

Strategic Plan Evaluation

CRS Credit for Protecting Natural Floodplain Functions

D R A F T

August 10, 2010



**National Flood Insurance Program
Community Rating System**

EXECUTIVE SUMMARY

By completing a comprehensive update of the Community Rating System, FEMA and its partners want to ensure that the program is doing all it can to meet its goals and to improve its effectiveness. Such an objective requires an in-depth evaluation of each part of the program, including natural floodplain functions, the focus of this evaluation.

For the purposes of this evaluation report, “natural floodplain functions” are focused on the functions of water resources (flood and erosion control, water quality, groundwater recharge) and of biological resources (species productivity; fish and wildlife habitat diversity).

This evaluation describes an “ideal community” that implements ideal planning and management activities to protect and restore natural floodplain functions. The ideal community was used as a yardstick to determine if CRS credits supported the full range of appropriate activities.

CRS credits were developed following a policy paper prepared in 1993. That paper limited credits for natural floodplain functions to those that have an observable and measurable impact on the floodplain. Such activities could not receive more than 250 points. As a result, there are small credits in a variety of CRS activities, including public information, open space preservation, regulatory standards, and planning. There are prerequisites for some activities to ensure that they do not adversely affect natural floodplain functions.

A review of the current credits and lessons learned about natural floodplain functions, particularly their impact on reducing flood losses, has led to the following recommended changes to the CRS:

- Improve ISO staff capabilities,
- Educate local officials and the public,
- Revise and increase the credit for regulations that protect natural floodplain functions,
- Revise and increase the credit for protecting open spaces that serve natural floodplain functions,
- Revise stormwater management credits to support low impact development approaches,
- Improve the credits for plans that protect natural floodplain functions,
- Create a new credit to encourage restoration activities, and
- Create a new prerequisite requiring Class 4 or better communities to obtain a minimum number of points under natural floodplain functions activities.

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INTRODUCTION

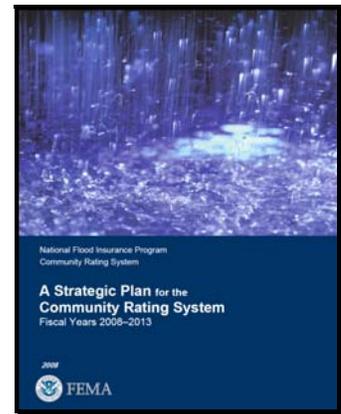
Background

The Community Rating System (CRS) has been successful in recognizing and encouraging communities to implement new and more effective floodplain management activities, including those intended to improve natural floodplain functions. However, FEMA and its partners want to ensure that the program is doing all it can to meet its goals and to improve it. Such an objective requires an in-depth evaluation of each part of the program.

In 2007, the Community Rating System Task Force and FEMA revised the goals for the CRS, which had been the program's foundation since its inception. The 2007 goals are to

- Reduce flood damage to insurable property;
- Strengthen and support the insurance aspects of the NFIP; and
- Encourage a comprehensive approach to floodplain management.

To implement these goals, the CRS Task Force and FEMA adopted a CRS Strategic Plan in 2008. The third goal of the CRS is expanded on in the Strategic Plan:



3. Encourage a comprehensive approach to floodplain management

Insurable property is not the only floodplain management concern of communities, so the CRS recognizes efforts that protect lives; further public health, safety, and welfare; and protect the natural functions of floodplains. The community staff should understand the physical and biological processes that form and change floodplains and watersheds and take steps to deal with flooding, erosion, habitat loss, water quality, and special flood-related hazards. Floodplain management programs need to protect buildings, infrastructure, critical facilities, and natural functions and also ensure that new development does not cause adverse impacts on others. A comprehensive approach uses all tools, including public information, planning, regulatory authorities, financial support, public works, and emergency management.

The Strategic Plan sets forth five objectives and several strategies per objective to accomplish the CRS goals and contribute to implementation of the FEMA Strategic Plan. Objective number 1 is

1. Ensure that all CRS credits are appropriate and fully earned.

Each objective has two or more strategies. Several strategies are interrelated and mutually supportive:

- 1.1 Ensure that all credited activities properly reflect the CRS goals.
- 1.3 Improve the CRS verification process.
- 3.1 Develop a set of incentives for implementing each CRS-credited activity.

To implement these strategies, the Task Force created committees to review each activity in depth. Two committees were tasked to review themes that crossed over many activities: credits for coastal areas and protecting natural floodplain functions. The Natural Floodplain Functions Committee was created to review the various credits, prerequisites, and incentives that encourage communities to protect and restore their natural floodplain functions.

Natural Floodplain Functions

“Natural floodplain functions” means different things to different people. Similar terms that have been used are “floodplain natural resources” and “ecosystem services.” These functions are listed in the box to the right.

The current definition of “natural and beneficial floodplain functions” in the CRS Glossary (Section 130) reads:

- a. The functions associated with the natural or relatively undisturbed floodplain that moderate flooding, retain flood waters, reduce erosion and sedimentation, and mitigate the effects of waves and storm surges from storms; and
- b. Ancillary beneficial functions, including maintenance of water quality, recharge of ground water, and provision of fish and wildlife habitat.

It should be noted that natural floodplain functions are not limited to locations in the mapped floodplain. Floodwaters come from the watershed and there are many watershed features and functions that affect flooding and water quality.

Natural Floodplain Functions and Flood Losses

The CRS is primarily concerned with reducing flood losses to insurable buildings. That is the first goal of the program. There are several reasons why protecting natural floodplain functions supports that goal:

- The natural flood and erosion control functions listed in the box above do have an impact on flooding. Obvious examples are the flood storage provided by wetlands and the wave protection provided by sand dunes and beaches.

NATURAL FLOODPLAIN FUNCTIONS

Water Resources

Natural Flood and Erosion Control

- Provide flood storage and conveyance
- Reduce flood velocities
- Reduce peak flows
- Reduce sedimentation

Water Quality Maintenance

- Filter nutrients and impurities from runoff
- Process organic wastes
- Moderate temperature fluctuations

Groundwater Recharge

- Promote infiltration and aquifer recharge
- Reduce frequency and duration of low surface flows

Biological Resources

Biological Productivity

- Rich, alluvial soils promote vegetative growth
- Maintain biodiversity
- Maintain integrity of ecosystems

Fish and Wildlife Habitats

- Provide breeding and feeding grounds
- Create and enhance waterfowl habitat
- Protect habitats for rare and endangered species

- Unified National Program for
Floodplain Management, 1994

- Disrupting natural features has adverse impacts on the flooding regime (see box).
- More and more studies are showing that natural floodplain features can be more effective at controlling or attenuating flooding and can be less expensive over the long run than traditional human-made flood control structures. These aspects were reviewed by the Committee.
- Other state and federal programs are requiring or encouraging communities to address water quality issues. Coordinating these programs with flood protection at the local level brings more resources to bear on flood loss reduction.
- Local officials and their constituents are concerned about the benefits that natural floodplain functions provide to their communities and want to protect them. This can generate a continuous level of interest to support local economies or improve recreational opportunities by protecting floodplains. This interest level lasts between infrequent floods, adding to the attention and resources available for flood loss reduction efforts.

Surface waters, their floodplains, and watersheds are viewed as parts of a broader, single system. This interaction of land and water exists in a state of dynamic equilibrium. If a component of the natural system is disturbed, the entire system works to readjust towards a new equilibrium. This is true of riverine and coastal systems alike. The effects of a system's readjustment are often felt far from the original site of the disturbance and can last for decades.

– *The Natural and Beneficial Functions of Floodplains: Reducing Flood Losses by Protecting and Restoring the Floodplain Environment*, FEMA pub 409, 2002

Accordingly, the Committee concludes that there is a direct, supportive relationship between protecting natural floodplain functions and the CRS's goal of reducing flood losses to insurable buildings. The CRS should provide credits and other incentives to encourage communities to address the natural functions in their floodplains and watersheds.

Approach

The CRS Task Force created the Natural Floodplain Functions Committee in January 2009. Task Force member Bill Lesser of FEMA Headquarters was named chair. Members included Josh Lott, NOAA; Dave Canaan, Mecklenburg County, North Carolina; David Stearrett, FEMA Headquarters; and John Graves, FEMA Region X.

Committee Chair Lesser made a concerted effort to involve other interested organizations to participate via liaisons. These included Burke Lokey, Maricopa County, Association of State Floodplain Managers; Lisa Hair, U.S. Environmental Protection Agency; Stephanie Lindloff and Shana Udvardy, American Rivers; Gino Lucchetti, King County, Washington, a floodplain biologist; and Peter Harnik, Trust for Public Lands. Supporting the effort were French Wetmore, Dave Carlton, and Aaron Booy, CRS consultants, and Scott Cofoid, ISO/CRS Specialist.

The Committee was charged to

2. Review the research on the effectiveness of activities to protect natural floodplain functions to prevent or reduce flood losses.
3. Review and coordinate with other programs that encourage or support local actions to protect natural floodplain functions, and activities that encourage low impact development.

4. Consider recommendations for enhancing recognition of natural and beneficial functions in various reports.
5. Determine local best practices to protect natural floodplain functions to prevent or reduce flood losses, e.g., what an ideal community should do.
6. Draft revisions and/or alternatives to the current natural functions credits and their prerequisites.
7. Get feedback on the revisions and/or alternatives from the experts and local officials.

The committee had a series of monthly conference calls to discuss issues and comment on draft papers. Members were sent background reports from sources such as the Association of State Floodplain Managers and EPA.

Scott Cofoid reviewed recent studies on the economic benefits of preserving natural floodplain functions, in terms of reduced flood losses and long term costs. His summaries are in Attachment 2. His basic findings were that the studies showed that

- Low impact development/natural approaches can provide as good or better flood protection and water quality benefits,
- These approaches can cost less to build and maintain, and
- Open space can increase property values.

Concurrent with this work, FEMA Region X and the committee support staff worked on various projects pursuant to a Biological Opinion issued by the National Marine Fisheries Services on whether the NFIP regulatory criteria have an adverse effect on endangered salmon habitat in Puget Sound. This work produced a model ordinance that incorporates the NFIP regulations, habitat protection criteria, and CRS credits for higher regulatory standards. Other products include *Regional Guidance for Floodplain Habitat Assessment and Mitigation* and *CRS Credit for Habitat Protection*.

The Ideal Community

As an approach for meeting the objectives of updating CRS to enhance credits for natural floodplain function activities, the Committee wanted a statement of what good practices in protecting natural floodplain functions should look like. Over several meetings, it developed the description of the “ideal community,” which appears on the next page.

There was a lengthy debate over whether communities could actually attain the listed objectives and, if they did, how they could be recognized. The debate considered the differences between built-up communities and those with extensive natural floodplain areas remaining and between downstream communities and those that had jurisdiction over their watersheds. These are reviewed later in the Issues section.

The Committee concluded that communities want CRS points more than recognition. We could still publicize good programs, but rather than establish a new award or other recognition, it was concluded that the Ideal Community statement was best used as a yardstick when considering CRS credits and other incentives that would encourage communities to pursue these measures.

The Ideal Community

The ideal community that protects its natural and beneficial floodplain functions would have the following attributes:

1. The “essential ecological attributes” of the watershed and the floodplain have been inventoried and assessed.
2. All remaining undeveloped wetlands and floodplains in the community’s jurisdiction are preserved as open space, kept in, or restored to their natural states, or otherwise serving a natural function, such as human-made habitat. This can be done by ownership, covenant, or restrictive land use regulations.
3. Floodplain open spaces are connected to each other and natural areas on higher ground via corridors as part of a green infrastructure system.
4. All areas identified as water or riparian habitat for endangered species are preserved from development.
5. The community’s land use development regulations
 - a. Prevent alteration of channels, channel banks, or shorelines, except to restore their ecological function,
 - b. Require all development activities to be set back from the channel or shoreline sufficiently far (based on the best available science) to prevent disturbance of riparian habitat and allow only native growth within the setback, and
 - c. Prohibit hazardous materials, landfills, and septic systems from the developed areas of the floodplain.
 - d. Regulations for new development that preserve pre-development hydrology for all events up to and including the 100-year storm, that includes managing
 - 1) Flood peaks,
 - 2) Flood volumes,
 - 3) Rate,
 - 4) Duration, and
 - 5) Temperature
6. There are watershed-wide programs to protect water quality, including
 - a. Erosion and sedimentation control regulations governing all construction sites,
 - b. Erosion and sedimentation control measures practiced on all agricultural lands,
 - c. Incorporation of water quality best management practices before the release of any stormwater into a natural system,
 - d. Inspections of streams and monitoring of outfalls to identify non-point sources of water pollution, and
 - e. A master plan with regulatory and capital improvement approaches to preserve and restore the watershed’s pre-development hydrology. Interjurisdictional plans are being implemented for the watersheds that extend beyond the community’s corporate authority.
7. There are educational programs for the general public and for school students on protecting and preserving natural and beneficial floodplain functions.
8. There are ongoing efforts to restore floodplain areas to their natural state or a state that protects the area’s natural and beneficial floodplain functions.

HISTORY AND RATIONALE

Current CRS Credits

CRS Recognition Policies

When it was initiated in 1990, the CRS paid little or no attention to natural floodplain functions. The goals at the time made no mention of natural functions or comprehensive floodplain management. In 1993, in response to concerns voiced by Congress and several organizations, the CRS officially added protection of natural floodplain functions as an element worth crediting. A policy paper, “Recognizing The Natural and Beneficial Functions of Floodplains” was published. It is included as Attachment 1.

Because of the need to relate such credits to the goals of the CRS at that time, Section 3 of the policy paper included the CRS’s recognition policies. These are excerpted here and provide a good background for why certain activities are not credited. Some key policies are underlined.

- 3.1 To be credited, an activity must have a demonstrable impact on the land or water in the floodplain. Activities must actually protect floodplain functions, through acquisition, regulation, on-site management, or similar physical or legal action. Adoption of general policy statements or community goals, for example, would not be credited.
- 3.2 There are two exceptions to policy 3.1:
 - a. Public information and educational activities.
 - b. Incorporating protection of natural and beneficial functions in a comprehensive plan...
- 3.3 Creditable activities must be observable and measurable....
- 3.4 Any activity that has an impact on protecting the natural and beneficial functions of floodplains may be credited. For example, the CRS would recognize a variety of approaches to preserving natural areas, including ownership by a local government, a state agency, or a non-profit organization, or regulations that prevent development. What counts is that the area will not be developed in a way that adversely affects its natural and beneficial floodplain functions.
- 3.5 Credit will not be provided for activities implemented solely by the federal government....
- 3.6 Some areas deserve more credit than others. Protecting particularly sensitive areas or areas that provide habitats for endangered species should receive more CRS credit than protecting other floodplains. However, in accordance with policy 3.3, there must be an objective way to measure the difference....
- 3.7 Where possible, the CRS should use existing criteria as the basis for recognizing or measuring an activity....
- 3.8 An activity can be recognized, even if its primary objective was not to protect the natural and beneficial functions of the floodplain....
- 3.9 Recognizing protection of the natural and beneficial functions of floodplains should be incorporated into the existing structure of the Community Rating System. ...
- 3.10 Activities that can only be credited as protecting the natural and beneficial functions of floodplains should not produce more than 250 credit points or one-half of a CRS class change. ... The objective of this policy is to support the actuarial basis for the NFIP by putting a ceiling on the amount of flood insurance rate reduction that can be obtained for activities not related to protecting insurable buildings. A class change should require a combination of activities that reduce flood damage and activities that are oriented toward natural and beneficial functions.

These policies guided the drafting of the credits and prerequisites of new elements that were created after the 1993 policy paper. There are five types of credits and prerequisites for natural floodplain functions, as listed in the following sections.

Public Information

The 300 series of public information activities has two small credits.

330 – Outreach Projects credits projects that cover up to 10 topics. One of those topics is

Natural and beneficial functions: The outreach project should discuss the natural and beneficial functions of local floodplains, any unique local features, the importance of protecting these functions, and how they can be protected. For CRS credit the discussion must address local conditions (see the *CRS Coordinator’s Manual*, page 330-4).

Communities can receive up to 2, 6, or 13 points, depending on the audience. For example, 13 points are provided for a project that is delivered to every property in the floodplain (OPF) while the two points are for touching on the topic in brochures or presentations (OPA).

350 – Flood Protection Information provides credits for having materials in libraries and on websites. The library credit is three points “for documents on the natural and beneficial functions of floodplains.” There are bonus points for those documents that are locally pertinent, as opposed to a generic discussion of natural floodplain functions.

The website credit is for up to four points for covering the same topics as Activity 330. Generally, these are copies of the material used in the outreach projects.

STORMWATER QUALITY

The storm drain system carries untreated stormwater runoff directly to creeks and rivers. Improper pouring of wastes into storm drains directly impacts our environment. Oil, paint, fertilizer and pesticides pollute the water, destroy plants, endanger wildlife and affect drinking water. The pollutants most commonly dumped into storm drains are motor oil, fertilizer, antifreeze, pesticides, herbicides and paint.

Water Quality Impacts

One quart of oil can contaminate 250,000 gallons of water. The oil from one motor oil change can create an 8 acre oil slick. Antifreeze is toxic to people, domestic animals and wildlife. Paint products can be harmful to people, animals and the environment. Pesticides are deadly to fish, birds and other wildlife. Herbicides destroy stream-side brush and vegetation as well as animals. Fertilizers encourage the growth of algae, which can reduce the amount of oxygen in water and lead to fish kills.

Much of the water we and other Californians drink comes from the American and Sacramento Rivers. Contamination can increase human health risk and endanger the food chain.

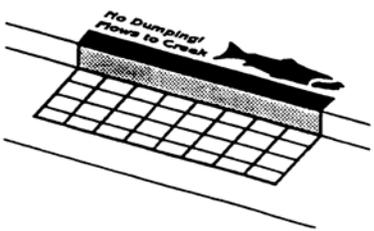
Water Quality Benefits

- We have clean water in our rivers for drinking, wildlife and recreation.
- Storm drainage facilities that are free of sediment and trash require less maintenance.
- Stream corridors are ribbons of green that provide a healthy habitat for wildlife and an attractive space in a neighborhood.

Do you care about reducing pollution in the Sacramento and American Rivers and local creeks?

If so, here’s what you can do to help.

- Properly store and dispose of oils, chemicals, antifreeze and other toxic material. Sacramento County Hazardous Waste Division collects recyclable and toxic household waste. Free collection events are held regularly. Hazardous Materials also investigates hazardous spills. To report a spill or for collection event information call 386-6160.
- Never dump any waste in the storm drain. Dispose of litter and animal waste in a trash can. Sweep sidewalks, gutters, driveways and other paved surfaces. Put the debris in a trash can.
- Participate in storm drain stenciling. Storm drain stenciling is an important public awareness activity to alert citizens that dumping litter and hazardous materials into storm drains is harmful to our environment. If you belong to a volunteer group and would like to stencil storm drains, call the WRD at 440-6851.



Newsletter article that received 330 credit for the topic of natural and beneficial functions

Preserving Natural Areas

420 – Open Space Preservation provides the most credit for natural floodplain functions activities. If a property qualifies as preserved open space (i.e., there is an “an assurance that the property will remain open, that is, without buildings or fill”), then there are up to 100 additional points if the property is “in an undeveloped natural state, has been restored to a natural state, or protects natural and beneficial floodplain functions.” This credit is known by its acronym, “NB.”

The points for NB are based on the percentage of the floodplain kept in qualifying open space. To receive the maximum 100 points, 100% of the floodplain must qualify. There is a default option of 10 points for having at least five acres that qualify.

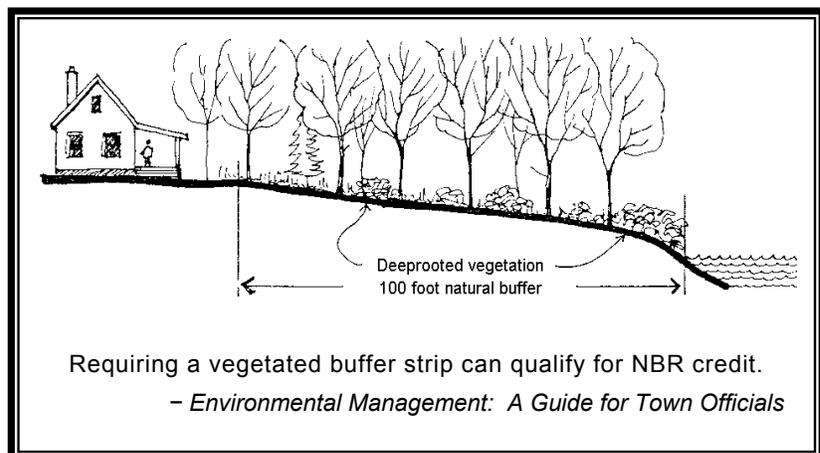
Twenty-seven percent of the CRS communities receive NB credit. The highest score received is 82 by the Lower Elwha Indian Reservation, Washington. The average score is 16. Sixty-seven percent of the credited communities receive the default value of 10 points.

To receive this credit, the community must provide documentation from a “recognized natural areas inventory, or a letter from a professional in a natural science such as botany or biology.” It is suspected that more communities would receive NB credit if they provided the needed documentation for at least five acres of qualifying open space.

Development Regulations

430 – Higher Regulatory Standards has two credits, both of them under the element natural and beneficial functions regulations (NBR). Fifteen points are provided “where regulations require new floodplain developments to avoid or minimize disruption to shorelines, stream channels, and their banks.”

Ten more points are under NBR “for regulations that protect aquatic or riparian habitat from new development.” This can increase up to 15 points if the regulations were enacted pursuant to a Habitat Conservation Plan or similar plan credited in Activity 510.



430LD – Land Development Criteria (LDC) provides credit for regulations that encourage developers to keep floodprone areas in dedicated, undeveloped open space through incentives such as housing density transfers. It does not specifically call for regulations to protect natural floodplain functions, but preserving floodplain open space often means preserving natural areas.

450 – Stormwater Management has two elements that were created pursuant to the 1993 policy paper. Erosion and sediment control (ESC) provides up to 35 points for regulations to manage erosion on construction sites and 10 more points if the regulations include farms. Seventy-four percent of the CRS communities receive this credit, averaging 33 points.

Requiring water quality provisions (WQ) in new stormwater management facilities is worth 25 points. Following policy 3.7, the CRS relies on state publications on best management practices (BMPs) to determine whether something qualifies as a water quality provision. Currently, 56% of the CRS communities receive the 25 points.

It is assumed that one reason a large percentage of communities receive these two stormwater management credits is that they are required to adopt these regulations as a condition of their states' National Pollution Discharge Elimination System programs. Communities in 21 states are receiving uniform minimum credit for ESC and in 19 states for WQ because of state mandates or programs administered by state or regional agencies.

Planning

450 – Stormwater Management has an element for a watershed master plan (WMP). Forty points are provided for managing peak flows *and* volumes. This has been found to be a key factor in preserving the natural, or pre-development, hydrology. There are additional points to specifically encourage protection of natural floodplain functions:

- (e) 15, if the plan identifies existing wetlands or other natural open space areas to be preserved from development to provide natural attenuation, retention, or detention of runoff.
- (f) 10, if the plan prohibits development, alteration, or modification of existing natural channels.
- (g) 10, if the plan requires that channel improvement projects use natural or “soft” approaches rather than gabions, rip rap, concrete, or other “hard” techniques.

However, few communities receive any of these credits.

510 – Floodplain Management Planning has two relevant elements. There are the following credits for a floodplain management plan (FMP):

- 4 points, if the plan describes areas that provide natural and beneficial functions, such as wetlands, riparian areas, sensitive areas, and habitat for rare or endangered species.
- 5 points, if the plan reviews natural resource protection activities, such as those listed in Figure 510-2 of the *Coordinator's Manual*.
- 10 points, if the plan's recommendations include activities listed in Figure 510-2 of the *Coordinator's Manual*.
- 10 points, if the plan's recommendations include recommendations from a Habitat Conservation Plan.

<p>3. Natural resource protection activities preserve or restore natural areas or the natural functions of floodplain and watershed areas. They are usually implemented by parks, recreation, or conservation agencies or organizations.</p>	
<ul style="list-style-type: none"> • Wetlands protection • Erosion and sediment control 	<ul style="list-style-type: none"> • Best management practices • Coastal barrier protection
<p>Excerpt from Figure 510-2, CRS Coordinator's Manual</p>	

Activity 510 also provides 10 points if the community has adopted a regional habitat conservation plan (HCP) or other plan that explains and recommends actions to protect rare, threatened, or endangered aquatic or riparian species. Five additional points are provided if the plan was accepted as a Habitat Conservation Plan by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service. Only three communities are receiving the 10 points credit; none receives 15 points.

Natural Functions Protection Prerequisites

530 – Flood Protection credits flood control projects. When this element was added in the late 1990s, there was much concern over whether the CRS was encouraging structural projects that would have an adverse affect on the environment. Accordingly, the following prerequisites for the credit were included:

- (1) If the project was constructed on or after January 1, 1990, the community must document that all state and federal permits were obtained, including a Section 404 permit from the U.S. Army Corps of Engineers (or documentation that a 404 permit was not required).
- (2) If the project was constructed before 1990, the community must document that the project would be approved if it went through an environmental review.
- (3) If the project potentially affects a listed species or critical habitat under the Endangered Species Act and was constructed after the date of the listing of that species or designation of the critical habitat, the community must demonstrate compliance with Section 7 or 10 of the Act.

To date only two communities have received credit for a structural flood control project and both went through an intensive review of the documentation for these prerequisites. It took the City of Ponca City, Oklahoma, over a year to assemble the record of reviews and approvals before its application for 530 credit for a local reservoir was approved.

540 –Drainage System Maintenance’s element for channel and basin debris removal (CDR) encourages communities to inspect and clean their open drainage channels and storage basins. There has been concern that this credit encourages communities to strip the channel banks bare of vegetation. Many communities consider “maintenance” to mean dredging or armoring the banks. One community in the early days of the program submitted a photograph of a bulldozer in the stream as documentation of its efforts.

Since then, CRS publications and staff have stressed that the activity credits inspections and removal of *debris*, not necessarily natural growth that does not affect flood heights. Here are some excerpts from the *CRS Coordinator’s Manual*:

The objective of this activity is to remove accumulated debris that obstructs flows that cause flooding to adjacent properties. It is important that the community's procedures spell out what can and cannot be removed. In some areas with natural streams, some woody debris may remain without causing a flooding problem. In other areas, with concrete lined ditches, all debris may have to be removed to maintain the ditch's carrying capacity (see *CRS Coordinator's Manual*, pages 540-4 – 540-5).

This activity is not concerned with drainageways through parks, farms, and undeveloped areas if insurable buildings will not be affected due to a lack of maintenance....

Communities must be aware of all environmental laws and regulations that affect their ability to conduct maintenance operations, including the Endangered Species Act of 1973. Credit will not be approved for any procedures that are not consistent with those requirements (page 540-3).

There has still been controversy over this element. Some communities are concerned that environmental regulations, especially those designed to protect salmon habitat, prevent them from removing log jams and other "debris" and, therefore, prevent them from getting full credit. Others are concerned that the CRS encourages communities to destroy in-stream habitat features, such as logs.

However, CDR remains one of the most popular elements in the CRS, accounting for half a class (248 average points) for 66% of the participating communities.

Summary

The table below summarizes the CRS credits and prerequisites that relate to protecting natural floodplain functions. It can be seen that there are many places where they appear. It can also be seen that many communities are not receiving the credits that are available. It is believed that there are two reasons for this: local officials are not aware of the credits and/or they do not want to spend the time needed to document the credits.

Activity	Element	Percent Comm's.	Score	
			Max	Average
330 – Outreach Projects	Covering the topic	*	2/6/13	*
350 – Flood Protection Information	Covering the topic	*	3/5/4	*
420 – Open Space Preservation	NB	24%	100	16
430 – Higher Regulatory Standards	NBR	16% **	30	*
	LDC	*	N/A	*
450 – Stormwater Management	ESC	74%	45	33
	WQ	56%	25	25
	WMP	4%	75	*
510 – Floodplain Management Planning	FMP	*	29	*
	HCP	0.003%	15	10
530 – Flood Protection	Prerequisite	N/A	N/A	N/A
540 – Drainage System Maintenance	Prerequisite	N/A	N/A	N/A

* Cannot tell natural floodplain functions-related numbers from the database
 ** Numbers could be higher, but cannot tell from the database

CREDITING ISSUES

This section reviews some common concerns that have been raised by communities and the ISO staff who have reviewed the activities and tried to measure their effectiveness. Although some of these are not major problems, they have been bones of contention that have not endeared the program to local officials. The Committee's recommendations are included.

Benefits to the NFIP

The 1993 Policy Paper assumed that protecting natural floodplain functions was tangential to flood loss reduction. The credits introduced at that time were instituted in advance of an expected Congressional mandate, not because FEMA believed there was a direct benefit to reducing flood insurance claims. FEMA's actuaries' cap of 250 points on the credits put "a ceiling on the amount of flood insurance rate reduction that can be obtained for activities not related to protecting insurable buildings."

Floodplain managers are now realizing that there is a greater relationship between protecting natural floodplain functions and flood losses than previously thought. The evolution of stormwater management is a good example. Historically, the objective was to control the peak flows leaving a new development, so that any time stormwater runoff left the development it did not exceed the peak flow from the site under pre-development conditions, thus limiting the amount of water new developments would contribute to a flood. From the beginning of the program, the CRS has credited local regulations that manage peak flows in Activity 450 – Stormwater Management.

This traditional approach allows and encourages construction of a detention basin that holds the excess runoff and releases it over time. As a result, after storms there are higher than normal flows for a longer period of time, which often erode channel beds and banks (adding sediment to the water, which fills in downstream channels, reducing the stream's flood carrying capacity). Because the development does not allow infiltration of the runoff, there are periods of lower than normal flows between storms. This disruption of the normal basin hydrology has an obvious impact on water quality and habitat and, in turn, biological values.

"When it rains, the stream gets too much water.
"When it's not raining, the stream doesn't get enough water."
– Dov Weitman, EPA

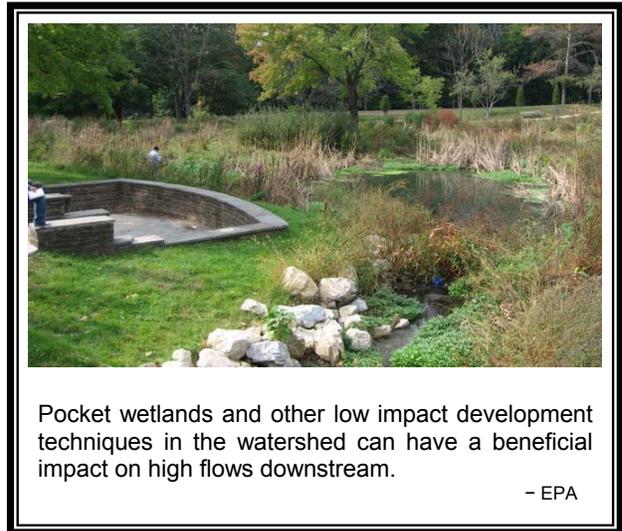
In response to this problem, EPA has studied and is promoting the low impact development (LID) approach. LID means using "systems and practices that use or mimic natural processes to infiltrate, evapo-transpire, or reuse stormwater or runoff where it is generated." Several site-specific studies have shown that, in addition to the water quality improvements, these measures reduce flood flows and can be more efficient over the long run.

The Natural Floodplain Functions Committee researched the flood protection benefits of LID and similar approaches to mimic natural floodplain functions. The findings are in Attachment 2 and can be summarized by saying that these approaches can provide as good or better flood protection and better water quality benefits than traditional stormwater management and flood

control approaches. The problem is that none of the studies provided an estimate of the economic or direct dollar benefit.

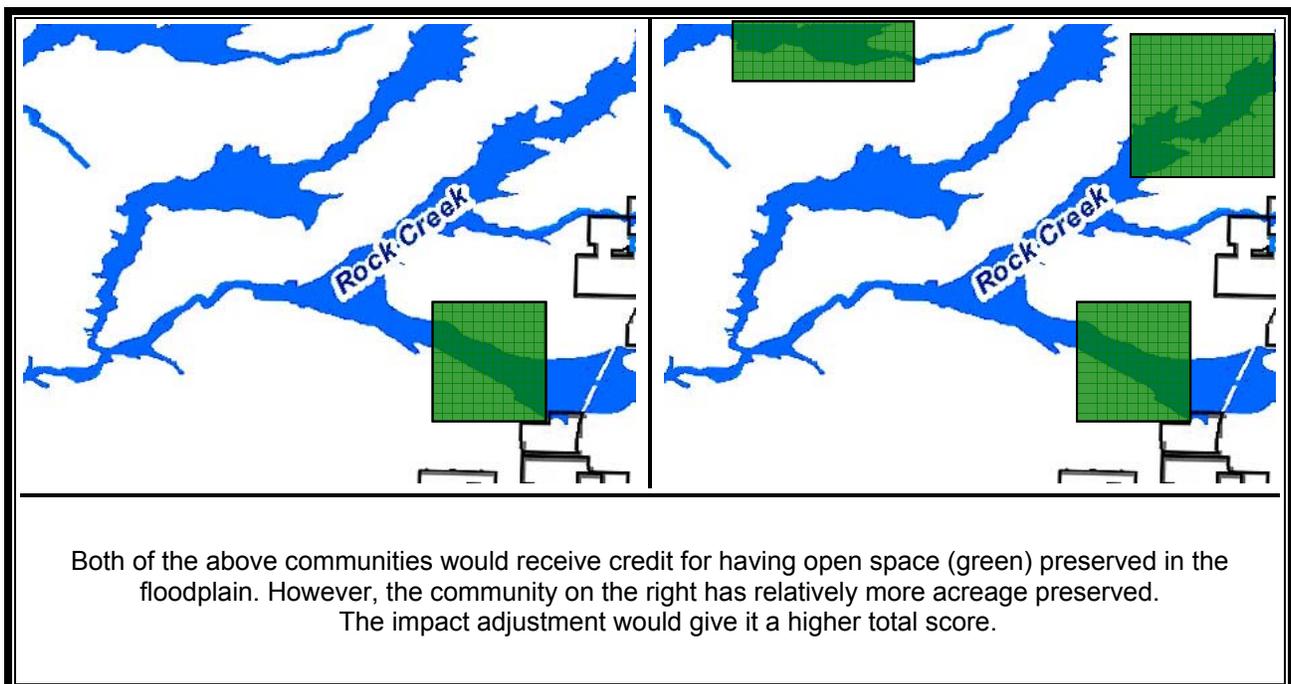
In short, we know that protecting natural floodplain functions will help prevent or reduce flood losses to insurable buildings, but we do not know by how much. As with most of the activities credited by the CRS, it may take professional judgment to determine the relative importance of protecting natural floodplain functions to the goals of the CRS.

Recommendation: FEMA should remove the 250 point cap on credit for elements that protect natural floodplain functions. The credit for elements that protect natural floodplain functions should be based on recommendations from the Natural Floodplain Functions Committee and confirmed at the next CRS weighting review.



Developed vs. Undeveloped Communities

Some communities have lots of undeveloped floodprone areas. Preserving those areas in their natural state would have a greater impact on flooding and flood losses than similar efforts in built up communities. How can the CRS treat these different areas equitably? The CRS's impact adjustment accounts for the relative area of the regulatory floodplain that is kept in open space (OS) and open space that has natural floodplain functions (NB). This is illustrated below.



Accordingly, it is easier for undeveloped areas to receive more credit for providing natural floodplain functions under the element NB in 420 – Open Space Preservation.

Recommendation: The current approach to measuring the relative impact of a community’s program should be kept where the measurement is based on the amount of area affected. The scores will better reflect the true impact of the activity on the local flood problem.

High- vs. Low-value Areas

The traditional approach has been to treat all mapped floodplains the same. The impact adjustment formulas do not differentiate between developed, undeveloped, high hazard, or low hazard situations. Preserving five acres of parkland in a downtown receives the same credit as preserving five acres in a forest. There is a desire to differentiate between communities that have intact and/or high-value floodplains (which are a higher priority to protect or restore) vs. those that do not.

Although there is extra open space credit under the current NB credit for areas “in or approximating their natural state,” there is no differentiation within the credit for higher-value areas. This traditional approach is simple and does not require the ISO/CRS Specialist to try to determine the relative worth of different areas.

One problem with differentiating high- vs. low-value areas is measuring the difference in value. Current procedures rely on a knowledgeable expert to state that the natural floodplain functions are worth protecting. Since the score is the same for all properties, that is all that is needed. If the score is different for higher-value properties, there needs to be some objective way to measure how much higher the value should be.

Recommendation: Credit for protecting natural floodplain functions should be based on the relative value of the site being credited. CRS staff should develop some simple or state-specific criteria or utilize existing national criteria to do this.

Jurisdictional Limits

It is commonly accepted that a floodplain management program implemented at the watershed level is more effective than one that stops at the city limits. The only way for a community to receive full credit for its stormwater management regulations (SMR) under Activity 450 – Stormwater Management, is if the regulations are enforced throughout all the watersheds that drain into the community. There is a minimum default value of 25% of the credit if the regulations are limited to the community’s jurisdiction.

Some communities state that they are doing all they can, so they should receive full credit, even if areas outside their jurisdiction do not have the same regulations. However, this approach encourages and rewards watershed efforts, either through cooperation with upstream communities or through a single overall agency, such as a water management or metropolitan sewer district.

Recommendation: As with the impact adjustment, the current approach does a better job of measuring the true effect of an effort regardless of political boundaries. It should be used for the credits for protecting natural floodplain functions.

Transitions

Communities are rightfully concerned that just when they get an activity going for CRS credit, the CRS changes the rules. The current guidance for floodplain management planning is “A grace period of up to one-year is given to any community in the CRS that is in danger of losing its class or becoming a class 10 because it has not met the current Activity 510 planning criteria on the date of the cycle visit.”

Recommendation: If a change in the prerequisites threatens a community’s CRS class, then it should have a grace period of one year to stay in good standing. The community should be told about the change well before the cycle visit and the new criteria will be applied at the time of the visit.

RECOMMENDATIONS

This section itemizes the Committee's recommendations on how the CRS can better encourage communities to initiate, improve, and maintain programs to protect natural floodplain functions.

Improve ISO's Capabilities

ISO should designate a person (either an ISO/CRS Specialist or a consultant) to become the in-house natural floodplain functions technical reviewer. This person would have duties similar to the current coastal and stormwater management technical reviewers, including:

- Maintaining contacts and periodically meeting with relevant agencies and organizations, such as EPA, the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, and the ASFPM's Natural and Beneficial Functions Committee. This work would include keeping up to date on technical and program developments and advising the agencies and organizations on how the CRS could help their activities.
- Conducting technical reviews of selected CRS credited elements.
- Preparing explanatory materials on CRS credit criteria for protecting natural floodplain functions.
- Training ISO and FEMA staff on the credit criteria and verification procedures.
- Making recommendations to the CRS Task Force on changes that may be needed.

Educate Officials

All those involved in the CRS should become more familiar with the need and methods for protecting natural floodplain functions. This work would involve

- Preparation of a summary paper on the benefits, technical aspects, and CRS credits for protecting natural floodplain functions. This would be similar to, but cover a broader area than, *CRS Credit for Habitat Protection*.
- Preparation of a PowerPoint presentation to introduce the topic. This would be made available to ISO/CRS Specialists, state associations, and others who want to explain the subject matter to their constituents.
- Articles in the *NFIP/CRS Update* newsletter on the topic, including good local examples.
- Providing CRS credit for attending courses on low impact development, habitat preservation, protecting natural floodplain functions, and related topics, similar to the current staffing credit for training in Activity 430 – Higher Regulatory Standards.
- Creation of a natural floodplain functions page on the CRS Resource Center with background information and links to references and programs.
- Outreach to ASFPM, American Rivers, Trust for Public Lands, and other organizations so their members and constituents will learn about how the CRS can help them promote good practices in their communities.

- Coordinating with the CRS marketing efforts and public information program evaluations to determine best practices for educating and motivating local officials to adopt programs to protect natural floodplain functions.

Educate Citizens

CRS credit for public information activities under Activities 330 – Outreach Projects and 350 – Flood Protection Information (see page 10) would keep the current credits for covering natural floodplain functions. The new natural functions technical reviewer would provide good examples and model language for communities to use. Any specific changes in the credits should be deferred to the Task Force’s Public Information Committee, which is evaluating CRS credits for public information programs.

Increase NB Credit

Activity 420 – Open Space Preservation provides up to 725 points for preserving floodplain open space, but only a maximum of 100 points if that open space provides a natural floodplain function. Given the recent realization of the flood protection benefits of open space kept in its natural condition, more credit is deserved. A maximum of 250 points is recommended.

The credit criteria should be revised as well. As noted above, the current system does not differentiate between high- and low-value areas. A sliding scale should be initiated that provides more points for high-value lands. Factors to incorporate in the development of such a sliding scale include, but are not limited to

- Whether the property is recognized in a local habitat conservation plan or other plan that reviews natural floodplain functions,
- Whether the property includes habitat for threatened or endangered aquatic or riparian species,
- Whether the property is part of a corridor or green infrastructure, and
- Whether the property has signage posted, a brochure, or other educational material for the general public.

If the criteria include whether the area qualifies as habitat or a threatened or endangered species, this would fulfill one of the reasonable and prudent alternatives (RPA 4.B) in the recent Puget Sound Biological Opinion.



Revise NBR Credit

Currently, most of the credit for floodplain management regulations to protect natural floodplain functions are in the element NBR in Activity 430 – Higher Regulatory Standards. The current text is to the right.

The following changes to this element are recommended:

Subsection 1(a) and (b) should be moved to another element, such as protection of critical facilities (PCF).

Subsection 2 should have more points for regulations that establish buffer zones where no development is allowed. A simple approach would be one point for each foot of buffer width, up to 100 points for a 100 foot buffer. However, sizing buffers depends on bank slope, soil type, vegetation, size of the watershed, and other factors. A 100 foot buffer in one part of the country would not provide much protection of natural floodplain functions, but might be considered a “taking” in another part of the country. Further, in some communities “buffer” means a prohibition of any ground disturbance activity while in other communities it may just be a restriction on siting a structure.

The drafters of the language for the *CRS Coordinator's Manual* need to consider these factors to ensure that the revised element differentiates between effective and not very effective buffer criteria.

Subsection 3 should have more points. Some credit should be provided for the current language, but more points should be provided for language modeled after the approach in the new Region X Model Ordinance, drafted to meet the requirements of the Endangered Species Act. This would fulfill one of the reasonable and prudent alternatives in the recent Puget Sound Biological Opinion (RPA 4.C).

Add Language to LDC

Section 430LD – Land Development Criteria provides credit for encouraging preservation of floodplain open space. It is recommended that terms like “sensitive areas,” “habitat,” and/or “natural resource areas” be added after “floodplain” in appropriate sections. The exact terms would be consistent with those used in other local regulations. For example, Section a.2.(c) would read

- (c) 50, if the regulations provide for incentives, such as density transfers, bonuses, or other mechanisms to encourage developers to avoid developing in the regulatory floodplain, wetlands, or naturally sensitive areas.

g. Natural and beneficial functions regulations (NBR) (Maximum credit: 40 points)

NBR is the total of the following points:

1. EITHER:

- (a) 10, where regulations prohibit ALL activities in the floodplain that may be hazardous to public health or water quality; OR
- (b) 5, where regulations prohibit one or two specific activities in the floodplain that may be hazardous to public health or water quality, such as sanitary landfills or septic systems.

2. 15, where regulations require new floodplain developments to avoid or minimize disruption to shorelines, stream channels, and their banks.

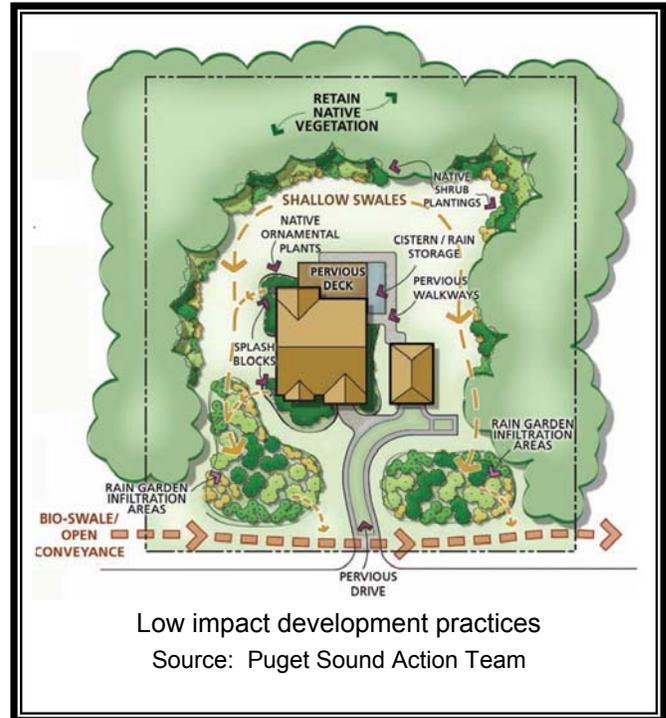
3. EITHER:

- (a) 15 for regulations adopted pursuant to a Habitat Conservation Plan or similar plan that has been credited under Section 511.b., OR
- (b) 10, for regulations that protect aquatic or riparian habitat from new development.

Promote LID Stormwater Management Practices

The current criteria for credit for stormwater management regulations, SMR, in Activity 450 – Stormwater Management, focus on managing peak flows. Credit for managing volume is provided in the element for watershed management planning, WMP. WMP credit is based on an extensive study of the community’s watershed that can be very expensive. Although 46% of the CRS communities receive SMR credit for basic regulations, only 4% receive the more advanced WMP credit.

It is recommended that the CRS raise the bar for SMR. The current credit criteria should receive fewer points. In order to obtain the full credit, the local regulations would have to require new developments to account for volume and/or approximating natural/pre-development run off peaks and volumes. Such a change would encourage many communities to move toward requiring low impact development stormwater management facilities, which keep runoff onsite to recharge groundwater supplies and match natural flow patterns. This would fulfill one of the reasonable and prudent alternatives in the recent Puget Sound Biological Opinion (RPA 4.A).



Activity 450 credits erosion and sediment control measures and stormwater management practices that incorporate water quality provisions. These should be revised to reflect the current state of the art. For example, element ESC (erosion and sediment control) could provide higher points for regulations that prohibit mass grading, a better practice than relying on human-made facilities to catch runoff and sediment.

Credit Natural Functions Planning

Local plans should be encouraged to address natural floodplain functions. The credit criteria for Activity 510’s floodplain management plan should encourage communities to address future conditions, such as watershed development, sea level rise, and natural floodplains (e.g., based on soil types and historical meanders), as part of their hazard assessment. Communities should be encouraged to adopt programs that address these conditions, such as higher standard mapping practices and buffers in areas where flooding is expected to increase.

The current element for habitat conservation plan (HCP), should be renamed to be “natural functions planning.” It would provide credit, in addition to the FMP credit for a floodplain management or hazard mitigation plan. The new element would encourage communities to undertake the following activities:

- An inventory and assessment of the “essential ecological attributes” of the watershed and the floodplain;

- A habitat conservation plan, as currently credited;
- Incorporating a green infrastructure plan into its land use plans and regulations; and
- A master plan (or a natural functions element of the comprehensive plan) on how the community will address its natural floodplain functions and needs, based on the inventory and assessment.

Credit would be provided for any or all of the above items. If there is a regional or inter-jurisdictional plan that deserves some of this credit, communities in that region would receive it.

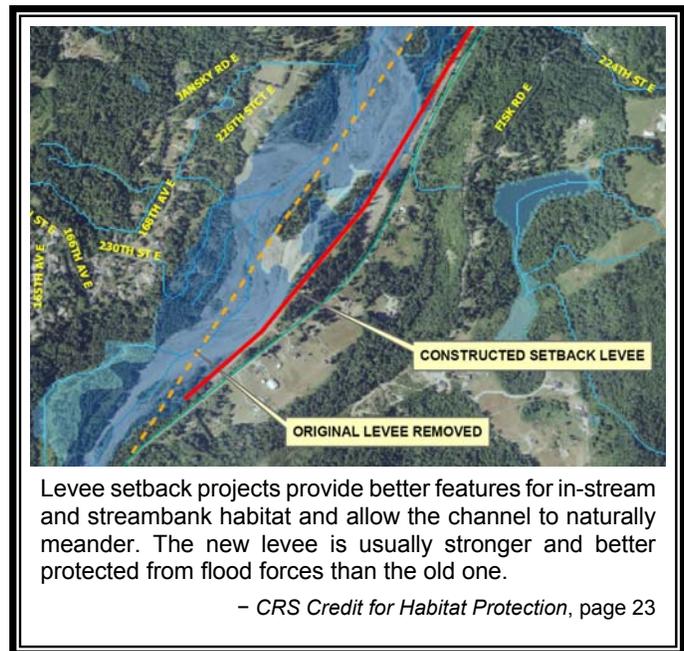
Credit Restoration Activities

All of the current CRS credits for protecting natural floodplain functions are either public informational activities, regulatory standards for new developments, or open space preservation. 420 – Open Space Preservation credit currently is for preserving areas that *already meet* the open space or natural benefits criteria. There is no credit for creating or restoring natural areas or functions.

There are currently detailed environmental protection prerequisites under Activity 530 – Flood Protection credit for flood control projects, but no credit for removing a dam, levee, or other structure that may have adverse effects on habitat. The recent Puget Sound Biological Opinion called for this credit in RPA 4.E, specifically to remove levees or set them back farther from the channel.

It is recommended that a new credit be added to Activity 420 – Open Space Preservation’s element for preserving natural floodplain functions (NB). Any area (even an area with buildings on it) would receive the credit if a community removes or relocates a dam or levee or otherwise restores a water body or riparian area to a level that it qualifies for NB credit. Credit criteria would need to be carefully drafted and the points would need to reflect the relative value of the project.

This approach would credit a setback levee without regard to whether buildings are affected. If some buildings were receiving increased protection (e.g., the new levee protects to a higher flood level than the previous one), then there would be more credit under Activity 530 – Flood Protection.



Class Prerequisite

For the most part, the CRS leaves it up to the community to pick and choose the activities for which it wants credit. But there are a few prerequisites. For example, communities with repetitive loss properties must undertake some specific projects. To be a Class 4 or better, a community must show that it has a balanced program with both flood loss reduction and flood loss prevention activities. As noted in the *CRS Coordinator's Manual* (page 210-4),

This prerequisite ensures that high-ranking CRS communities have programs that minimize flood losses and increases in future flooding. A community that cleared most of the buildings from its floodplain with disaster assistance funds after a flood could not be a Class 4 or better unless it had an effective regulatory program to prevent a recurrence of the problem.

The Class 4 prerequisites are

- A Building Code Effectiveness Grading Schedule Class 5/5 or better,
- At least one foot of freeboard for new buildings,
- At least 250 points under other elements of Activity 430 – Higher Regulatory Standards,
- A watershed management plan for at least 50% of the watersheds that drain to the community, and
- A floodplain management plan that meets certain point thresholds.

It is recommended that a sixth Class 4 prerequisite be added:

- At least 100 points under one or more elements that protect natural floodplain functions, including 420-NB, 430-NBR, 450-SMR, WMP, or WQ, and 530.

There are currently more requirements for a community to become a Class 1. The Committee recommends that the above prerequisite be for at least 200 points for a Class 1 community.

Table 2 shows the current natural floodplain functions scores for the eight Class 4 or better communities. None of the communities has close to 100 points, but the proposed prerequisite would be based on the revised, higher points for these elements.

Class		420-NB	430-NBR	450-WQ	Total
1	Roseville, CA	10	7	25	42
2	King County, WA	12	10	25	47
2	Tulsa, OK	15	0	25	40
3	Pierce County, WA	10	14	25	49
4	Fort Collins, CO	34	6	25	65
4	Skagit County, WA	26	23	25	74
4	Sacramento County, CA	0	5	25	30
4	Charleston County, SC	10	5	25	40
	Maximum possible	100	40	25	165

Notes: 420-NB scores are after impact adjustments; 430-NBR and 450-WQ scores are before impact adjustments. Actual scores may be higher due to the community growth adjustment completed in Section 710.

Summary Tables

Table 3, below, summarizes the current CRS credits and prerequisites that relate to protecting natural floodplain functions and the changes recommended by the Natural Floodplain Functions Committee.

On the next page, Table 4 has the Ideal Community list of activities shown on page 8. The column to the right identifies this paper's recommendations and the activity and element where the Ideal Community activity is addressed.

Table 3. Current CRS Credits and Prerequisites and Recommendations					
Activity	Element	Percent Comm's.	Current Scores		Recommendations
			Max	Average	
					Improve ISO's capabilities
					Educate officials
330 – Outreach Projects	Covering the topic	*	2/6/13	*	Defer to Task Force's 300s committee
350 – Flood Protection Information	Covering the topic	*	4	*	Defer to 300s committee
420 – Open Space Preservation	NB	24%	100	16	Raise max to 200 + 50 points for ESA protection New credit for restoration
430 – Higher Regulatory Standards	NBR	16% **	30	*	More detailed criteria, raise max to 100+
	LDC	*	N/A	*	Add language
450 – Stormwater Management	ESC	74%	45	33	No change
	WQ	56%	25	25	No change
	WMP	4%	75	*	No change
	SMR	46%	N/A	N/A	Raise the bar for what qualifies
510 – Floodplain Management Planning	FMP	*	29	*	No change
	HCP	0.003%	15	10	More detailed criteria, raise max points
530 – Flood Protection	Prerequisite	N/A	N/A	N/A	No change
540 – Drainage System Maintenance	Prerequisite	N/A	N/A	N/A	No change
					New class prerequisites
* Cannot tell natural floodplain functions-related numbers from the database					
** Numbers could be higher, but cannot tell from the database					

Table 4. The “Ideal Community” Crosswalk

Ideal Community Aspect	Recommendation
1. The “essential ecological attributes” of the watershed and the floodplain have been inventoried and assessed.	510 – HCP
2. All remaining undeveloped wetlands and floodplains in the community’s jurisdiction are preserved as open space, kept in or restored to their natural states, or otherwise serving a natural function, such as man-made habitat. This can be done by ownership, covenant, or restrictive land use regulations.	420 – NB
3. Floodplain open spaces are connected to each other and natural areas on higher ground via corridors as part of a green infrastructure system.	510 – HCP
4. All areas identified as water or riparian habitat for endangered species are preserved from development.	510 – HCP 420 – NB
5. The community’s land use development regulations:	
a. Prevent alteration of channels, channel banks or shorelines, except to restore their ecological function,	420 – NB
b. Require all development activities to be set back from the channel or shoreline sufficiently far (based on the best available science) to prevent disturbance of riparian habitat and allow only native growth within the set back, and	420 – NB
c. Prohibit hazardous materials, landfills, and septic systems from the developed areas of the floodplain.	430 – PCF
d. Regulations for new development that preserve pre-development hydrology for all events up to and including the 100-year storm, that includes managing: 1) Flood peaks, 2) Flood volumes, 3) Rate, 4) Duration, and	450 – SMR
5) Temperature	
6. There are watershed-wide programs to protect water quality, including:	
a. Erosion and sedimentation control regulations governing all construction sites,	450 – ESC
b. Erosion and sedimentation control measures practiced on all agricultural lands,	450 – ESC
c. Incorporation of water quality best management practices prior to the release of any stormwater into a natural system,	450 – WQ
d. Inspections of streams and monitoring of outfalls to identify non-point sources of water pollution, and	510 – HCP
e. A master plan with regulatory and capital improvement approaches to preserve and restore the watershed’s pre-development hydrology. Interjurisdictional plans are being implemented for the watersheds that extend beyond the community’s corporate authorities.	510 – HCP
7. There are educational programs for the general public and for school students on protecting and preserving natural and beneficial floodplain functions.	330, 350
8. There are ongoing efforts to restore floodplain areas to their natural state or a state that protects the area’s natural and beneficial floodplain functions.	420 – NB

NEXT STEPS

1. This report is being submitted to the CRS Task Force for approval of its recommendations.
2. Committee staff will ensure that the approved recommendations are incorporated into the *CRS Coordinator's Manual*.
3. The Natural Floodplain Functions Committee will continue to review relevant issues and CRS credit criteria as the various activities are evaluated over the next year. Draft *CRS Coordinator's Manual* language will be reviewed as the activities are revised.
4. When the *CRS Coordinator's Manual* is completed and accepted by the Task Force, the Committee is expected to disband.

REFERENCES

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Attachment 1. 1993 POLICY PAPER

National Flood Insurance Program Community Rating System Recognizing The Natural and Beneficial Functions of Floodplains Policy Paper

1. Introduction

- 1.1 Background: The National Flood Insurance Program (NFIP) provides federally-backed flood insurance for properties in communities that enact and enforce floodplain management regulations. The primary objective of the regulations is to protect new insurable buildings from damage by the base or “100-year” flood.

The Community Rating System (CRS) was created to adjust flood insurance rates in those communities that do more than regulate development according to the minimum NFIP criteria. The CRS has provided an effective incentive for communities to initiate new floodplain management activities and to maintain or strengthen current programs. A copy of the Summary of the CRS is provided with this paper.

CRS rating classifications are based on a point system. Most of the CRS credit points are based on the activities’ impact on flood insurance premiums, i.e., on how they prevent or reduce flood damage to insurable buildings. In 1992, the U.S. Congress proposed expanding the CRS to include credit for another aspect of floodplain management: protection of the natural and beneficial functions of floodplains. A similar bill, H.R. 62, has been introduced in the House of Representatives this year.

In anticipation of a Congressional directive, the Community Rating Task Force has decided to investigate incorporating credit for protecting the natural and beneficial functions of floodplains in the CRS. The Task Force is charged with developing, reviewing and recommending changes to the CRS for the Federal Insurance Administrator, who is responsible for the operation of the NFIP.

The Community Rating Task Force with assistance from ISO/Commercial Risk Services, Inc., and its subcontractor, French & Associates, is drafting changes to the *CRS Coordinator's Manual*. This Policy Paper is the first step in this process and proposes general definitions, policies and examples of activities which would or would not receive CRS credit for protecting the natural and beneficial functions of floodplains.

- 1.2 Comments: The draft of this paper was circulated among numerous government agencies and public interest organizations that are concerned with the protection of the natural and beneficial functions of floodplains. The Community Rating Task Force’s responses to their comments is published separately as Recognizing the Natural and Beneficial Functions of Floodplains on June 1, 1993.

2. Definitions

2.1 Floodplain: If the CRS is to recognize activities that protect floodplain functions, a definition is needed for “floodplain.” For the sake of simplicity and consistency with other CRS activities, it is proposed that recognition be tied to the “regulatory floodplain.” This term is defined and used in the *CRS Coordinator's Manual*. It includes, but is not limited to, the 100-year floodplain mapped as the Special Flood Hazard Area on Flood Insurance Rate Maps.

The CRS’ regulatory floodplain also includes additional areas that the community has brought under its regulatory program. For example, if a community opts to restore a wetland outside its mapped Special Flood Hazard Area, the activity would be credited provided the community covers the area under land use regulations related to floodplain management.

2.2 Natural and Beneficial Functions of Floodplains: The following definition of “natural and beneficial functions of floodplains” is taken from the latest Congressional proposal:

- a. the functions associated with the natural or relatively undisturbed floodplain that moderate flooding, retain flood waters, or reduce erosion and sedimentation, and
- b. ancillary beneficial functions, including maintenance of water quality, recharge of ground water, and provision of fish and wildlife habitats.

3. CRS Recognition Policies

The following policies are proposed to guide Community Rating System recognition of activities that protect the natural and beneficial functions of floodplains. They are based on the lessons learned in developing and revising the credit criteria for the 18 activities currently credited by the CRS.

3.1 To be credited, an activity must have a demonstrable impact on the land or water in the floodplain. Activities must actually protect floodplain functions, through acquisition, regulation, on-site management, or similar physical or legal action. Adoption of general policy statements or community goals, for example, would not be credited.

3.2 There are two exceptions to policy 3.1:

- a. Public information and educational activities would be credited.
- b. Incorporating protection of the natural and beneficial functions in a comprehensive community plan or floodplain management plan would be credited. The CRS currently has criteria for recognition of plans.

3.3 Creditable activities must be observable and measurable. A regulation that prevents filling wetlands would not be credited unless the areas affected are identified. The CRS must be able to observe an activity to verify that it is being implemented.

3.4 Any activity that has an impact on protecting the natural and beneficial functions of floodplains may be credited. For example, the CRS would recognize a variety of approaches

to preserving natural areas, including ownership by a local government, a state agency, or a non-profit organization, or regulations that prevent development. What counts is that the area will not be developed in a way that adversely affect its natural and beneficial floodplain functions.

- 3.5 Credit will not be provided for activities implemented solely by the federal government. The National Flood Insurance Program should not provide credit to communities for national parks, wilderness areas, or other projects that are implemented by a federal agency. A local or state project that is partially financed or assisted by a federal agency would still be recognized. The following criteria will be used
- a. If a project was 100% federally-funded and is on federal land, there will be no credit.
 - b. A federal regulation, such as Section 404 wetlands regulations, will not be credited.
 - c. Projects that are supported with cost-shared federal funds will receive full credit.
 - d. There will be full credit for programs implemented with federal technical assistance, mapping, or other non-monetary support.
- 3.6 Some areas deserve more credit than others. Protecting particularly sensitive areas or areas that provide habitats for endangered species should receive more CRS credit than protecting other floodplains. However, in accordance with policy 3.3, there must be an objective way to measure the difference. If the difference cannot be measured objectively, then the CRS must treat them the same.
- 3.7 Where possible, the CRS should use existing criteria as the basis for recognizing or measuring an activity. The CRS must rely on other organizations and federal agencies for the technical basis for scoring activities. Existing programs, such as a state inventory of sensitive lands or data on water quality, should be used, provided they are generally accepted nationally by professionals in the appropriate fields.
- 3.8 An activity can be recognized, even if its primary objective was not to protect the natural and beneficial functions of the floodplain. Again, CRS credit is based on the impact on the floodplain's land and water. For example, the CRS should credit restoration of a riparian area by a sportsmen's organization to provide game habitats. The end result is that the area resembles an undeveloped floodplain more than one that has been degraded or developed.
- 3.9 Recognizing protection of the natural and beneficial functions of floodplains should be incorporated into the existing structure of the Community Rating System. To the extent possible, CRS recognition should augment existing CRS credit criteria rather than by creating new creditable activities. Crediting protection of natural floodplain functions will be facilitated through a system that many communities are familiar with and that has been shown to work.
- 3.10 Activities that can only be credited as protecting the natural and beneficial functions of floodplains should not produce more than 250 credit points or one-half of a CRS class change. The CRS classification system uses ten classes based on increments of 500 points.

Each class improvement results in a 5% reduction in the flood insurance premium rates for properties in the floodplain.

The objective of this policy is to support the actuarial basis for the NFIP by putting a ceiling on the amount of flood insurance rate reduction that can be obtained for activities not related to protecting insurable buildings. A class change should require a combination of activities that reduce flood damage and activities that are oriented toward natural and beneficial functions.

4. Creditable Activities

For the purposes of CRS recognition, the following would be activities creditable as protecting the natural and beneficial functions of floodplains. Recognizing and scoring them would be consistent with the above listed policies.

[2010 Note: The 1993 Policy Paper lists the policies used to initiate new credits in 1993. Not all of the ideas and examples discussed in the paper were incorporated into later editions of the CRS Coordinator's Manual.]

4.1 Credit would be given for activities that preserve floodplains in their natural, undeveloped state. Examples:

Community A has an ordinance provision that prevents filling, draining, or construction of buildings, roads, or other infrastructure in designated wetlands. The ordinance is more restrictive than federal wetlands protection requirements. The areas affected are shown on a map.

Community B has regulations that protect environmentally sensitive lands in the floodplain from development. The ordinance defines sensitive lands to include wetlands, lands with highly erodible soils, groundwater recharge areas, and habitats for endangered species. Therefore, the regulations are provided more credit than the regulations adopted by Community A.

Community C owns a tidal wetland. Community C shows that the area is in its regulatory floodplain and documents that preserving the property protects the natural and beneficial functions of its floodplain. (A statement from a state conservationist or listing the property on a state inventory of sensitive lands would be sufficient documentation.)

Community C would receive the same credit points if, instead of owning the property, it used one of the following methods to preserve it:

- a. Acquisition of the area by the state park system to preserve it in its natural state,
- b. Acquisition of the wetland by a land trust to preserve it in its natural state, or
- c. Dedication of the property by a developer to be maintained as open space by the school district, provided there is a legal document that ensures the area will be kept in its natural state in perpetuity.

- 4.2 Credit would be given for activities that restore developed floodplains to their natural, pre-development state. Credit for this approach would not be as great as for 4.1, preserving floodplains in their natural, undeveloped state. Example:

A construction project in Community D removed buildings and streets, regraded the land to its pre-development contours, and planted appropriate indigenous vegetation to restore the site to a condition close to its original natural state.

- 4.3 Credit would be given for activities that construct, create or improve the natural and beneficial functions of floodplains. While not restoring an area to its pre-development natural state, these projects would further some of the natural or beneficial functions of floodplains. Accordingly, they would receive less credit than the above examples. Examples:

The state fish and wildlife commission modified a concrete-lined urban stream in Community E to provide fish ladders and to ensure a minimum stream flow for fish habitat.

A stream in Community F has dried up due to diversion of the water for irrigation. A riparian habitat is built in the stream's floodplain by a non-profit conservation organization. The habitat includes both local and exotic species of flora and fauna. It is watered with sewage treatment plant effluent.

- 4.4 Credit would be given for activities that reduce or prevent water pollution or enhance the quality of water that enters floodplains. Examples:

Community G's subdivision ordinance requires new developments to construct detention basins large enough to hold the first inch of rainfall. The "first flush" of stormwater runoff is held so that many pollutants will settle out before the water drains into public waters. The areas regulated are plotted on a map.

Community H's public works department has constructed vegetative buffer zones along stream channels to filter stormwater runoff from existing developments. The buffer zones are plotted on a map.

Community I is subject to a state law that prohibits the location of environmentally degrading land uses in the floodplain. Examples of such uses include sanitary landfills, hazardous materials storage, and septic tanks.

- 4.5 Credit would be given for activities that reduce or prevent soil erosion in the watershed or along stream banks. Examples:

The farmers in Community J follow practices that minimize erosion and sediment laden runoff. There are legal documents binding the farm owners to implement the practices. There is a map of the farms affected which is used to calculate what percentage of the watershed is affected.

Stream bank stabilization projects that prevent or minimize bank erosion and resulting sedimentation have been implemented in Community K. The projects use natural materials, such as willow shoots, that provide both bank stabilization and habitat. Community K has an ongoing program to ensure they are maintained.

4.6 Credit would be given for nonstructural activities that facilitate ground water recharge.

Example:

Community L has an ordinance that requires stormwater runoff to be retained in basins that have no outlets. Stored water either evaporates or seeps into the ground to help recharge groundwater aquifers.

4.7 Credit would be given for public information activities that educate the public about the natural and beneficial functions of floodplains. Public information projects would not receive as much credit as projects that make actual changes to the floodplain land or water. Example:

Community M has initiated a program to teach elementary school students about the natural and beneficial functions of floodplains and ways they can be protected.

4.8 Credit would be given for comprehensive plans that include protection of the natural and beneficial functions. The planning process must meet the CRS guidelines for floodplain management plans. Example:

Community N has adopted a comprehensive plan that includes an inventory of the natural and beneficial functions of the community's floodplain, reviews various ways to protect them, and recommends specific projects to preserve or restore them. The projects are coordinated with other floodplain management and community development goals and projects.

5. Activities That Would Not be Credited

For the purposes of CRS recognition, the following activities would not be credited as protecting the natural and beneficial functions of floodplains. They may have a beneficial impact on floodplains and they may be credited under another section of the Community Rating System. However, they are not considered as protecting the natural and beneficial functions of floodplains for the purposes of this special CRS recognition:

5.1 Credit would not be provided for construction of structural flood control projects that moderate flooding or retain flood waters. Preserving natural areas for the purpose of flood water retention would be credited, but constructing reservoirs or channel improvements solely for flood control purposes would not be recognized. Example:

Community O regrades an area to form a detention basin. The site has subsurface drains to dry out the ground as quickly as possible. It is planted with grass and mowed periodically.

5.2 Credit would not be provided for open space uses that disturb natural conditions. The CRS currently recognizes open space preservation, i.e., preventing buildings or filling on certain properties in the floodplain. However, additional credit to preserve areas to protect natural floodplain functions would not be provided for open space uses that disturb natural conditions. Examples:

Community P redevelops a floodplain site by removing the buildings and streets, regrading the land, planting grass, and building a baseball diamond. While the project would qualify for

open space credit under existing CRS credit criteria, it does not preserve the natural and beneficial functions of the floodplain.

Community Q has a 160' wide greenway along a human-made canal. The greenway has mowed grass and a paved road that parallels the canal that is used for hiking, jogging, biking and maintenance access. While credited as open space under the CRS, the area is not in a natural state and would not receive CRS recognition as protecting natural and beneficial functions. However, some credit could be provided if it was shown that the greenway provided a buffer for filtration of stormwater runoff.

Community R's zoning ordinance has an agricultural zoning district intended to prevent urbanization of rural areas. The district allows uses such as crop production, timber harvesting, golf courses and marinas, which are not considered preserving the natural and beneficial functions of Community R's floodplains. This activity could be recognized under the current CRS credit criteria as low density zoning because it limits the construction of new insurable buildings.

5.3 Credit would not be provided for activities implemented solely by a federal agency or only to comply with a federal requirement. For example, land preserved from development because of federal programs such as the following would not be credited:

- a. Lands purchased and owned by a federal agency, such as the National Park Service, the National Forest Service, the Bureau of Land Management, or the Department of Defense,
- b. Lands kept open only because of U.S. Army Corps of Engineers' Section 404 wetlands regulations, or
- c. Lands designated by the Coastal Barrier Resources Act that are not subject to any state or local development restrictions.

5.4 Credit would not be provided for activities that do not directly protect the natural and beneficial floodplain functions. Examples:

Community T has a stormwater management plan that does not address water quality. The CRS currently recognizes stormwater management programs that manage water quantity. Community T must show water quality intent and benefits for the additional credit for protecting natural floodplain functions.

Community U has an information kiosk in the floodplain that discusses coastal storms, waves, erosion, and other coastal flooding hazards and appropriate safety precautions. To be credited as a public information program that impacts natural and beneficial floodplain functions, the kiosk must also have information on the native floodplain flora and fauna and the need to preserve them.

In Community V, the soil and water conservation district encourages farmers to use practices that minimize erosion and sediment laden runoff. As per policy 3.1, the impact of such an activity on the ground is too remote.

On the other hand, under policy 3.2, an educational program to advise farmers on erosion control practices would receive some credit. Community V could also receive credit if it had legal agreements from the farmers ensuring that they will follow erosion control practices.

Attachment 2.

ECONOMIC BENEFITS OF PRESERVING NATURAL FUNCTIONS OF FLOODPLAINS

– Scott Cofoid, ISO

The CRS Task Force’s Natural and Beneficial Functions Committee is evaluating the credit criteria for activities that provide or protect a natural floodplain function. To assist this effort, various reports and studies were reviewed in order to answer two questions:

1. How does protecting natural floodplain functions reduce flood losses?
2. Does using natural features and approaches cost less than standard structural approaches?

The following pages provide a synopsis of each report in terms of how it answered these two questions. Overall, the number of studies on the economic benefits of natural floodplain functions is increasing, but it is difficult for researchers to use dollars to compare these functions vs. conventional design. It was also difficult to show flood damage savings, although most reports mentioned some benefits. Most studies referred to the need for more comprehensive evaluation techniques. A summary of the findings and a conclusion follow the synopses.

Low Impact Development (LID): A Literature Review – U.S. EPA (Oct. 2000)

This literature review concentrated on the few existing LID studies that were done at the time that measured LID effectiveness for reducing stormwater runoff and pollutant loads. Most studies reviewed concluded that LID measures accomplished both goals fairly well. Pollutant removal efficiency studies varied greatly (depending on the scope of LID techniques used and site variations), but LID techniques clearly have a significant effect on filtering the first 2 inches of runoff.

Several limitations to LID use were also identified. It was noted that LID techniques may not completely replace the need for conventional stormwater controls – they may have to be used in conjunction to optimize their benefits. LID practices must be carefully studied to accommodate each site or watershed. Many communities do not have regulations that fit LID use and actually restrict innovative practices. Lastly, community perception of LID, and the need for maintenance by the homeowner or homeowner’s association, may prevent implementation simply because of lack of understanding about LID use.

Downstream Economic Benefits of Conservation Development– Johnston, Braden & Price (Jan/Feb ‘06)

This article for the Journal of Water Resources Planning and Management publication looked at a single case study in Kane County, Illinois, in a largely agricultural, but suburbanizing watershed in the far western suburbs of Chicago. The study looked at applying the 100-yr. storm event to the watershed, using LID design vs. conventional stormwater management techniques for new development, attempting to quantify the downstream economic benefits (flood damage

reduction) and drainage infrastructure savings. Design, installation, O & M and life-cycle costs of each approach were not parameters in this study.

Other conclusions were that LID approaches can increase stormwater storage abilities, offset impacts from existing development, decrease peak flows, lower flooding levels, raise property values and reduce infrastructure costs (\$3.3 million in this study). Researchers concluded that further study should be done to apply this same methodology at multiple scales of urban development in different watersheds to get a better range of conclusions.

Economics of Low-Impact Development: A Literature Review – ECONorthwest (11/07)

This study compared existing literature and studies to determine if LID techniques are economically comparable to conventional stormwater management approaches. The paper discussed 3 ways of analyzing economic impacts: installation costs; life-cycle cost analysis and benefit-cost analysis. Not one of these methods is fully accurate in its attempt, since it is difficult to compare the two approaches equally and difficult to quantify the many benefits that LID offers. Therefore, conflicting studies and parameters hamper solid conclusions. However, most studies found LID to be less expensive and higher performing than conventional approaches.

It was concluded that if developers, homeowners and local officials understood LID better, LID would be more prominent. Once the stakeholders understand LID, it should be easier to show that LID controls are more cost effective. LID also has been proved, theoretically, to reduce downstream flood damage. This was shown using the Kane County, IL study that is referenced in the previous synopsis. All studies focused on potential developments or new construction, but more studies are needed for urban redevelopment or retrofitting cases.

A New View of the Puget Sound Economy: The Economic Value of Nature's Services in the Puget Sound Basin – Earth Economics (2008)

This study focused on the Puget Sound ecosystem and showed the connection of ecosystem services to the region's economy. It tried to estimate the partial dollar value of 12 ecosystem services. These services included flood protection, drinking water quality, climate stability, recreation, aesthetic value, habitat and others. Since hard value estimates are difficult to determine for services, the researchers had to use a low and high range of values to determine economic impact. The report illustrates that we should view our forests, trees, wetlands, rivers, lakes, etc. as "natural capital". The report showed that as we lose the natural services that healthy ecosystems provide for free in perpetuity, we suffer losses and have to pay for "built capital" replacements. In the case of flood protection, "built capital" would be levees, new roads, bridges, drainage infrastructure, etc. Unlike "natural capital", "built capital" requires construction costs and maintenance while eventually depreciating.

Not only did the study assign a range of values for ecosystem services, it also broke them down for the various land use types found in the region. For flood protection, salt marshes showed the most value as protection, with a high range of \$96,000 per acre, per year. Beaches also showed a modest benefit with a high range of \$36,000 per acre, per year.

The Puget Sound ecosystem provides between \$7.4 billion and \$61.7 billion in benefits to people every year. If its goods and services were treated as an economic asset, it would total between \$243 billion and \$2.1 trillion.

While LID techniques were not specifically discussed, it was suggested that an approach to preserving and restoring the natural processes of our land is economically beneficial when compared against the conventional stormwater techniques most engineers design currently.

Installation and maintenance costs of LID vs. conventional stormwater approaches were not discussed.

Conservation: An Investment That Pays - The Economic Benefits of Parks and Open Space – The Trust for Public Land (2009)

This report, an update from the 1999 report of the same name, provided more studies with better economic benefit values of open spaces. For instance, both residential and commercial property values were dramatically higher near parks or open spaces and parks/open spaces improve the “quality of life” that so many employees look for when selecting a workplace and retirement community. Parks and better businesses also attract tourism. In essence, revenue growth and sustainability for a community can be traced to parks and open spaces. Initial and long-term costs of development are much cheaper with conservation practices than traditional development techniques. One study in Jackson County, Georgia showed infrastructure cost savings of 60 percent.

Flood damage reduction was another benefit found in a study done for St. Charles County, Missouri (CRS Community, Class 7) after the Great Flood of 1993 along the Mississippi River. The county bought-out 1,159 homes and subsequently saved 99% (over \$25 million) on disaster relief when another severe flood occurred 2 years later.

A newly discovered benefit, global warming reduction, was also shown to increase in areas of tree cover. Growing plants and trees sequester carbon; the main greenhouse gas that contributes to global warming. One study showed Canada’s 1.3 billion acre boreal forest saves about \$3.1 trillion by storing carbon.

Purchase, design and implementation costs for the two different types of development standards were normally part of the studies cited, however, they were part of so many other parameters, it is hard to draw comparisons. While placing accurate values on each benefit is difficult, it was deemed necessary in order to do proper comparisons.

The Economic Benefits of Land Conservation – The Trust for Public Land (2007)

The same basic information and study conclusions from this report were integrated in the 2009 Trust for Public Land report, as noted above.

Economic Benefits of Parks and Open Space – The Trust for Public Land (1999)

This report on open space is one of the first that describes the many benefits that “conservation design” or “smart growth” offer. It attempts to show that planning for conservation and planning for development can co-exist and will flourish if done correctly. It also demonstrated, through citing various studies throughout the U.S., that open space preservation most always provides a much better economic return for the community than does development. Since tax revenues for the currently popular development styles (suburban style, low-density and sprawl) don’t cover the costs associated with them (schools, infrastructure, emergency services, transportation re-designs), it’s better to leave the land as open space and enjoy the other amenities (thus creating a tax break), especially where there is environmentally-sensitive land (such as floodplains).

Flood damage reduction was one of the benefits. The study cited numerous studies that showed preserving lands or restoring lands to undeveloped conditions leads to significant economic savings in the future. The numbers cited vary significantly based on the scope of each study. Restoring open space also increases water and air quality. No analysis was done on the costs of conservation vs. conventional approaches. This report looked more at the long-term economic benefit than at time of development costs.

The Economic Value of Wetlands: Wetlands' Role in Flood Protection in Western Washington – Leschine, Wellman & Green for Washington State Dept. of Ecology (Oct. 1997)

This report focused on studies that were done on two developing watersheds in western Washington and the economic valuations derived from the protection of wetlands as it relates to flood protection, both locally and downstream. Wetlands in western Washington are currently undergoing significant degradation from development. This study was done as a way to attach some kind of economic value to wetland preservation.

According to the authors, as of 1997, only one study like this had been done previously. A study by USACE in the 1970's on the Charles River watershed compared a flooding event on 2 rivers in Massachusetts. The river with extensive wetlands at its headwaters showed a significant decrease and desynchronization of the peak flood when compared to the other, which was characterized by rapid run-off. It was estimated that the loss of 8,442 acres of wetlands would result in annual flood damage of over \$17 million.

Through various research techniques, this report showed that in one watershed, the improvement and restoration of wetlands had a cost savings, or value of \$36,000/acre to \$51,000/acre, while the other watershed showed a \$41,000/acre value. While there were many variations in the two cases that made these studies difficult to compare, the conclusion was that protection and enhancement of existing wetlands are much more cost effective for flood protection than is conventional development techniques or even restoring wetlands once they've been eliminated/badly degraded.

Because economic measurement techniques vary considerably, further research could be done in relation to applying more practical and theoretical limitations so that uncertainty in the results can be controlled. The costs associated with natural feature design vs. conventional techniques were not really a part of this study – this focused strictly on flood protection costs associated with conserving wetlands.

Reducing Stormwater Costs Through LID Strategies and Practices [Full Report] – U.S. EPA (12/07) and **Reducing Stormwater Costs Through LID Strategies and Practices** [Fact Sheet] – U.S. EPA (12/07) and **Questions and Answers: Reducing Stormwater Costs Through LID Strategies and Practices** [Q & A Sheet] – U.S. EPA (12/07)

This report, along with the two short companion documents, discusses the basics of LID design and implementation in 17 case studies that were done throughout the U.S. The studies showed that in most cases well-chosen LID practices were found to reduce initial project costs. Analysis from the studies showed that LID techniques simulate nature to preserve predevelopment flow conditions, result in flow and pollutant reduction and are both fiscally and environmentally beneficial.

While no data was given to reinforce the fact that LID techniques reduce downstream flooding and flood damage, the report did point out that one can draw that conclusion. The studies demonstrated that in most new development studies, total capital cost savings ranged from 15 to 80 percent for those that employed LID techniques. In a few exceptions, project costs were higher using the LID approach. This report suggested that additional research was needed to quantify environmental benefits of LID approaches and reductions in long-term O & M costs and/or life-cycle costs.

Making the Most of Small Spaces – Janet Aird (Oct. 2008)

This article in Stormwater magazine reported on two projects in Los Angeles County, CA that converted concrete-lined channels to mostly natural drainage ways and parks. Only the cost

of each project was given and was not compared with other options. While flooding appears to have been reduced, there are no numbers to support it.

Washington State Decision Makes LID Mandatory – Henrietta H. P. Locklear (July/Aug. 2009)

An August 2008 decision in a Washington state lawsuit regarding NPDES permit language now requires that the Washington “Phase I Permit must be modified to require the use of LID where feasible, as it is necessary to meet the MEP [maximum extent practicable] and AKART [all known and reasonable technology] standards of federal and state law, respectively”.

Seattle Public Utilities – Natural Drainage System Program

This is a short comparison of the community and ecological benefits of street and drainage improvements using natural drainage systems vs. traditional systems. The 2 areas they compared side-by-side showed 23% and 45% cheaper costs using the natural drainage systems. Both contained the same amount of impervious areas, but the traditional designs showed better flood protection and the natural designs improved water quality – which is what Seattle was trying to achieve. No numbers were put on flood damage reduction.

The Use of Low Impact Development Practices to Reduce Flooding at a Residential Community in Fairfax County, Virginia – Fairfax County & Michal Baker, Jr., Inc – (2008)

This paper reported the effects of retrofitting a residential area using LID practices to enhance flood reduction. The conclusion was that only LID techniques could achieve the reduction of flood levels that Falls Hill and Poplar Heights wanted. It was also noted that LID techniques were not suitable in certain areas because of existing topography, soils and underground utility issues; so LID was not the answer for every property.

The LID retrofit of about 5 percent of the homes controlled run-off from the 2-year event. This type of event accounted for 96 percent of the total precipitation in Fairfax County. The study also showed that if about 55 percent of the homeowners participated, 30 percent of the storage needed to prevent the 100-year flood would be realized.

While this report demonstrated how effective LID techniques could be in retrofitting residential areas and what the initial installation costs would be, it did not discuss the monetary value of reducing flood levels nor did it provide any comparison of installation costs.

California Regional Water Quality Control Board: Putting a Price on Riparian Corridors As Water Treatment Facilities – Ann L. Riley (8/6/09)

This research focused on the construction and maintenance costs over a 50 year period for a standard water treatment plant (the Santa Monica Urban Run-off Facility in Santa Monica, CA) vs. the restoration of a riparian corridor (a 4,125 foot length of Wildcat Creek near San Francisco) that treats the same amount of water. The study only looked at the water quality benefits of these two systems. The water treatment plant saw an annualized cost of \$1.3 million while the Wildcat Creek restoration project resulted in a \$967,700 annualized cost.

It should be noted that while the annualized costs were lower for a stream restoration project than a standard “brick and mortar” treatment plant, there are other benefits that these systems provide than just water quality. No assessment was made on the effect each system had on flood losses.

Damages and Costs of Stormwater Runoff in the Puget Sound Region – Booth, Visitacion & Steinemann for the Water Center, University of Washington (8-30-06)

The purpose of this paper was to examine documented economic impacts of the various costs related to stormwater run-off: flooding/property damage; degradation of water quality; loss of fish and wildlife habitat; and closure of shellfish growing areas in the Puget Sound region. The report ended up showing a wide range of costs associated with run-off so it was difficult to pin down a single number to use for a conclusion.

The total costs associated to flooding were captured in three categories: insurance claims; stormwater facility construction and maintenance; and stormwater/regulatory programs. From 1978 until 2006, the NFIP has paid insurance claims totaling \$56 million in the Puget Sound region. The cost of building stormwater facilities, their maintenance and on-going stormwater programs ranged from hundreds of thousands of dollars per year in the region to millions depending on the size and population of the area.

This report did not compare the costs of using natural features vs. traditional approaches to stormwater management to retro-fit areas; only what costs Puget Sound communities are experiencing right now.

An Ecological Assessment of King County's Flood Hazard Management Plan – Earth Economics (Swedeen & Pittman), (8-10-07)

This study looked at what ecological value is obtained when riparian ecosystems are restored using natural approaches. It showed that implementation of various natural flood protection approaches in 6 case studies in the Cedar River Watershed in King County, WA, would result in various quantifiable benefits; one being flood damage reduction. A net gain ranging from \$65,326 to \$3.11 million per year was shown for all quantifiable benefits (flood damage, habitat protection, water quality, recreation, etc.). This study went further and isolated the flood damage avoided costs if all six projects were implemented. The mean avoided costs fell between \$7,099 and \$11,137 annually. In fairness, based on the information given, there was not a sizable urban area with numerous structures to count for damage. These numbers were also admittedly conservative since the effect of implementing all six projects together would have an elevated effect on values that was not entered in the analysis.

This research showed empirically that value is to be gained from removing homes and flood control structures (levees in this case) that are in danger of repeated damages from flood events. The costs of restoring these areas were not included in this study, only the benefits derived from each project was analyzed.

Comparative Valuation of Ecosystem Services: Leeds Project Case Study – ECONorthwest, (June 2004)

The objective of this study was to identify return on investment in an ecosystem, services-oriented flood abatement project in the Leeds neighborhood of Portland, OR in order to understand the benefits of restoring and protecting ecosystem services to the public. The flood abatement portion of the study concentrated on the nuisance floods this neighborhood typically receives (the 5-year, 7-year and 10-year flood) and averaged these conditions over a 100-year period. Structural damages, utility damages, road closures and emergency response were identified as costs during flooding and determined using previous flood records, adjusted to 2002 dollars. Avoided costs for flooding totaled \$14,694,387 accrued over 100 years, almost half of the entire return on investment for all ecosystem services.

No data was offered on the costs of implementation, construction and maintenance of this natural approach vs. other flood abatement options.

CONCLUSION:

An increase in downstream stormwater levels and costs are often assumed a necessary outcome of urbanization. LID has shown that this assumption may not be necessary anymore. Not only does LID manage these outcomes, they may also reduce them, in certain situations, when compared to conventional stormwater design techniques.

When economic values are assigned to preserving and/or restoring our land to its natural condition, many studies have shown that, in most cases, not only do LID techniques cost less, they actually provide better flood protection, quality of water and air, increased surrounding property values and positive economic draw (businesses, employment, sales tax, tourism) when compared to conventional development techniques employed throughout the country now. The results of these studies indicate that implementation of upstream LID practices should have substantial local and downstream economic benefits.

LID practices can be cheaper to construct and maintain and have a longer life-cycle cost than centralized stormwater strategies. Investing in the restoration of natural systems often provides more benefits, more reliability, over a longer period and at far less cost. LID practices reduce flood losses (flood storage is increased, lower frequency of events and lower peak flows occur) by preserving open space in the floodplain and decreasing run-off velocity (lower peak flows).

Simple cost-benefit comparisons of development vs. preservation projects must be interpreted with caution, since numerous interrelated, non-market common benefits (flood loss reduction, water quality, air quality, aesthetics, environmental habitat, etc.) are realized through preservation projects, many of which can not be easily converted to dollars or compared adequately. The numerous parameters that can be placed on any particular study hampers solid, or even comparable, conclusions at times. However, most of the studies reviewed here show that while a strict comparison is difficult, LID appears to be equivalent or cheaper in installation, operation and maintenance costs while providing many more benefits, both direct and indirect, than traditional stormwater management techniques.

Concerning the CRS Program, one benefit seems clear: LID techniques can increase flood protection locally, while also doing so in a more pronounced and cheaper manner for the downstream populace. Ultimately, this reduces flood damages and lowers insurance premiums and claims.