headings didn't seem necessary. Management and site assessment are included in the same area in this standard.

Assess unstable streambank or shoreline sites in enough detail to identify the causes contributing to the instability. The assessment should provide details necessary for design of the treatments and convey reasonable confidence that the treatments will perform adequately for the design life of the measure. If the failure mechanism for a streambank is a result of the degradation or removal of riparian vegetation, if possible, implement stream corridor restoration, along with bank treatment.

Causes of instability include—

- Livestock access;
- Watershed alterations resulting in significant modifications of discharge or sediment production;
- In-channel modifications such as gravel mining;
- Head cutting;
- Water level fluctuations; and
- Boat-generated waves.

C64: These seem very narrow. Where does bank failure due to cohesionless silts/sand horizons come into play?

RESPONSE: This national language that cannot be edited. More specific discussion on causes of instability are included later in the WI language on site assessment.

Design streambank and shoreline treatments that are compatible with—

- Existing bank or shoreline materials;
- Planned improvements or improvements installed by others;
- Water chemistry;
- Channel or lake hydraulics; and
- Slope characteristics above and below the water line.

Avoid adverse effects on—

- Endangered, threatened, and candidate species and their habitats;
- Archaeological, historical, structural, and traditional cultural properties; and
- Existing wetland functions and values.

Design treatments that result in stable slopes based on the bank or shoreline materials and the type of measure proposed. Account for anticipated ice action, wave action, and fluctuating water levels. Ensure that installations are protected from overbank flows from upslope runoff and flooding. Include internal drainage where bank seepage is a problem. Use geotextiles, designed filters, or bedding to prevent piping or erosion of material from behind the treatment. Anchor end sections into existing treatments or existing stable areas. Refer to NRCS NEH, Part 633, Chapter 26 for design of granular filters.

Geotextile, granular filters, or bedding is not required to prevent piping or erosion of material from behind rock riprap protection under all of the following conditions:

C28: This is a little confusing. Is it any one of these options or all to eliminate the need for Filters?

RESPONSE: Thanks for your comment, text was clarified. The intent is that all conditions would need to apply to eliminate the need for a designed filter.

- Minimum thickness of the rock riprap layer is three times the D_{50} stone size
- Seepage is not evident during the soils investigation
- Soil base is cohesive i.e. no substantial layers of fine sand or non-plastic silt
- Soil base is free of organics and very soft clays

Revegetate all areas disturbed during construction in accordance with NRCS Conservation Practice Standard (CPS) Critical Area Planting (Code 342). If climatic conditions preclude the use of vegetation, use NRCS CPS Mulching (Code 484) to install inorganic cover materials such as gravel. Protect the area from livestock and human traffic until the site is fully stabilized.

Additional Criteria for Streambanks

C18: A lot of blue text has been added to this section which appears to involve more engineering and analysis. Maybe these specifics are required to complete the pre-existing (black ink) criteria. If not, I wonder if all these additions will increase complexity and time requirements for project development to the point that NRCS field staff complete less projects annually or avoid these standards/projects altogether which ultimately undermines the original intent of the program which is to assist landowners with conservation practices that protect their livelihood/investments while also protecting and improving environmental conditions. Is it possible that most of these additional analyses are best applied to the "Critical Sites" described below?

RESPONSE: The team spent quite a bit of time trying to figure out what the appropriate amount of data gathering and analysis would be required on projects of varying size and complexity. Currently, the requirements are very similar to the previous standard and for the majority of projects will not require significant additional time. The Critical Sites section requires additional evaluation for some sites that warrant it.

In addition to the assessment requirements under General Criteria, include the following information in the design report. Refer to WI NRCS Supplements to NEH, Part 650, Chapter 16 for assessment tools.

- List the landowner's objectives for protection, available materials for bank treatments, existing and desired riparian land use, willingness to carry out maintenance activities, and special conditions.

C2 // C19: This might be a good place to encourage the idea of deformability and stream

dynamism. Could you require them to list the landowner's willingness to have the stream laterally migrate? Or at least be willing to delineate an erodible stream corridor? That could open up a lot of opportunities for new designs to be implemented. // Do "special conditions" refer to things like who's responsible for spoils or tree/brush pile removal from the project site, providing access for heavy equipment, timing and extent of crop planting on fields adjacent to the project site (contractors need room to work and access project site, DNR permit requirements for work in trout streams is mid-May through mid-September – projects cannot be conducted outside of this time frame to accommodate crops), livestock access to project site (cows eat hay/straw used for mulch, trample post-construction stream banks), and fence removal and post-project fence restoration.

RESPONSE: Thanks for the comments, there are a lot of potential things to consider in this one bullet on the landowner's objectives. We tried to minimize the list to prevent a long list of requirements for each project. The criteria in the standard can't replace training and conservation planning with the landowner, which include alternatives. The key is to document those special conditions to justify and support measures specified in the plan.

- Determine the elevation of the bankfull discharge (i.e. channel-forming discharge or ordinary high water mark.) Bankfull flow is the discharge that fills a channel to an elevation where flow begins to spill onto the active floodplain. Bankfull flow can be identified by field indicators in alluvial channels that have adjusted to hydrologic conditions and sediment delivery. Over the long term, bankfull flow typically completes the most work in transporting sediment relative to the magnitude and frequency of other flows. Bankfull flow has a typical recurrence interval range of 1 to 3 years on an annualized frequency curve, with a predominance of values in the 1.2 to 1.8-year range, although exceptions may include urban areas, wetland streams, or settings influenced by colluvium or glacial features and
- Determine the elevation of the highest active floodplain bench.

C7: Somewhere around [this bullet], and again in the companion document can we get a more thorough definition of bankfull that emphasizes the vegetative component. I have been required by Area Office staff to install rip rap up to the elevation of the lowest floodplain because of this [bolded] line in the companion document: **"**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."** // **C29:** Bankfull is well defined in [CPS 582] but left vague in the 580. Should the same language be used in both? // **C32:** Why mention both bank full and ordinary high water mark? This expression of two terms apparently meaning the same thing in this context is confusing. In the NW bank full is often above the vegetation line on streams when hydrology and hydraulic tools are used for evaluation. Ordinary high watermark may be more helpful for lake shores than stream banks. // **C33:** I suggest requiring hydrology and hydraulic models be used exclusively to determine the bank full discharge for stream banks. With the large sediment loads in many streams and intense storm events the bank-full field indicators can be difficult to interpret or are misleading. // **C55:** Bankfull discharge is not always the OHWM. Consider rephrasing as it is confusing.

RESPONSE (C7, C29, C32, C33, C55): Thanks for the comments, the bankfull/OHWM definition and use in the standard were clarified.

- Description of bank erosion severity using both methods below. Refer to the WI Field Office Technical Guide, Section III >Planning Tools >Engineering for erosion calculations.

C6 // C10 // C65: Says "using both methods below". There are either 3 methods [below] or [one] should have a solid bullet point. // "Description of bank erosion severity using **both** methods below" 3 methods are listed. // There are 3 methods below, not 2.

RESPONSE: The requirements have varied throughout different team draft; text clarified to 2 options.

- Average annual rate of lateral migration (~~tons of soil loss~~feet/year) measured at the apex of the channel bend using historic aerial imagery over a period of 20 years. This method may be excluded, or the evaluation period abbreviated, if imagery is unavailable or obscured by canopy. In this case, use the estimated age of trees bordering each side of the channel.

  C66: The estimated tree age is not always a good way to estimate. The older air photos tend to be a bit grainy and hard to get an accurate distance when we are talking about a matter of say 18' to 24'. It's a big difference in the erosion calculator.

  RESPONSE: Estimating lateral migration can be difficult on sites and additional guidance is going to be needed for users of the standard to estimate this consistently.

- Bank Erosion Potential Index (BEPI) at the apex of the channel bend

- ~~Rosgen Stream Classification at a crossover location immediately upstream and downstream of the channel bend.~~

  C5 *//* **C34:** We occasionally install rip rap up to the first floodplain in order to protect something valuable. The results of a Rosgen analysis wouldn't ever influence this decision or cause us to consider grading and bioengineering. We could save some time if the standard included an exception to the Rosgen analysis if rip rap is installed up to or above the elevation of the lowest floodplain, on a single bend, under 500', where the rip rap is used to protect something of high value like a structure or a field road. *//* Brace yourself; I would seriously consider removing the Rosgen requirement. Most people are incapable of evaluating the results correctly and requiring it for each bend would be time consuming. There are nearly a hundred different stream classification systems and their value for information pertaining to stabilizing a stream-bank corner is questionable. The stream classification can even vary within property boundaries. I do see value in Rosgen stream classification for selecting fish habitat. Using our hydrology and hydraulic models ensure stability. Describing the stream evolutionary stage can be helpful.

  RESPONSE: The team had a lot of discussion about whether this should be included in the standard for sites less than 1000' of protection and agrees to remove Rosgen here. Text adjusted.

- Describe the channel evolutionary stage (i.e. down-cutting, widening, aggrading, or stable) and indications of future direction. Refer to NRCS NEH Part 654.0305(c).
- Describe the type and cause of streambank instability. Determine the type of bank failure such as a shallow slip failure, cantilever failure, or rotational shear failure. Describe causes of erosion such as concentrated flow around debris or sediment bars, seepage and soil piping, or high flow velocities along weak soil stratigraphy.

C67: Concentrated flow around debris is going to happen in flood events. How do we account for this in the design?

RESPONSE: This is a good comment/question. It is hard to design around debris accumulations, but it is identified as a potential cause of the original instability to help the design process account for the root causes of the erosion.

C68: These are inconsistent with causes of instability listed on page 2 [under "General Criteria Applicable to All Purposes"].

RESPONSE: Correct, the national language is quite generic, and the Wisconsin language

attempted to add additional items to consider in the assessment of the site.

C69: Do we have a Job Sheet developed to organize all of this information in one spot? WI Job Sheet 816?

RESPONSE: There are companion documents located in WI Supplements to the Engineering Field Handbook, Chapter 16 that have management and site assessment checklists. These may be updated at some point in the future to align with the new standard but will be completed after the standard is developed. There is a new WI design spreadsheet that will assist with stream classification: "Stream Classification – 4/29/2020."

Perform a soils investigation along the planned improvement. Log the soil profile from the top of high bank to a depth of stable substratum using the Unified Soil Classification System. Identify the location and elevation of soil layers with seepage. Classify the bedload material.

C35: Are you requiring documented soil logs at each treated bend here? Why not say at each planned improvement of something stated more clearly?

RESPONSE: The team discussed the required intensity for soil borings and intentionally left it vague to allow some designer discretion. Every bend may be excessive to log on some sites, so soils should be logged to be representative of the site and account for changes in soils over the length of the project.

Design streambank protection to be stable for all discharges from bankfull flow up to the 100-year flood or highest active floodplain bench. Estimate stream flows using the USGS Flood Frequency Characteristics of Wisconsin Streams or hydrologic models such as NRCS WinTR-20, WinTR-55 or USACOE HEC-HMS.

C36: Rephrase to: "*Estimate the discharges and stream flow stability from the bank full discharge elevation up to the 100 year flood or highest active flood plain. Estimate the channel cross section capacity and flow depths using the Flood Frequency for Wisconsin Streams hydrology model and shear stress*." Don't beat around the bush about using the hydrology and hydraulic models for the bank full determination but clearly state that they will be used and clearly state the stability model to be used.

RESPONSE: The wording notes that the stream flows need to be estimated and gives options for doing so. There are cases where the USGS Flood Frequency doesn't apply and other models would need to be used or may be more appropriate.

C58: Add "*Consider design in excess of 100 year event due to evolving climatic changes and projection of continued frequent extreme events*."

RESPONSE: Flows in excess of the 100-year event are likely inconsequential to the stability of improvements within the channel.

C70: Do we need to document why we are choosing a certain design flow? Bankfull is going to be different than the 100yr event, and if we need to design for all storms why document a specific storm event?

RESPONSE: The standard is asking the user to evaluate flows from the bankfull up to the 100-year event or highest active floodplain bench. This is because sometimes a lower elevation can cause the maximum shear stress or velocity based on the channel cross section. The designer should be designing for this flow that generates the maximum shear stress and documenting this elevation or flow.

C71: If we only stabilize the toe or to bankfull with rock, do need to document that the seeding/grass mix is stable? (5 fps or less in channel for 100 yr storm or to top of bank, depending on what is lowest)

*RESPONSE: Later in this standard, there is a requirement: "*Do not extend inert protection into areas where a stress analysis shows that vegetative establishment will protect the bank*". There should be documentation that the vegetation will protect the bank in this case.*

Use the shear stress method to design rock riprap, soil bioengineering, or other protection components. Use a minimum safety factor of 1.2 for stability design. Refer to WI NRCS Website >Engineering > Spreadsheets >Streambank Protection, or NEH, Part 654, TS-14C for stone sizing criteria.

C37: Are you removing the velocity method from our design tool box for stability? This paragraph doesn't mention the velocity method for determining stability and could sow confusion. You could mention using approved hydrology and hydraulic models for determining flow depths/channel capacity with shear stress as the exclusive tool to be used for stability. Slipping in this statement without qualifiers makes the design method unclear and vague.

RESPONSE: The team discussed requiring both the velocity and shear stress method. Most evaluations that have been done using the new design spreadsheet that uses both velocity and shear stress have found shear stress to be controlling. Rather than requiring that 2 analysis be completed, it was decided to just use the one that is likely the most limiting and eliminate velocity.

C72: Similar to the 1'-2' above ohwm.

RESPONSE: Currently many designers are using safety factors by increasing the minimum D50 size or taking the rock slightly higher than minimum required, this standard is just more explicit in calling for a minimum safety factor of 1.2 for the design.

Extend inert bank protection to the elevation of the bankfull flow~~discharge~~ or above. Limit structural treatment above the bankfull flow where vegetation establishment is adequate to stabilize the bank. ~~Do not extend inert protection into areas where vegetative establishment will protect the bank.~~ Use a minimum slope of 1.5 horizontal to 1 vertical for rock riprap, ~~articulated concrete mats, or other slope treatments;~~ 2:1 or flatter is recommended.

C8 // **C11** // **C38:** In a severely entrenched channel the difference between the OHWM and the lowest floodplain is substantial. Since line 135 now explicitly states that inert protection must be installed up to the bankfull elevation I feel it's important that the new standard also explicitly state that while bankfull could be the 1.2 year storm and it might be the lowest floodplain it is definitely the elevation below which grass will not grow. Our 580 standard has always lacked clarity about the vegetative component of the bankfull elevation and the vegetation is the most important part. A lot of rock has been wasted on a lot of streambanks because of this. // "Extend inert bank protection to the elevation of the bankfull discharge or above. Do not extend inert protection into areas where vegetative establishment will protect the bank." Bankfull should be defined. Is it the 1.2 yr storm, 1.8 yr storm, visual evidence in the field? // Rephrase to: "*Extend structural treatments that armor the toe to a minimum height of the bank full elevation as determined using approved hydrology and hydraulic models*." That is a clear design instruction. Using field identification of bank-full is impractical for most streams in the NW (in my opinion) since the field indicators and modeled bank-full determinations very rarely match.

RESPONSE: Similar to Comments C7, C29, C32, C33, C55, clarification of the bankfull language was added earlier in this standard to address these concerns. Permanent vegetation cannot be established below the bankfull elevation and therefore it is requiring inert protection in those areas.

C12: The comment of not extending inert protection where vegetation will protect. Is this only for conditions above the bankfull?

RESPONSE: Yes, it is recognized that permanent vegetation typically is not established below the bankfull elevation.

C39: Get rid of inert term and replace with structural treatments that armor the toe.

RESPONSE: The team changed some terminology to clarify.

C40: [Add] statement "*Do not extend structural treatment above bank-full into areas where vegetation*

establishment is adequate to stabilize the bank according to the shear stress evaluation of stability."

RESPONSE: Text clarified.

C59: Add to end of paragraph: "*If construction margin and spoil area is adequate, consider 4:1 to reduce shear and widen the flood cross section*."

RESPONSE: The standard provides design minimums. There is no basis to support the proposal that a 4:1 slope will substantially reduce shear, and in many circumstances there may be no reason to increase the flood cross section. Options could also be flatter than 4:1 or incorporate a bankfull bench or other options to do the same.

C73: What is considered "other slope treatments"? Is vegetation intended to fall under other slope treatments? Some counties are using vegetation successfully on steeper sites. If vegetation is intended to be excluded here more specific language is required.

RESPONSE: Other slope treatments would be some form of structural treatment and not vegetation only. Text adjusted.

Classify stream segments requiring protection according to a system deemed appropriate by the State. Evaluate incised segments or segments that contain the 5-year return period (20 percent probability) or greater flows for further degradation or aggradation.

C13: [First sentence] needs to be expanded to define what is being asked by the State, or removed.

RESPONSE: This is national language that cannot be edited. The site assessment guidance covers what is deemed appropriate by the state.

C41: Describe evaluation tools used for incised segments meeting this criteria.

RESPONSE: This is national language that cannot be edited. The site assessment guidance covers what is deemed appropriate by the state.

Do not realign the channel without an assessment of upstream and downstream fluvial geomorphology that evaluates the impacts of the proposed alignment. Determine the current and future discharge-sediment regime using an assessment of the watershed upstream of the proposed channel alignment.

Do not install bank protection treatment in channel systems undergoing rapid and extensive changes in bottom grade and/or alignment unless designing the treatments to control or accommodate the changes. Refer to Channel Bed Stabilization (Code 584). Construct bank treatment to a depth at or below the anticipated lowest depth of streambed scour.

Refer to NRCS NEH, Part 654, TS-14B, or USACE EM 1110-2-1601, Chapter 3, Section IV for scour calculations. At minimum, key the revetment at least two feet below the streambed or into stable substratum. Investigate the thalweg for at least 150 feet downstream to anticipate advancing headcuts or knickpoints.

C42: Strongly consider creating a companion document so technicians are able to easily determine and document the anticipated scour. At present it's generally considered the lowest elevation of the adjacent thalweg without a great deal of engineering computations.

RESPONSE: Thanks for the comment. This is a change in the new standard that will need some training and guidance for the field staff to efficiently implement.

Protect the upstream and downstream end of a revetment from flanking by bank erosion. Start and end the revetment at a stable anchorage point, such as a crossover or well-vegetated bank. Consider the potential for lateral channel migration in determining the appropriate keyway depth. Key the ends of articulated concrete mats or gabion-type revetment at least 4 feet into the bank. Key the ends of a rock

riprap revetment at least 2 times the blanket thickness into the bank--a minimum length of 4 feet on each end.

C60: Add: “The frequency of eventual scour at the end of hard armoring is common. Use of stream barbs (per line 182) to moderately center the thalweg can alleviate this probability.

RESPONSE: This is one option that can help in some situations, but would not be required in all situations.

Stabilize toe erosion by treatments that redirect the stream flow away from the toe or by structural treatments that armor the toe. Where toe protection alone is inadequate to stabilize the bank, shape the upper bank to a stable slope and establish vegetation, or stabilize with structural or soil bioengineering treatments.

C43: Rephrase to "*Stabilize toe erosion using treatments that redirect the stream flow away from the toe or by structural treatments that armor the toe to a minimum height of the bank full elevation*."

RESPONSE: This is national language that cannot be edited. Your comments are reflected in previous language on stabilizing the toe.

Shape the vegetated portion of banks to a slope of 3 horizontal to 1 vertical or flatter. A 2:1 slope is acceptable for short reaches where physical structures, roadways, utilities, or property lines restrict space.

C74: I believe the critical area seeding standard (342) references 2:1. Again, should there be a specific slope limit for vegetated bank sections?

*RESPONSE: This criteria in CPS 580 is consistent with CPS 342 and also provides flexibility in small areas as needed. Note, the CPS 342 section on **Bank and Channel Slopes** indicates “A combination of vegetative and structural measures may be necessary on slopes steeper than 3:1 to ensure adequate stability.”*

C75: Some of the turf-reinforced blankets do a fantastic job holding up to shear stress. Should we allow more flexibility here by referencing the DOT Product Acceptability List channel matrix guide?

RESPONSE: There are many design guidelines available for this. The design requirement is that the vegetated banks are stable to anticipated shear stress. Turf reinforced blankets may allow some banks with higher shear stress to be treated with the blankets and vegetation rather than rock or other structural measures.

To the extent possible, retain or replace habitat-forming elements that provide cover, food, pools, and water turbulence. This includes stumps, fallen trees, debris, and sediment bars. Only remove these stream habitat elements when they cause unacceptable bank erosion, flow restriction, or damage to structures.

Design treatments to remain functional and stable for the design flow and sustainable for higher flow conditions. Evaluate the effects of changes to flow levels compared with the preinstallation flow levels, for low and high flow conditions. Ensure treatments do not limit stream flow access to the floodplain. Do not design treatments that result in negative offsite impacts such as increased channel or bank erosion downstream.

C14: What methods are being used to evaluate the effects of changes to flow levels?

RESPONSE: This is national language. This is a reminder that changing the cross section by adding rock or other structures can have impacts to flow levels upstream and potential impacts downstream. Modeling software may be used on larger more complex projects to evaluate how the changes will impact water levels.

C76: What is defined as sustainable? How is the designer expected to evaluate the effects of flow levels? Providing a specific tool as an example here would be helpful.

RESPONSE: Sustainable means the practice should be able to last for the practice lifespan under the design conditions. Modeling software may be used on larger more complex projects to evaluate how the changes will impact water levels. For less complex projects, consider what changes in the constructed cross section or elevation of the bed may cause.

Evaluate the impact of flow-changing techniques (e.g. stream barbs) on the opposite bank. If the opposite bank is under different ownership, consult with the landowner about potential impacts. Refer to NRCS NEH, Part 650, TS-14H for flow-changing techniques.

Critical Sites. The following sites present a high risk of failure and require further analysis of the potential failure modes to ensure a stable design.

- Water surface slopes (energy grade line) > 0.8 percent

  C77: Where is this number derived from? What is the methodology behind 0.08%? Is this riffle to riffle (localized) or the entire site?

  RESPONSE: This number was derived from the team and their collective experiences. There were lots of examples provided on streams where there has been damage to projects and excessive bed load movement and the group was comfortable with the slope of 0.8% as a cutoff. This would be the design slope for a project which is typically the entire site unless there is a steeper portion of the project the designer is using for a design slope. Should be measured consistently on features, such as top of riffle to top of riffle.

- Sites < 200 feet downstream from ~~below~~ a bridge or culvert crossing.

  C26: Does "below" mean underneath, or does it mean downstream?

  RESPONSE: The language means downstream and is changed for clarity.

- Entrenched channels (floodprone width to bankfull width ratio <1.4) and headwater channels with colluvium cobbles and boulders. These conditions are indicative of Rosgen Stream Types (A, F, G, and D) at crossover sections immediately upstream and downstream of the channel bend.

  C15 // C78: Is this assuming that all streambank protection projects that are under 1,000 ln ft in a ¼ mile or sites less than 500 ln ft will be evaluating the stream based on Rosgen? // Take out the Rosgen's, please. Companion Document 580-6 says Rosgen F can get by with minor grading. Is A being flagged because the erosion potential is very low-very high (companion document 580-14)? Ds are very high erosion potential too, but Da series is very low (580-14). Same with the Gs. G1-2 moderate, G3-5 very high. These sites should not require more engineering based solely on Rosgen's classifications. Rosgen's is an indicator, not a bible or tell all. How accurate is Rosgen when many sites have already been manipulated or are artificial streams? Also, oftentimes sites where Rosgen is used to evaluate a stream, local knowledge is needed to correct the stream type to account for lack of sinuousity, etc that is due to manipulation.

  RESPONSE: The team agrees that the Rosgen classification is just one tool and does not give certain answers. This is one way to evaluate the site for potential stability and for different treatment options. Clarification added.

- Banks with a ~~surcharge load (e.g.~~ building or infrastructure~~)~~ less than two times the bank height from the edge. Conduct a geotechnical investigation ~~according to NRCS NEH, Part 631,~~ and

evaluate the effects of surcharge load, seepage, and safety factors in ~~develop~~ a slope stability model. Investigation typically includes logging and sampling to the depth of a uniform, firm foundation for toe protection. It may also include soil testing: sieve analysis and Atterberg limits for Unified Soil Classification; in-place density and shear strength for slope stability. Refer to NRCS NEH, Part 631, Chapters 2 and 5 for Group B structures.

C17: A geotechnical investigation will be cost prohibitive unless the NRCS state geologist is able to provide this service.

RESPONSE: It is understood that a geotechnical investigation will cost additional money; the additional costs are needed in this instance to provide assurance that designs are adequate when protecting homes, valuable buildings or infrastructure. The geotechnical investigation requirement is considered the standard of care if buildings or infrastructure are in jeopardy. The types of buildings or infrastructure were not specified due to the broad spectrum of importance which can only be decided on a site by site basis.

C45: Does the geotechnical evaluation only apply to this bullet? Tell which slope stability model will be used or what it will include. In the past NRCS has rarely if ever done slope stability analysis for projects other than PL566 etc. See [Comment C44 below].

RESPONSE: Yes, the geotechnical evaluation is only for this bullet, unless there are unusual slope stability issues identified in the site assessment that would also warrant it. There are different ways of doing the slope stability analysis and will be done by those with experience so there isn't a need to specify the exact methodology.

C44: [For full Critical Sites list above] Since the evaluation has become too time consuming and complex for field technicians you could consider just excluding all critical sites falling under this criteria from the standard.

RESPONSE: This was considered by the team; however, not all critical sites will need extensive evaluation. Other sites that do require more evaluation can be done by state office staff or private engineers and would still allow the sites to be completed. If removed from the standard, we wouldn't have the ability to address any of the critical sites identified.

Flow at critical sites is often classified as nonuniform, rapid, or supercritical. Use a water surface profile model to evaluate a full range of flows to determine the location and magnitude of sudden changes in water surface elevation (i.e. hydraulic jumps); and to determine energy slope and shear stress for bank treatments and scour depth calculations. This hydraulic analysis may result in heavier revetment components, uniform rock gradations, flatter side slopes, or deeper keyways. Refer to USACE HEC-RAS software for flow modeling. Refer to rock sizing methods for hydraulically steep slopes ~~on the WI NRCS website >Engineering >Spreadsheets >Rock Chute,~~ or USACE EM 1110-2-1601, 3.7(e).

C16: Appears critical sites will have to be evaluated with HEC-RAS?

RESPONSE: The intent was the critical sites would need additional evaluation but this may or may not include a HEC-RAS model depending on the situation. The text refers to HEC-RAS and its associated capabilities. It does not explicitly require its use, but establishes a standard for evaluation.

C46: Who do you anticipate will complete the analysis? The private sector? I don't see field technicians easily doing the HEC RAS evaluation or any critical site designs due to time constraints and competence required. See [Comment C44] the critical sites section.

RESPONSE: Field staff would not typically be completing the analysis but would be able to gather data needed for the model. Private engineers and NRCS or DATCP engineering staff may be able to assist with modelling depending on program and technical assistance needs.

C79: Is HEC-RAS the only software we can use for flow modeling? There needs to be an acceptable

alternative method for this type of modeling.

RESPONSE: HEC-RAS is the main software that is available for this type of analysis. It is free and in the public domain.

C80: Are we going to use the rock chute spreadsheet to design rip rap? This is confusing and implies we are we not running the watershed and/or sizing the channel according to CFS, rock to velocity and side slopes to fit the site. Suggest rewording to "*Refer to rock sizing methods for hydraulically steep slopes in the WI NRCS website>Engineering>Spreadsheets>Gradation (Rock Chute-EFH Chapter 6) or USACE EM 1110-21601, 3.7(e).*"

RESPONSE: Agreed; the rock chute language was removed.

Additional Criteria for Shorelines

C20: Add something about shoreline habitat elements and replacement with stable, designed devices.

RESPONSE: There is language about habitat elements in this standard, located under the streambank specific criteria.

For the design of structural treatments, evaluate the site characteristics below the waterline for a minimum of 50 feet horizontally from the shoreline measured at the design water surface.

C27: Direction of required measurement is not clear – is it upstream-downstream or perpendicular to the shoreline?

RESPONSE: This is national language and cannot be changed. Because it is asking to evaluate the site characteristics BELOW the waterline, it would be perpendicular to the shoreline into the lake.

Base the height of the protection on the design water surface plus the computed wave height and freeboard. Use mean high tide as the design water surface in tidal areas. Limit revetments, bulkheads, or groins to no higher than 3 feet above mean high tide, or mean high water in nontidal areas. Key-in structural shoreline protective treatments to a depth that prevents scour during low water.

When using vegetation as the protective treatment, include a temporary breakwater during establishment when wave run-up could damage the vegetation.

In addition to the assessment requirements under General Criteria, include the following information in the design report.

- Landowner's objectives for protection, available materials for shoreline treatments, existing and desired riparian land uses, willingness to carry out maintenance activities, and special conditions.

C56: Add adjacent landowners use and or shoreline stability.

RESPONSE: The standard can't include criteria that constrains or depends on a neighbor.

- Elevation of the ordinary high water mark and range of lake level fluctuations.
- Height of watercraft waves and frequency of watercraft activity.
- Severity of shoreline erosion using average annual rate (feet per year) of shoreline recession with measurements from historic aerial imagery over a period of 20 years. This method may be excluded, or the evaluation period abbreviated, if imagery is unavailable or obscured by canopy.

Refer to NRCS Field Office Technical Guide, Section III >Planning Tools >Engineering for erosion calculations.

- Location, type, and quantity of existing shoreline protection within a ¼ -mile reach that encompasses the site. Describe the effectiveness or success of those treatments.
- History of ice action which may include interviews or evidence of ice sheet thickness and push up elevations.
- Lake designations: Areas of Special Natural Resource Interest (ASNRI), Outstanding Resource Waters (ORW), Exceptional Resource Waters (ERW), size and type of water body.
- Type and density of riparian vegetation and invasive species.

C47: Add erosion rates on adjacent properties as a bullet. I don't think it's a good conservation minded idea for a landowner to apply riprap on a property that becomes a point extending out into the lake since adjacent shoreline is receding. The Winnebago system is an exception to this rule since they are saving large wetland areas.

RESPONSE: The standard can't include criteria that constrains or depends on adjacent properties.

Perform a soils investigation along the planned reach of protection. Log the soil profile from the top of high bank to a depth of stable substratum. Use the Unified Soil Classification System. Identify the location, elevation, and soil layer(s) of observed seepage. Classify the littoral material.

Conduct a geotechnical investigation according to NRCS NEH, Part 631 Chapters 2 and 5 for Group B structures and develop a slope stability model if a ~~surcharge load (e.g.~~ building or infrastructure~~)~~ is located less than 2 times the bank height from the edge.

C48: Consider this situation a high hazard and exclude from the standard. NRCS hasn't typically done slope stability analysis.

RESPONSE: If these situations are excluded from the standard, they cannot be completed using the standard. This provides an option to adequately assess the situation and complete a protection project through this standard.

C81: Who is conducting this geological investigation and what does it entail? Is this going to require the NRCS Geologist completes all of these? Who would do the investigation if the site is state or county funded?

RESPONSE: Engineering staff from NRCS, DATCP, county or private engineers may all be capable of providing this service. Each project will be different as to the extent of investigation needed and who may be able to provide the service.

Provide lakeshore protection to the highest elevation of the following:

- OHWM plus the design storm wave height
- OHWM plus wave setup and run-up
- Height of watercraft generated waves
- Height of seep lines in the bank if not controlled by some other fashion

Use a bank slope of 3 horizontal to 1 vertical or flatter for revetments or vegetative treatments.

C82: Not consistent with 342. Per 342 Additional Criteria to Stabilize Stream and Channel Banks, Ponds and Other Shorelines, Earthen Features of Structural Conservation Practices "A combination of vegetative and structural measures may be necessary on slopes steeper than 3:1 to ensure

adequate stability." Suggest using this language instead.

RESPONSE: Although the language doesn't match CPS 342 exactly, the intent is the same. The 580 standard is calling for 3:1 on vegetated areas and 342 says you may need to add structural measures when over 3:1, which applies 3:1 or flatter would be considered stable with vegetation only.

If the site has a history of aggressive ice action, design rock riprap for the minimum size that will withstand the forces of wave action. The ice may move the rock, but the landowner can put smaller stones back more readily and reduce contractor expenses.

C49 // C83: Are there any side-slope recommendation for ice protection on lake shores that can be added here? What a good side-slope to cause ice to flow up and over rather than against the rock? Is that what we want to happen? // If it is aggressive ice action a landowner is not going to pick up that size rock and put it back. They will need equipment to move that size rock. What constitutes aggressive ice action and how do we know if it is occurring? Can this be defined?

RESPONSE: The lakeshore slope is a landscape-level topographic constraint that is rarely within the control of the planner.

Additional Criteria for Stream Corridor Improvement

Establish stream corridor vegetative components as necessary for ecosystem function and stability. The appropriate composition of vegetative components is a key element in preventing excess long-term channel migration in reestablished stream corridors. Establish vegetation on channel banks and associated areas according to NRCS CPS Critical Area Planting (Code 342).

Design treatments to achieve habitat and population objectives for fish and wildlife species or communities of concern as determined by a site-specific assessment or management plan. Establish objectives on the survival and reproductive needs of populations and communities, including habitat diversity, habitat linkages, daily and seasonal habitat ranges, limiting factors, and native plant communities. Develop the requirements for the type, amount, and distribution of vegetation using the requirements of the fish and wildlife species or communities of concern.

C50: Who is qualified to complete this plan? It might look good in the standard but from a practical standpoint who will do it at the local level? Are you expecting biologists to evaluate each site or the local field office staff? Our field office clients will not know what to do with this requirement without clarification. When you make a practice too complicated people stop doing it.

RESPONSE: This is national language that cannot be edited. This is recommending a team approach to stream corridor projects. There may be technicians that have enough experience to be able to assess all components or they may need assistance from a planner or biologist, which may be an external partner such as DNR fisheries.

C84: Who is this assessment or management plan to be completed by (NRCS, DNR, private Biologist/Ecologist)?

RESPONSE: This is national language that cannot be edited. This is recommending a team approach to stream corridor projects. There may be technicians that have enough experience to be able to assess all components on simpler projects or they may need assistance from a planner or biologist, which may be an external partner such as DNR fisheries.

C85: Why is habitat included in the 580 standard? How will this be perceived by reviewers if only some of the site (certain meanders) will be addressed with these habitat objectives? Can we take "habitat" out of 580? Just leave it in 395?

RESPONSE: The main objective of CPS 580 is streambank protection, but large projects can impact multiple things and vegetation and habitat need to be considered. This paragraph is asking for an assessment of the project on habitat, vegetation and fisheries. Specific design

criteria for habitat are included in CPS 395.

Design treatments to meet aesthetic objectives as determined by a site-specific assessment or management plan. Establish aesthetic objectives based on human needs, including visual quality, noise control, and microclimate control. Use construction materials, grading practices, and other site development elements compatible with adjacent land uses.

CONSIDERATIONS

When designing protective treatments, consider changes that may occur in the watershed hydrology and sedimentation over the design life of the treatments.

C86: It is very hard to predict watershed hydrologic changes in the future. What was intended when including this in the standard?

RESPONSE: We agree it is hard to predict the future, and this item is just under considerations. There are often predictable changes that can be foreseen and should be considered, such as development around a city/village/subdivision or changes in local farming practices such as sodbusting, or loss of dairy farms or CRP from a certain watershed.

~~The magnitude and duration of rainfall and streamflow events may have increased from historical averages due to climate change. Evaluate the bankfull discharge under more intense hydrologic conditions.~~

C3 // C30 // C51 // C87 // C100: You could also use this framing of climate change-driven intensification of flooding to encourage reasonable accommodation of lateral migration within an erodible stream corridor. **//** Can we define what is more intense? We talking velocity of the water, volume duration? **//** Describe evaluation tools such as hydrology and hydraulic models and a return period here. Field indicators may not be reliable to determine bank full. The low bank could be brought into the conversation. **//** What method are we using to evaluate more intense hydrologic conditions? There are so many different models out there that predict what the climate will do in the future and they all seem to show different results. **//** I am in agreement with the statement of with the obvious aspect of recent rainfall extremes and duration that are having such an impact on restoration and stabilization measures. In that vein of thought, potential presently subtle indicators of bankfull may be evolving to a greater elevation thus new or repaired restoration and stabilization measures would need to be reevaluated and addressed. Basing stabilization on historical bankfull indicators present without considering the apparent changes occurring in rainfall patterns may compromise the projects. Engineering beyond obvious present bankfull indicators may be realistically considered though may be difficult to justify following present construction standards and parameters.

RESPONSE: This statement was adjusted for clarification.

Incorporate debris removed from the channel or streambank into the treatment design when it is compatible with the intended purpose to improve benefits for fish, wildlife, and aquatic systems.

Use construction materials, grading practices, vegetation, and other site development elements that minimize visual impacts and maintain or complement existing landscape uses such as pedestrian paths, climate controls, buffers, etc. Avoid excessive disturbance and compaction of the site during installation.

Use vegetative species that are native and/or compatible with local ecosystems. Avoid introduced species that could become nuisances. Consider species that have multiple values such as those suited for biomass, nuts, fruit, browse, nesting, aesthetics, and tolerance to locally used herbicides. Avoid species that may be alternate hosts to disease or undesirable pests. Consider species diversity to avoid loss of function due to species-specific pests.

C52: Use native species only when stability is adequate and temporary cover crop or mulch are used. Introduced cool season species are established sooner and provide stabilization faster.

RESPONSE: This is a consideration and not a design requirement. You are correct that establishing natives on critical slopes of a protection project is risky and establishment needs to be considered. Other standards cover specific planning and criteria for vegetation.

C88: Native species are always the best in the long run. Unfortunately, native species establishment is more difficult and NRCS does not cover the additional cost for native seed and establishment. If native vegetation is used to stabilize the streambanks (above bankfull up to the top of the bank or 100 yr storm - whatever is lower), how do we account for increased susceptibility of bank erosion due to longer establishment times? It takes (1-2 years) for natives to establish, so how do we plan for slope stabilization measures if we encounter 5 fps or higher in the channel? Would we need to install additional erosion control measures, like erosion control matting, to account for this? It seems like we should take into account the difference in native vs introduced species establishment period.

RESPONSE: This is a consideration and not a design requirement. Other standards cover specific planning and criteria for establishment of vegetation.

Select plant materials that provide habitat requirements for desirable wildlife and pollinators. The addition of native forbs and legumes to grass mixes will increase the value of plantings for both wildlife and pollinators. Consider and refer to NRCS CPS Wetland Wildlife Habitat Management (Code 644).

Use treatments that promote beneficial sediment deposition and the filtering of sediment and sediment-attached and dissolved substances.

C89: What is beneficial sediment deposition? Can we spell out the difference between "beneficial" vs. "detrimental" sediment deposition?

RESPONSE: This is national language that cannot be edited. The planner is expected to understand what is beneficial.

Maintain or improve fish and wildlife habitat by including treatments that provide aquatic habitat in the treatment design and that may lower or moderate water temperature and improve water quality.

Stabilize side channel inlets and outlets, and outlets of tributary streams from erosion.

Maximize adjacent wetland functions and values with the project design to the extent practicable.

To maintain plant community integrity, exclude livestock during establishment of vegetative treatments and apply appropriate grazing practices after establishment.

Control wildlife during establishment of vegetative treatments. Use temporary and local population control methods with caution and within applicable regulations.

C90: This is difficult. Any tips on how to accomplish this?

RESPONSE: This is very dependent on the site, the species of concern and the abilities of the landowner to control. The key is to assess potential issues and try to determine if there are methods to address it.

When appropriate, consider establishing a buffer strip and/or diversion at the top of the bank or shoreline protection zone to help maintain and protect installed treatments, improve their function, filter out sediments, nutrients, and pollutants from runoff, and provide additional wildlife habitat.

Consider the perennial vegetation requirement (35' min.) under the Shoreland Zoning Code in the operation & maintenance plan.

C91: This is easier with easements and is not always practical.

RESPONSE: Correct, this is under considerations and not required because of this.

To the extent possible, excavate a floodplain bench to reduce the entrenchment ratio and stress on streambank protection measures. ~~Flatten point bars slopes opposite of the protected bank to allow the channel cross section to expand and contract with changes in the flow regime (i.e. deposit or remove bedload) in order to improve channel resiliency and reduce stress on protection measures.~~

C4: Yes! This is consistent with my previous comments.

RESPONSE: Text clarified to encourage floodplain connection and its benefits.

C21 // **C92** // **C93:** Good addition. May also want to consider additional stability measures for point bars and associated banks. Energy transferred during flood events from hard-armored banks can severely erode opposite banks. // Point bars, especially sandy ones, will come and go in flood events. Bars comprised of debris and rock tend to stay more stable and redirect flows. It seems more critical to shape the point bars above the ordinary high water mark to give highwater a place to spread out. // Is the DNR on board with removing point bars? Past experience with regional DNR staff indicates inconsistency with manipulation of point bars.

RESPONSE: Text clarified to encourage floodplain connection and eliminate specific reference to the point bar.

C61: Hard armoring of the outside meander would put stress on the inside meander at high flow regimes as the thalweg would migrate toward the opposite bank to some degree. Flatten and armor the point bar to establish the thalweg to ensure thalweg changes do not destabilize downstream areas?

RESPONSE: Text clarified/simplified.

Consider safety hazards to boaters, swimmers, or people using the shoreline or streambank when designing treatments. Place warning signs as necessary.

Consider installing self-sustaining or minimal maintenance treatments.

PLANS AND SPECIFICATIONS

Prepare plans and specifications that describe the requirements for applying the practice according to this standard. Include provisions to minimize erosion and sediment production during construction and provisions necessary to comply with conditions of any environmental agreements, biological opinions, or other terms of applicable permits. At a minimum, include—

- A plan view of the layout of the streambank and shoreline protection.
- Typical profiles and cross sections of the streambank and shoreline protection.
- If the planned treatment exceeds 300 feet, show a profile view along the ~~improved~~ channel reach to be improved. Include the thalweg, top of high bank, bankfull elevation, vertical extent (top and bottom) of treatment and other planned structures. Include soil logs and seepage locations.

C94: Some of these streams are very dynamic. If they are functioning properly, the channel profile will change with any sizable storm event. It may even change during or before construction. This additional profile requirement should be removed because it is not very helpful in the design or construction phase.

RESPONSE: The profile view is helpful in design review and construction.

C95: Should “improved channel reach”… be “channel reach to be improved”?

RESPONSE: Thanks for the comments; since the reach has yet to be improved, your language is better.

- Structural drawings adequate to describe the construction requirements.
- Requirements for vegetative establishment and mulching, as needed.
- Safety features.
- Site-specific construction and material requirements, e.g. rock and bedding/filter gradations.
- Work limits --- extent of protection, ingress and egress locations for construction equipment, parking areas, borrow and spoil locations, areas of habitat requiring protection or avoidance (e.g. wetlands, regulated floodplains, riparian and upland areas, instream habitat), property lines, and buried/overhead utilities.

C96: Will a Diggers Planning locate now be required? Or, are we just talking about what is visible based on pedestals and power boxes? Also, who is responsible for properly locating “avoidance” areas? We can pull data from the DNR for wetlands, or from FEMA for floodplains, but the designer is not necessarily trained to locate these boundaries in the field. And, retaining a professional to field locate these might delay the project for a year. The same holds true for property lines. Can technicians be provided some general “liability protection” as it pertains to these “avoidance” areas” and property lines. Liability ultimately falls on the landowner. Can we leave these questions/decisions up to the landowner?

RESPONSE: None of these items are a change over what is currently required or being done, and should be part of the construction plan. Diggers Planning locates may be helpful on some sites, but would not be required, just known utilities. Avoidance areas have been identified in the past through assistance with NRCS wetland specialists and DNR staff. We need to help plan the projects so the contractor is aware of potential issues, sites with critical wetland, floodplain, or property boundary issues should seek assistance from those with proper expertise in that area.

- Pollution control, e.g. staged construction, floating silt curtains, silt fences, erosion control wattles and logs.

C97: Installation of temporary erosion control methods on these sites is very difficult. And, oftentimes they are not practical.

RESPONSE: Traditional construction site erosion control techniques are difficult on many streambank projects. However pollution control needs to be considered and any appropriate measures should be utilized.

C98: Can we add temporary diversions, sediment traps, and rock check dams to this list? These work well and are currently used by many contractors.

RESPONSE: The list suggests that many techniques are available. Temporary diversions, sediment traps, and rock check dams are not typically used to remediate in-stream construction disturbances.

C99: Also, if certain erosion control practices are required as part of the Chapter 30 permit it should be clarified that those provisions will be enforced by the authorizing agency.

RESPONSE: Thanks for the good comment. The standard has consistently tried to avoid specific language on pieces that are regulated by others because something will be missed. In general, the project must follow all laws and regulations. It is a good idea to emphasize required items versus recommended ones in specific plans.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan for the operator. At a minimum, include—

- Instructions for operating and maintaining the system to ensure it functions properly.
- Periodic inspections and prompt repair or replacement of damaged components.
- Periodic inspections and prompt repair of erosion.
- Instructions for maintaining healthy vegetation, when required.
- Instructions for controlling undesirable vegetation.

REFERENCES

USDA NRCS. 1996. National Engineering Handbook (Title 210), Part 650, Chapter 16, Streambank and Shoreline Protection. Washington, D.C. https://directives.sc.egov.usda.gov/

USDA NRCS. 2008. National Engineering Handbook (Title 210), Part 654, Stream Restoration Design. Washington, D.C. https://directives.sc.egov.usda.gov/

USDA NRCS. 2010. National Engineering Handbook (Title 210), Part 653, Stream Corridor Restoration: Principles, Processes, and Practices. Washington, D.C. https://directives.sc.egov.usda.gov/

USDA NRCS. 2017. National Engineering Manual (Title 210). WI Supplement. Washington, D.C. https://directives.sc.egov.usda.gov/

USDA NRCS. 2012. National Engineering Handbook (Title 210), Part 631, Geology. Washington, D.C. https://directives.sc.egov.usda.gov/

USDA WI NRCS. 1996. National Engineering Handbook (Title 210), Part 650, Chapter 16, Streambank and Shoreline Protection. WI Supplements https://www.nrcs.usda.gov/wps/portal/nrcs/site/wi/home/ > Engineering > Engineering Field Handbook, Part 650 > Chapter 16.

USDA NRCS. 2008. National Engineering Handbook (Title 210), Part 633, Chapter 26, Gradation Design of Sand and Gravel Filters. Washington, D.C. https://directives.sc.egov.usda.gov/

USDA WI NRCS. Website https://www.nrcs.usda.gov/wps/portal/nrcs/site/wi/home/ > Engineering > Spreadsheets > Streambank Protection.

USDA WI NRCS. Website https://www.nrcs.usda.gov/wps/portal/nrcs/site/wi/home/ > Field Office Technical Guide > Wisconsin > Section III > Planning Tools >Engineering.

Design of Rock Chutes, K. M. Robinson, C. E. Rice, K. C. Kadavy; Transactions of the ASAE: Vol 41(3): 621-626. WI NRCS website https://www.nrcs.usda.gov/wps/portal/nrcs/site/wi/home/ >Engineering >Spreadsheets >Rock Chute.

USDA NRCS. 2016. User Guide. Windows Technical Release 55 (WinTR-55) Version 1.00.10. Watershed Hydrology. Washington, D.C. https://directives.sc.egov.usda.gov/

USDA NRCS. 2016. User Guide. Windows Technical Release 20 (WinTR-20) Version 3.20.0. Project Formulation Hydrology. Washington, D.C. https://directives.sc.egov.usda.gov/

USACE. 1991. Engineering Manual No 1110-2-1601, Chpt. 3, Sec. IV, Hydraulic Design of Flood Control Channels. https://www.publications.usace.army.mil/USACE-Publications/Engineer-Manuals/?udt_43544_param_page=2

USACE. 2020. Hydrologic Engineering Center, River Analysis System (HEC-RAS) Software, Version 6.0. https://www.hec.usace.army.mil/software/hec-ras/documentation.aspx

USACE. 2020. Hydrologic Engineering Center, Hydrologic Modeling System (HEC-HMS) Software, Version 4.7.1. https://www.hec.usace.army.mil/software/hec-hms/downloads.aspx

USGS. 2003. Water-Resources Investigations Report 2003-4250. Flood-Frequency Characteristics of Wisconsin Streams.

USGS. 1989. Water Supply Paper 2339, Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains.

USFWHA. 2012. Publication FHWA-HIF-12-018. Hydraulic Design of Safe Bridges. https://www.fhwa.dot.gov/engineering/hydraulics/pubs/hif12018.pdf