BUFFER ZONE STUDY

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Purpose:

The Boquet River Association (BRASS) obtained a small grant ($4000) from the Lake Champlain Basin Program to conduct an inventory of areas along the river where it appeared there might be insufficient woody vegetation to control runoff pollution to the river or to inhibit streambank erosion. We were also to prioritize those areas most in need of vegetation–a minimum of least 3 river miles--and to determine the best measures for restoring vegetation to those parcels. Below is an explanation of how we conducted the inventory, and the results.

Use of aerial maps: Land parcels were identified by BRASS on infrared aerial digitized photos taken between 1994 and 1999 (80% of which were from 1994 and 1995). The aerial photos had been taken in the early spring, and depicted all the watercourses downstream of State Forest Preserve uplands. The smallest objects discerned in the photographs were at about 1x1 meter.

Developing criteria: BRASS developed criteria for the selection of parcels appearing to be in need of a -- or of an enlarged -- woody vegetated buffer. For active agricultural lands: buffer areas with no woody vegetation extending 50 feet from the river. (Fallow lands were excluded, assuming they would remain fallow in the coming years.) For roads: buffer areas without woody vegetation extending 100 feet from the river. For hamlet areas and/or areas of industry or mining: buffer areas of developed or disturbed properties without woody vegetation extending 150 feet from the river. All bridges were included.

Criteria result: 14.2 miles in agriculture; 5.4 miles of road corridor, and 3.4 miles of hamlet parcels, or a total of 23 miles without sufficient woody buffer out of about 56 miles evaluated.

Preparing for field inventories: Plastic was laid over the aerials and buffer areas were measured and marked for properties not meeting the criteria. Tax maps were referred to in order to identify landowners and send them a note requesting survey permission. 136 landowners were sent letters. Fifty-nine landowners (43%) responded affirmatively; we had one negative reply, and the remainder failed to return a signed permission slip.

Following landowners' permission, the selected parcels were inventoried on the ground. Field forms were developed for different land use categories and for noting various aspects of current vegetation, land activity, and evidence of wildlife. Field form entries also provided information important for the design of buffer zone vegetation, such as corridor slope, channel and streambank conditions, flood prone width, soils, solar orientation, and connected bands of trees to upland forest areas.

Field Assessments: 114 parcels representing 49,421 feet (or 9.36 miles) were inventoried, plus 43 bridges. Land areas next to bridges were assessed for vegetation due to the typical steepness of corridor slopes next to abutments, the immediate proximity of the river, the special requirements for non-eroding slopes and the need for trapping road runoff contaminants and winter sanding/salt material.

Prioritizing and Ranking Parcels:

Although BRASS staff designed several ranking procedures, neither a simplified approach nor a more elaborate computerized process were implemented for several reasons. The number of variables needing to be factored, valued, then weighted for value against other sets of information made one ranking process too simplistic and the other terribly time consuming. (For example, for reduction of surface land runoff of sediment or phosphorus, an "old field" of grasses and forbs should be highly valued despite the amount of mature trees. However, if 50% of more of a streambank were eroding or slumping, then the "old field" had less value than mature trees. Or, if a diverse wildlife habitat were desirable, a vigorous or good understory development amongst mature trees–and possibly an "old field"–should be awarded more points.)

Additionally, ranking was considered moot when BRASS staff realized how quickly parcels change. Changes in vegetation since the '94 and '95 aerial photos was sometimes dramatic. Parcels that appeared to be fallow fields contained at the time of the inventory vigorous brush growth of up to 12-15 feet of height. Impacts from flooding since the inventory caused changes to the channel and riparian corridor. Obviously, a carefully crafted inventory ranking procedure could be made useless were properties to change hands, or if farm fields were rotated or land practices changed.

Instead, BRASS staff (the same who had conducted the inventories) meticulously examined each field sheet and made determinations about which parcels were most critical for the reduction of phosphorus or sediment inputs into the Boquet River. Agricultural parcels, for the continuous length of eroding embankments and the proximity of crop land without a woody vegetation buffer, were considered an immediate priority for planting designs and implementation. Fourteen parcels (belonging to 8 landowners) totaling 9,275 feet (out of a total 26,575 feet of agricultural parcels inventoried) were selected. A "hamlet/industrial" parcel of 8,300 feet (5,400 feet of which is owned by the Town of Willsboro) was also selected due to its continuous length, friable soils, and proximity to the hamlet, historic structures, and a well-known salmon pool.

Another set of parcels, totalling 2,660 feet and all within the hamlet/industrial category, were put into a potential "to-do" pile.

Generalizations Concerning Buffer Zone Needs For Each Land Use Category:

Agricultural Buffers: Parcels with a small band of mature trees within 50-feet of the river, or containing a few trees with good shrub growth, were generally backed by

old field grasses that provided some amount of filtering and trapping of phosphorus or sediment runoff. These parcels also had less than 30 % of streambank slumping or erosion, were more apt to have large woody debris in the stream, had numerous species of birds and evidence of other wildlife (such as deer, raccoon, muskrat and beaver), and 60% of these parcels had "ladders" of trees somewhere along their length connecting the riparian area to treed uplands.

On the other hand, wherever BRASS staff encountered an area without woody vegetation there was nearly always ~75% of streambank erosion or slumping, fewer birds and more butterflies identified, and little other evidence of wildlife activity except for turtle eggs buried at the top of sandy banks.

Hamlet/Industrial Buffers: Mature trees at the top of the bank were common on hamlet parcels whether occupied by a business or residence, but very little woody brush was encountered. However, bushes and grasses did appear along the streambank, providing protection from bank erosion, but bank alterations of rip rap and sheet piling were common. Virtually no hamlet landowner allowed a "wild" unmown buffer vegetation strip, of any width, at the top of the bank. Many streambanks were used as dumping areas for lawn clippings, leaves and old brush which inhibited vegetative growth.

Roadside Buffers: About two miles of macadam and dirt roads run in a close proximity (within 100-feet) to the Boquet River or its tributaries. All roadway parcels contained mature trees, at least some shrubs, and grasses. Although none of the parcels had more than 15% instability or erosion of streambanks, three-quarters of the total roadway/streambank miles had been altered with rip rap, sheet piling or log cribs. Some parcels could well benefit from grass seeding to inhibit runoff, about half could benefit from additional seedling or pole plantings, and one parcel was experiencing slight rills and gullies. There was no apparent damage of vegetation due to winter road salting. Given all these conditions, road parcels were not considered a priority by BRASS staff.

Bridge Buffers: The corridor slopes next to road and railroad bridges were stable and with little erosion or gullies due to the amount of "hard armoring" by rock ledge or with rip rap, sheet piling, or concrete wing walls. Grasses along the upper slopes were mostly of good condition and growth. A few mature trees stood beside bridges, but frequently poles and saplings were being actively cut, especially near State road bridges even when they did not appear to be interfering with sight distance or have the potential to dislodge rip rap by future root growth. In addition to storm drain pipes in hamlet areas, concrete sluiceways were sometimes near bridges where there was a significant gradient to corridor slopes. Rather than terminating into a grass swale area prior to the river, these concrete drains continued to the edge of water.

Vegetation Design Considerations:

The Successional Restoration Objective: Once critical parcels were identified for buffer zone designs, BRASS staff visited similar riparian areas of good vegetative

quality to note species of trees, shrubs, grasses and forbs, and their percent makeup within the buffer area. But, attempting to initially plant species identical to those existing in a natural, mature vegetated state may not be a wise approach. Micro-climatic conditions near the end of a successional sequence are often different from those present in pioneer states, and climax species will find it difficult to survive if planted as pioneers. Therefore, selection of plant species for an introductory stage of woody growth in a riparian buffer zone will differ from a selection for an area where a natural successional sequence has already produced shrubs, pole trees, and/or some mature trees with understory growth.

Of course, successional restoration projects are long term projects and cannot, by the very nature of the succession process, fit into tidy annual budgets or one-year federal cost-share programs. Nevertheless, suggested below are vegetative plans.

Vegetative Plans for Priority River Reaches:

1) For selected agricultural parcels with well drained soil, in pasture or hayfield, with little lateral erosion of the streambank:
The first goal is to establish a more diverse plant community that will intermix with, and gradually replace, the monotypic grass community. Most of the herbaceous species below should probably be established by broadcast seeding. If time and labor are available, a more immediate and more programmed succession could be established by transplanting sets into the site. In either case, seeds for these species should be gathered locally the preceding season. Recommended old field species are: goldenrods, ox-eye daisy, black-eyed Susan, Queen Anne's lace, New England aster, daisy fleabane, bird's foot trefoil, yellow and white sweet clovers and tufted vetch. Interspersed among these should be shrub seedlings tolerant of open field conditions such as: brambles, meadowsweet and hardhack, red panicled dogwood, and chokeberry that reach a mature height of 5-10 feet, and nanneyberry, cranberry viburnum, buck-thorn, staghorn sumac, and hornbeam that can grow to 15-20 feet. A few trees appear locally tolerant of this early successional stage: slippery elm, wild apple, red oak, and sugar maple.

Where little to no crop shading is desired by the farm owner, only the smaller shrubs should be planted. However, because the newly established buffer should not be mown there will be an eventual requirement of removing taller tree species as they naturally become established.

If pasture areas are frequently flooded, or when corridor slopes are greater than 5%, a permanent grass filter strip of a minimum 20 feet is recommended at the time when woody vegetation begins to replace grasses. Fencing and alternative watering arrangements may be necessary on some sites.

2) For selected agricultural parcels with well drained soil, with dominant vegetation in "old field" or shrubs, and with little lateral erosion of the streambank:
Note: Red panicled dogwood and slippery elm are the two local species which seem to

dominate the transition from old field to secondary forest. Both appear to tolerate the heat and relative dryness of the open fields and both are relatively immune to foraging by deer. Red oak and sugar maple, while able to grow in these situations, are both subject to damage by deer.

If old field conditions have already been achieved or if some shrubs are present, BRASS recommends incorporation of additional species of shrubs and the planting of tree seedlings typical of early stages of forest succession. Some climax species may also be capable of being planted at this stage. Shrubs to be planted if not already present: brambles, red panicled dogwood, nanneyberry, cranberry viburnum, buckthorn, staghorn sumac, chokecherry, and hornbeam. Trees to be planted include gray birch, slippery elm, quaking aspen, big tooth aspen, pignut and shagbark hickory, white ash, red oak, eastern red cedar, and wild apple. An example of a later successional stage tree that might be successful is sugar maple.

If at least moderate tree cover and shading are already present on a selected parcel, the list above should be modified to emphasize species found naturally under these conditions: sugar maple, red oak, white ash, and understory species of alternate leafed dogwood, beaked hazelnut, witch hazel, and hobblebush.

Should agricultural activity be reintroduced for cropland or pasture into these fields, a permanent grass filter area should be incorporated into the plan, as stated above in #1.

3) For selected agricultural parcels with well drained soil and current rapid lateral erosion of the streambank:

In cases where the bank is exhibiting rapid lateral erosion, BRASS believes an effective approach would be to establish larger individual trees and shrubs of the same species listed above in order to achieve more rapid binding of the soils at the edge of the bank. These large plantings will require more maintenance and watering every other day through the first growing season if there is no rain to assure a good survival rate. They should be planted far enough back from the present bank to provide ~10 years of growth before they are subjected to bank erosion. Lateral flood plain waterbreak plantings may be needed and should be joined to parallel bands of trees according to natural feature aspects of each site. Lateral plantings may need to be raised in beds or ridges to improve soil aeration and increase spring soil temperatures.

4) For the selected hamlet/industry parcel in well drained black ash in Willsboro:

This site has such unusual substrate that modeling a vegetative succession on the downstream flood plain is probably inadvisable. A more reasonable goal is to duplicate the types of vegetation growing elsewhere on the black ash, although this will require additional topsoil for areas where the ash is deep. Because the ash does not hold water and the depth to which roots will have to reach to penetrate the water table, species must be tolerant of fairly xeric environments.

Initial planting of grasses is a major component. (The choice of cool or warm season grasses depends on time of year and level of maintenance available.) Either concurrently or in the following year, bare ground herbs such as pigweed, musk mallow, colt's foot, dandelion, king devil and devil's paintbrush should be admixed well with the grasses. After grasses are established, old field species (such as those listed in the first paragraph of #1 above) along with small woody shrubs such as meadowsweet and hardhack, sweet fern, staghorn sumac, bayberry, and bramble should be planted. It may be worthwhile to try to establish a few small tree species at this time (such as quaking aspen, graybirch, red oak, jack pine, and pitch pine) but only if these can be watered every 3-4 days the first growing season, unless there is heavy rainfall. With their shallow root systems, the pines will not be effective in prevention of bank erosion, but will have aesthetic appeal.

In subsequent years replanting will be necessary where individual initial plants were unsuccessful. Perhaps in 5-10 years when the soil microclimate has begun to stabilize, other species of shrubs and trees can be planted. (The site will probably never support a moist forest, but additional species like white pine and white ash may be able to survive.) At the same time understory plants, those unable to survive the initial conditions, can be established.