Determination of Compensation

5.0 Determination of Compensation Requirements (Credits)

This section describes the methods and alternatives for fulfilling the **Compensation Requirement (CR),** representing the total stream compensation required for the project, and explain the process. Using this process ensures that crediting compensation projects, evaluating, and approving stream compensation banks and in-lieu fee fund projects through the Interagency Review Team are all credited in the same manner. This process does not include a method for crediting out-of-kind compensation between streams and wetlands; these activities may serve to fulfill the **CR** in certain situations, but will be evaluated on a case-by-case basis.

The process categorizes compensation methods for various levels of stream enhancement and restoration as well as riparian buffer preservation activities. The compensation may be further refined by applying appropriate Adjustment Factors (AF) to the credits obtained through the various activities.

The following provides details on compensation practices and guidelines for using the calculating compensation. This method is applicable to streams assessed under Level 1, 2 and 3 Stream Condition Assessment procedures.

5.1 Re-Establishment Credits (3 credits per linear foot)

Re-establishment means the manipulation of the physical, chemical, and biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. Re-establishment shall result in a net gain in aquatic resource. Re-establishment activities include the process of converting an unstable, altered, or degraded stream corridor, including flood-prone areas, to a natural stable condition considering recent and future watershed conditions. The re-establishment process shall target the restoration standards set forth in the *Restoration and Re-Establishment Priorities* section of Chapter 3 or may be based on pre-approved reference sites. This process supports the re-establishment of the stream's biological, chemical and physical integrity, including transport of the water and sediment produced by its watershed in order to achieve dynamic equilibrium. Re-establishment activities may include: 1) the re-establishment of a channel on the original floodplain, using a relic channel or constructing a new channel; 2) re-establishment of a floodplain at the existing level or higher but not at the original level; or 3) re-establishment of a channel with a flood prone area, but without an active floodplain.

5.1.1 Re-establishment Restrictions

The difference between projects that are credited as re-establishment and projects that are credited as rehabilitation or enhancement is whether or not changes are necessary to address the current channel's dimension, pattern, and profile to produce a stable channel.

All three geomorphic characteristics (i.e., pattern, profile, and dimension) are required to be addressed, as well as a net gain in aquatic area, for a stream to receive re-establishment credit. Rehabilitation or enhancement credit is given in all other situations when only two geomorphic variables are addressed to produce a stable channel or there is no net gain of aquatic resource area. Additional restrictions include:

1. No rehabilitation and/or enhancement activities can be coupled with re-establishment on the same linear foot of stream channel. Credit is limited to three credits per linear foot of in-channel and buffer work for the mandatory first 100-foot of buffer work. Additional Credit for additional buffer between 100-200 feet is calculated pursuant to Section 5.2.2.
2. Re-establishment mitigation credits cannot be generated for stream channel or streambank restoration if the mitigation segment is within 500 feet of a dam or a channelized/piped stream reach.
3. No artificial hydrology allowed.
4. Water rights should be established.

5.2 Rehabilitation or Enhancement Credits

Rehabilitation means the manipulation of the chemical, physical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource.

Similarly enhancement means the manipulation of the physical, chemical, or biological characteristics of a site to heighten, intensify, or improve a specific aquatic resource function(s). Neither rehabilitation nor enhancement will result in a gain in aquatic resource area. For this reason, rehabilitation and enhancement credits are determined the same way. Stream rehabilitation and enhancement activities may include physical alterations to the channel that do not constitute re-establishment but that directly augment channel stability, water quality, and stream ecology in accordance with a reference condition, where appropriate. In order for a site to be considered for rehabilitation, pre-approved reference sites must be utilized to establish the natural/historic function goals. However, enhancement process shall simply target the Optimal and Suboptimal standards set forth in the Conditional Assessment Procedure. Rehabilitation or enhancement activities may include in-stream and/or streambank activities, but in total improve only one or two of the chemical, physical or biological functions of a stream.

5.2.1 Rehabilitation or Enhancement of Physical Functions (1 credit per linear foot).

Rehabilitation or enhancement of physical function is primarily achieved through the manipulation of following geomorphic variables – dimension, pattern, and profile. Activities included, but not limited to, in rehabilitation or enhancement category: 1) In-stream structures constructed of natural materials that provide channel stability (cross vanes, j hooks, etc); 2) Bankfull bench creation; 3) Laying Back Banks; and 4) Bioremediation Techniques. Structures constructed by non-natural materials, such as concrete or metal, may be considered on a case-by-case basis and shall only be approved when no natural alternative is feasible. These compensation activities shall directly improve the stability of the streambank or streambed.

5.2.1.1 Typical Streambank and Streambed Improvements

The following are typical examples of streambank and streambed improvements. However, these representatives are not the only improvements that may be considered during development of re-habilitation or enhancement projects.

In-stream Structures: This activity includes natural structures that are specifically designed and result in grade control and/or bank stabilization. Accepted structures include, but are not limited to, cross-vanes, j-hook vanes, native material revetments, W-rock weirs, rock vortex weirs, log-vanes, constructed riffles, and step-pools. These structures may be created out of appropriate sized rock or logs, boulders or cobbles based on the size of the stream and the flow regime. Structures not listed will be considered on case-by-case basis. Normally, a pool should be constructed in combination with these structures; however, if one is determined not to be required, it will not alter the credit provided.

Bankfull Bench Creation: This activity involves the creation of a bankfull bench along the streambanks. This activity may result in less than the proper entrenchment ratio but does result in a stable channel. The compensation plan should state, and the plan sheets should clearly demarcate, the length (in linear feet) of stream channel where bankfull benches are proposed. The bankfull bench shall be sufficient to handle discharge rates associated with a bankfull event for that stream. Normally, a bankfull bench should be constructed on both streambanks; however, if one it is determined to not be required, it will not alter the credit provided.

Lay Back Bank: This activity involves the manual manipulation of the bank slope but does not create a bankfull bench or floodplain. The compensation plan should state, and the plan sheets should clearly demarcate, the length (in linear feet) of stream channel where laying back the banks is proposed. Normally, both banks should be layed back; however, if one is determined to not be required, it will not alter the credit provided.

Bioremediation Techniques This activity primarily relates to the use of coir logs or similar materials for bank stabilization. Techniques and materials in this category include, but are not limited to: live fascines; branch packing; brush mattresses; coir logs; and natural fiber rolls. More than one of these materials or techniques may be warranted over the same stream length. In this case, no additional credit will be applied for that length. In other words, the compensation plan should include all bioremediation techniques required over a particular length. Techniques and materials other than those listed will be considered on a case-by-case basis for approval.

Streambank Planting: This activity includes the installation of plants other than seed, along the immediate streambank area for the purpose of streambank stabilization. Seed is a required construction BMP with no lift given. This activity includes: live stakes; dormant post/stakes; branch layering; and/or the installation of native plants at or below the ordinary high water mark. Species selected shall be adapted to fluctuations of water

levels and have flexible branches that will in most cases bend over without damaging banks. This activity will not be considered on stable streambanks.

5.2.2 Rehabilitation or enhancement of Chemical Functions

Riparian Buffer Zones (Buffer) improve water quality in different ways depending upon the pathway of delivery of water to the Buffer. Groundwater passing through the Buffer may be cleansed of nitrate and acidity due to a combination of denitrification, biostorage, and changes in soil composition. Overland storm flows entering laterally from the uplands may be cleansed of suspended particulates, with adhering nutrients, inorganic toxins, and pesticides, as well as some dissolved nutrients and toxins. Sometimes these overland flows will also infiltrate within the Buffer and become a part of the groundwater, thus also obtaining the benefits associated with groundwaters in the Buffer. During stream flooding events, waters flooding out into the Buffer may also be cleansed of sediments, nutrients and toxic materials as a result of particulate trapping and the binding of materials on the leaf litter and soils within the Buffer.

This category includes establishment or enhancement of riparian buffer zones and requires appropriate monitoring and site protection in perpetuity. With some exception, livestock shall not access riparian buffers within compensatory mitigation or restoration sites. Livestock exclusion is normally accomplished by fencing stream corridors and may include the construction of stream crossings with controlled access and with stable and protected streambanks. No more than one livestock crossing is allowed per 1,000 linear feet of stream mitigation or restoration. The width of the livestock crossing and any length of affected stream downstream will be deducted from the total length of the stream mitigation segment. After cattle have been removed, impacted riparian buffers must be restored or enhanced and may not be used for preservation purposes only. Additional activities restricted from the riparian buffer include:

1. Timber harvesting.
2. Any off-road vehicles.
3. Horses.
4. Any other activity that may affect the water quality and/or aquatic habitat.

The Riparian Buffer Credit category includes the following four activities: 1) Buffer Re-Establishment; 2) Heavy Buffer Planting; 3) Light Buffer Planting; and 4) Preservation Only.

The minimum buffer width for which mitigation credit will be earned is100 feet on both sides of the stream as measured from the top of the ordinary high water mark, perpendicular to the channel. Buffer areas should be developed as a belt width that allows the stream to naturally migrate within the belt. However, the stream may not extend any closer than 25 feet from the outer edge of the buffer.

Up to an additional 100 feet of buffer may be included for credit; however, buffer in excess of 100 feet will be credit at a prorated amount. Narrower buffer widths may be

approved on a case-by-case basis and will also be prorated. Target species in the first 100 feet are limited to native woody species. Target species in the outer 100-200 feet may be planted with non-woody, native coastal prairie species if the project is located in the coastal prairie.

5.2.2.1 Riparian Buffer Calculations

Buffer Re-Establishment (0.5 per linear foot for the inner 100 feet/0.5 per linear foot for the outer 100-200 feet)

Credit for this activity is given when impervious surfaces; mine spoil lands; denuded surfaces; conventional tillage; active feed lots; or other comparable conditions are removed and the buffer area is replanted with target species and a heavy buffer planting rate. Annual abatement to ensure invasive species eradication for the duration of the monitoring period and the success of the target species shall be required. Invasive species are those included in the Texas Invasive Plant and Pest Council database. For a current, comprehensive list of species, visit http://www.texasinvasives.org/invasives_database/index.php.

Heavy Buffer Planting (0.5 per linear foot for the inner 100 feet/0.25 per linear foot for the outer 100-200 feet)

Credit for this activity is given when the buffer area requires extensive planting (e.g. 400 stems per acre or more) and may include balled and burlapped specimens and/or containerized specimens. Annual abatement to ensure invasive species eradication for the duration of the monitoring period and the success of the target species shall be required. Invasive species are those included in the Texas Invasive Plant and Pest Council database. For a current, comprehensive list of species, visit http://www.texasinvasives.org/invasives_database/index.php.

Light Buffer Planting (0.25 per linear foot for the inner 100 feet/0.25 per linear foot for the outer 100-200 feet)

Credit for this activity is given when the buffer area requires only light or supplemental planting. This activity would involve planting at less than ideal densities (example: less than 400 stems per acre), either because vegetation is already present, a seed source is present, or the project does not otherwise warrant it. Annual abatement to ensure invasive species eradication for the duration of the monitoring period and the success of the target species shall be required. Invasive species are those included in the Texas Invasive Plant and Pest Council database. For a current, comprehensive list of species, visit http://www.texasinvasives.org/invasives_database/index.php.

Preservation Only (No Work Proposed)

Credit for this activity is given when no work to a riparian buffer area is proposed but that area will be placed under perpetual protection through an appropriate real estate instrument. Riparian buffer preservation must meet the requirements contained in 33 CFR Part 332.3(h) on preservation. Credit is given based on the quality of the stream buffer preserved. A High Quality streams is defined as a stream with an RCI score of 4 or higher. A Low Quality streams is defined as a stream with an RCI from 3-3.9. Preservation will not be allowed for streams that score below an RCI of 3. When preservation of high-quality buffer is conducted on streams where stream re-establishment, rehabilitation or enhancement activities are proposed, the credit for Low Quality streams is applied since the compensation proposal has not yet resulted in an improvement. Calculation of buffer preservation scores is as follows:

- High Quality streams receive 0.1 credits per linear feet for the inner 100 feet.
- Low Quality streams receive 0.05 credits per linear foot for the inner 100 feet.
- For the outer 100-200 feet of buffer, all streams receive 0.05 credits per linear foot.

5.2.2.2 Riparian Buffer Restrictions:

- Buffer proposals for less than 100 feet in width or greater than 200 feet in width, on either side of the stream, must be approved on a case -by-case basis.
- No area of buffer can be credited under more than one Riparian Buffer category.

5.3.3 Rehabilitation or Enhancement of Biological Functions (0.5 Credit per Linear Foot)

Aquatic species, such as fish and macroinvertebrates require sufficient habitat for their survival and prosperity. Many streams in our region lack natural habitat as a result of many situations, including stream channelization, poor agricultural practices, inadequate stormwater management, and disturbance to the riparian zones bordering the stream. The placement of artificial habitat structures can often enhance stream reaches that lack naturally occurring habitat features. The more diverse this habitat is, the greater potential it has to support a healthy, self-sustaining population. Habitat functions may be credited based on either the construction of habitat structures that provide habitat for aquatic species (fish boards, root wads, etc) and/or streambank planting.

5.3.3.1 Typical Habitat Improvements

Habitat Structures: This activity includes structures designed specifically for habitat creation. Although, In-stream structures typically provide habitat, they are constructed for channel stability and will not receive credit for Habitat Structures. Habitat Structures do not typically contribute to channel stability; however bank stability is required for successful habitat structures. Accepted structures include, but are not limited to, submerged shelters, fish boards or bank cover, floating log structures, root wads, and half-log cover. Riffle and pool complexes and over hanging vegetation do not qualify

for credit in this activity. Technical design of in-stream structures should mimic natural structures found in a reference stream.

Streambank Planting: This activity includes the installation of plants other than seed, seed is a required construction BMP with no lift given, along the immediate streambank area. While this is primarily done for streambank stabilization, stable streams banks that have been denuded may use this technique for habitat improvements. This activity includes: live stakes; dormant post stakes; branch layering; and/or the installation of native plants at are below the ordinary high water mark that are adapted to fluctuations of water levels and have flexible branches that will in most cases bend over without damaging banks.

5.4 Credit Adjustment Factors

Adjustment Factors **(AF)** are used to account for exceptional or site specific circumstances associated with the compensation site. These circumstances may provide ecological benefits or detriments that must be accounted for when determining credits. The Adjustment Factors are applied only when ecological and/or water quality function is affected by the action.

Each AF activity is scored within a prescribed range. The range is to account for variation in activities and conditions that warrant **AF** credit. Examples are given for each of the ranges. The agency representative shall make this determination on a case-by-case basis and use best professional judgment.

5.4.1 Credit Adjustments

Riparian Buffers with Wetlands (0.25 per linear foot of buffer with wetland)
Increased compensation will be offered for riparian buffers where medium to high quality wetlands, as determined by an approved functional assessment, are created, enhanced or restored. Wetlands included in this adjustment factor shall not be utilized for compensatory mitigation to offset the authorized impacts to wetlands. A credit may be given at a rate of 0.25 credits per linear foot of buffer with a medium to high quality wetland.

Riparian Buffers Under 100 feet (-0.25 per linear foot of buffer under 100 feet)
In rare cases, stream mitigation will be authorized in areas where land use prohibits the minimum buffer of 100 feet. Sites where buffers will not be the minimum 100 feet from the middle of the stream will have an adjustment factor of -0.25 credits per linear foot of buffer under 100-feet. The following factors are considered when determining if the reduced buffer will be authorized: 1) quality of remaining buffer (e.g. wetlands present), and 2) the water quality and/or streambank stability benefits of the stream restoration/enhancement activities.

Livestock Exclusion (-0.5 per linear foot of buffer subject to grazing)
Sites where livestock will be excluded will have no additional credit awarded for this management technique. Sites where livestock will not be excluded will have an adjustment factor of -0.5 credits per linear foot of buffer subject to grazing and must have

an approved management plan. The following factors are considered when determining an approved grazing regime and monitoring protocol for a management plan: 1) the number and type of livestock, and 2) the water quality and streambank stability impacts.