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# Agricultural Buffer Zone

## A Multi-purpose Vegetative Cover Integral in Watershed Management



**Bantay**

**Bantay Kinaiyahan is a regular publication of Interface Development Intervention, Inc. to provide the public with relevant and concise information on pressing watershed issues**

**Kinaiyahan**  
**Watershed Issues in Brief**

**D**espite being a highly urbanized center of trade and business in southern Philippines, a great portion of Davao City is still agriculture-based with large tracks of cavendish banana and pineapple plantations occupying the upland watersheds. The constant use of massive amounts of synthetic pesticides and fertilizers by these plantations has seeped into the surface run-off, which, compounded with the heavy sedimentation, has contaminated rivers and creeks and eventually, the Davao Gulf. Since surface water is the only viable additional drinking water source for a rapidly growing city with an increasing demand for water use, it is crucial to establish agricultural buffer zones to protect Davao City's people and water resources.

### ■ What is a buffer zone?

It is a natural, undisturbed strip or "green belt" surrounding a development or land disturbance activity or bordering a stream or permanent water body<sup>1</sup>. It is also referred to as a "conservation area" by the Natural Resources Conservation Services (NRCS) of the US Department of Agriculture and defines it as an area or strip of land maintained in permanent vegetation that can be used in a systems approach to manage soil, water, nutrients, and pesticides for sustainable agricultural production, while minimizing environmental impact<sup>2</sup>.



[http://en.wikipedia.org/wiki/Riparian\\_zone](http://en.wikipedia.org/wiki/Riparian_zone)

A buffer zone is also known by these names: riparian<sup>3</sup> buffer strip, field border, alley cropping, herbaceous wind barrier, and green belt or vegetative cover because it describes the way it should look – occupied by vegetation or plants or trees.

The word buffer also means safeguard, shield, defense, shock absorber, holding area and storage area. All these words give us an idea of the purpose of a buffer zone.

### ■ What is the purpose of an agricultural buffer zone and how does it protect people and environment?



[http://ian.umces.edu/imagelibrary/albums/userpics/11062/normal\\_iil-eco-en-00039.jpg](http://ian.umces.edu/imagelibrary/albums/userpics/11062/normal_iil-eco-en-00039.jpg)

An agricultural buffer zone can safeguard people and other life forms from the toxic effects of chemicals that are applied in an agricultural area.

*Specifically, buffer zones near bodies of water are usually designed to:*

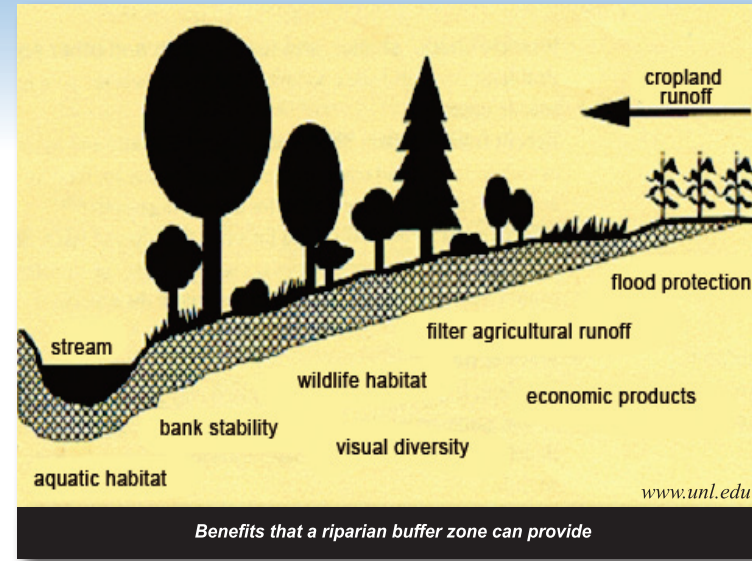
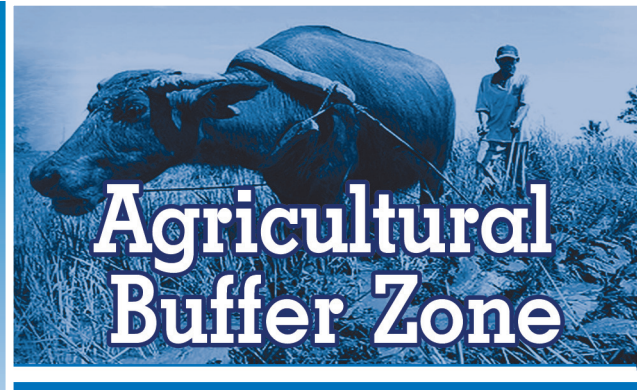
- Improve water quality of river by filtering sediments, fertilizers and pesticides that are carried by surface run-

off coming from agricultural fields.

- Minimize or prevent river bank erosion. The root system of plants stabilizes the stream bank by binding soil particles thereby providing resistance to the erosive forces of flowing water.
- Provide shade to water bodies to help maintain water temperature thereby protecting habitat of aquatic life.

■ **What other functions do plants within a buffer zone provide to farmers and the environment?**

- Reduce pesticide drift going to non-targets;
- Improve soil moisture, as plants reduce the transport of water into atmosphere from the earth's surface and regulate temperature;
- Provide connecting corridors for wildlife to move from one habitat area to another;
- Break strong wind thereby minimizing physical wind damage to crops;
- Produce wood for fuel/cooking;
- Act as sinks for carbon dioxide, helping reduce global warming;
- Enhance the landscape's beauty and diversity;
- Improve or increase pollination activity in the farm as more wildlife gets attracted by the plants in the buffer zone;
- Improve off-farm environment by acting as dust and sound barriers<sup>4</sup>; and
- Prevent or minimize the occurrence of floods during rainy season as the vegetation inside buffer zones absorbs and breaks the volume of water coming from agricultural areas and denuded forests.



■ **Are there studies done on developing model buffer zones?**

Yes! A lot of studies have already been done in other countries. These studies were able to measure the amount of pesticides and sediments being trapped by different buffer models. Results of these studies include the following<sup>5</sup> :

LOCATION	FEATURES
Georgia, USA	The effectiveness of a three-zone riparian buffer in trapping herbicide runoff has been studied. More than 90% of pesticide atrazine and alachlor was trapped by the buffer with a total width of 164 ft. —planted with grass, pine and hardwood trees. Most herbicide was trapped by the grass strip, with 60 to 70 percent of herbicide in runoff trapped <sup>6</sup> .
France	Buffers composed of ryegrass ( <i>Lolium perenne</i> L.) having width of 20-59 feet were able to reduce runoff volume by 43 to 99.9%; suspended solids by 87-100%; and different kinds of pesticides and metabolites by 44-100%
South Carolina, USA	The 1,500 acres of buffer strips are filtering sediment, pesticides, and animal waste coming from 15,000 to 20,000 acres of cropland and pastureland.
Utah, USA	100 major landowners participated in restoring the woody vegetation in the riparian area which is seen as the long-term solution to streambank erosion control.
New York: Chris and Rick Fesko's farm <sup>7</sup>	"The whole thing is, we need soil to farm with and that's where it begins. We've had buffers for eons because we don't want erosion... We could have wind erosion, but we don't because we have planted trees—the 200 I planted 10 years ago are really big now."
Iowa, USA	The Iowa State Agroforestry Research Team project is conducting research on a constructed multi-species buffer strip that consists of both woody plants and native grass. Their preliminary results have shown that this design is superior to the all-grass buffer strip. The researchers concluded that willow post bioengineering techniques placed along the entire length of Bear Creek could reduce the sediment load by as much as 50 percent <sup>8</sup> .
PA, USA	Over 56 km. of riparian area in the Pequea and Mill Creek watershed have been fenced and returned to permanent vegetation of diverse tree species. Farmers also fenced 305 - 914 meters to improve herd health and wildlife habitat, to reduce streambank erosion.

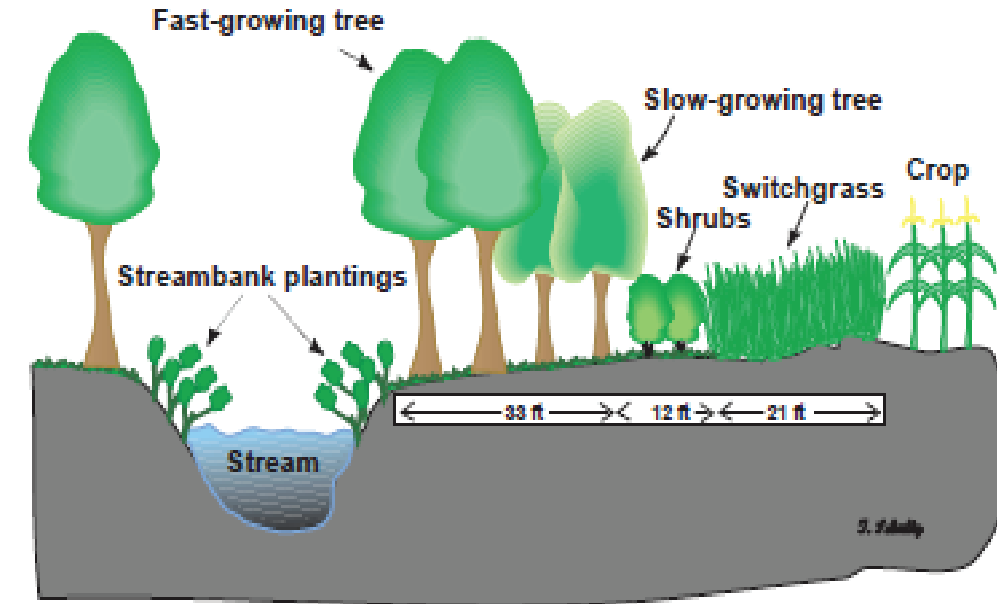
■ **What are the factors to consider in establishing the width of a buffer zone?**

There is no single "ideal" buffer width, However, there are five factors that influence ideal buffer widths:

1. Slope - in steep slopes, the water will rush over it faster, giving it less time to be absorbed hence, the buffer zone for this type of area needs to be wider.
2. Soil type - The type and density of soil also affects the speed of absorption. Loose or sandy soils are easily eroded.
3. Vegetation mix - The type of vegetation in the buffer is perhaps most important - buffers with a wide variety of vegetation types (trees, grasses, bushes, etc.) will absorb more nutrients than buffers with just one type of vegetation.
4. Method of chemical application used in the adjacent area. -- Pesticides aerially sprayed drift farther<sup>9</sup> from the target area, hence buffer zone for farms employing aerial spraying should be wider compared to farms using ground spraying only.



**Multi-species riparian buffer strip model**



5. Goal or purpose of the buffer – Whether used to trap sediments, or remove unwanted pesticides and fertilizers to protect people, the effectiveness of a buffer is dependent on the size of its width, depending on the purpose of the buffer zone.

■ **Are there models of buffer zones applicable in agricultural areas? Yes!**

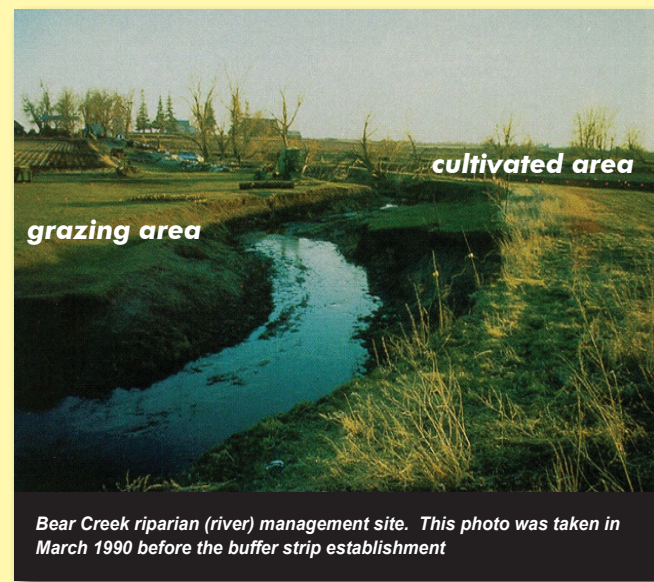
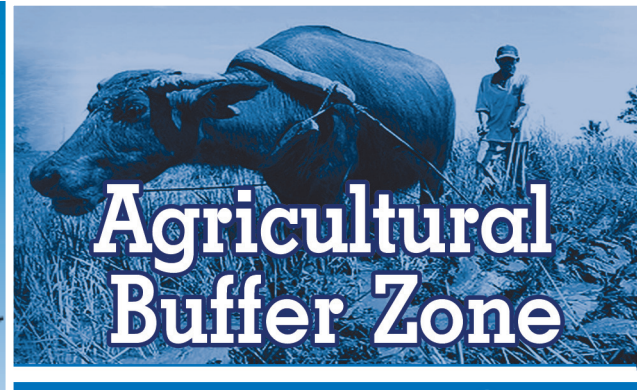
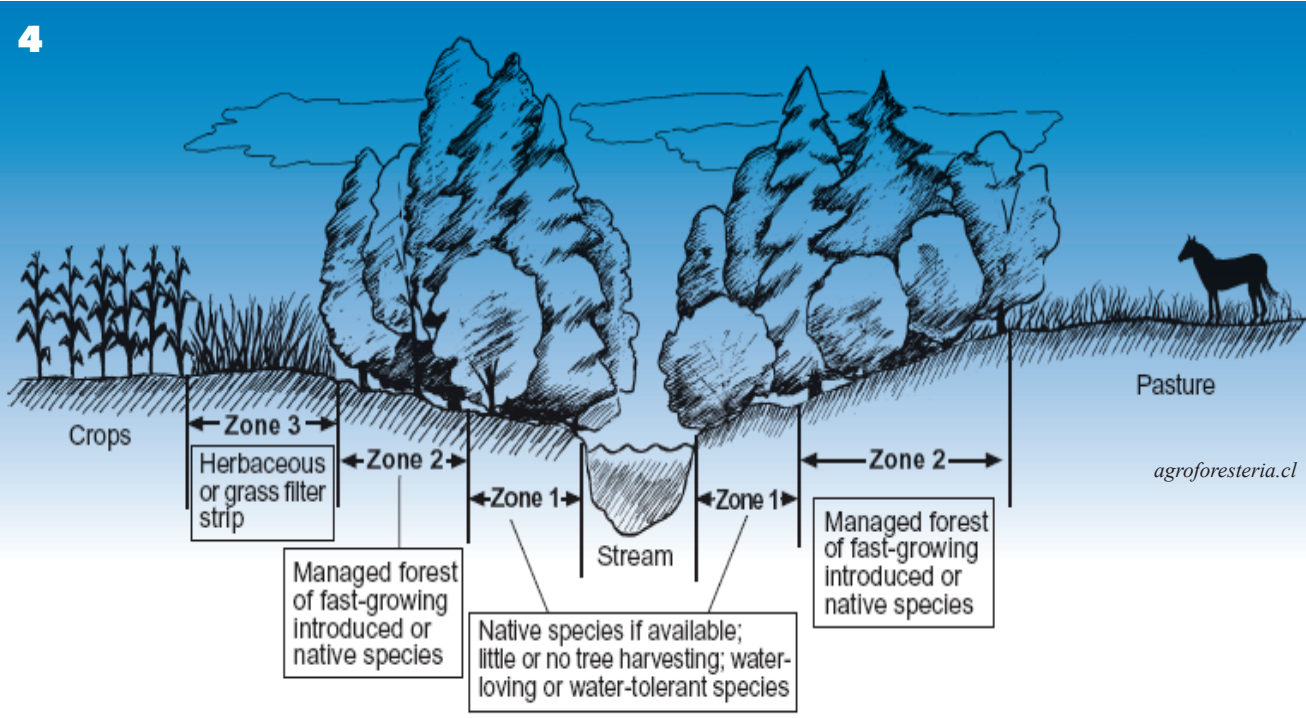
The three (3) zone "buffer strip" concept and the multi-species riparian buffer strip system. These two models can be modified or combined based on the local condition and the objective of the buffer zone.

The trees and shrubs provide perennial root systems which trap long-term nutrient storage close to the stream, while the shrubs add more

woody stems near the ground to slow flood flows and provide a more diversified wildlife habitat. The native grasses dissipate the energy of surface runoff, while the deep roots provide dense annual root systems needed to increase soil infiltration capacities and provide organic matter for many microorganisms living in the soil<sup>10</sup>.

■ **The 3 Zone "Buffer Strip" Concept**

The USDA Natural Resource Conservation Service (NRCS) have developed guidelines for riparian forest buffers (Welsch 1991). A riparian buffer has three distinct zones: **Zone 1** is a 5 meter wide strip of undisturbed mature trees starting at the edge of the streambank. **Zone 2** is a 20 m wide zone of trees managed to provide maximum infiltration of surface runoff, and nutrient uptake and storage while also providing organic matter for microbial processing of agrichemicals. **Zone 3** is a 6 m wide zone of grazed or ungrazed grass which filters sediment from the run-off generated in the uplands and causes large quantities of water and agrichemicals to infiltrate into the biologically active rooting zone where nutrient uptake and microbial processing occur.



Bear Creek riparian (river) management site. This photo was taken in March 1990 before the buffer strip establishment

Taken in June 1994, after 4 seasons of riparian management

**Bear Creek –Iowa - dramatic changes took place in as little as four growing seasons after establishment of a MSRBS system located on the Risdal farm, along Bear Creek, near Roland, Iowa.**

**Long-term Management of Buffer Zone**

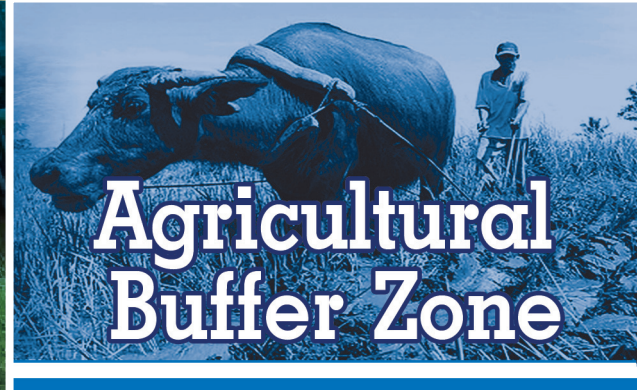
Buffer zones must be monitored and managed to maintain their purpose. Riparian buffers, in particular, should be inspected always within a few days after heavy rains or floods to check for evidence of sediment deposit, erosion, or concentrated flow channels. Repairs should be made as soon as possible.

In the US, the USDA-NRCS provide incentives to farmers by allowing harvests of fast growing species within the riparian buffers. This is to allow effective use of nutrients and other excess chemicals coming from farmlands that could pollute water. Harvesting removes nutrients and chemicals stored in tree stems. Thus, it may be necessary to harvest these fast-growing trees every 8-12 years. For longer rotations, a wider spacing within rows should be used. Periodic harvest also promotes continued vigorous growth. To ensure a continuous annual harvest after the first eight years, remove only 1/8 to 1/12 of the total tree zone each year and make sure the harvested trees re-grow or are replanted.

**Are there national and international laws governing buffer zone establishment? YES!**

Philippines (Local and National)		International <sup>11</sup>	
Law	Distance (meters)	Law	Distance (meters)
<b>Watershed Code of Davao City:</b> - Between plantations and houses, clinics, schools, chapels and other institutions - Between plantations and critical areas such as recharge zones, critical slopes, riverbanks, rivers, springs, wells and other sources of water	30 40	<b>Food and Agriculture Organization (FAO)</b> defines buffer zone as an untreated area wide enough to capture drift fallout adjacent to the sprayed area. For aircraft spraying the buffer zone needs to be wider than for ground spraying. For example, recommended buffer zone for certain organochlorine insecticides	5,000
<b>Ban Aerial Spray Ordinance of Davao City<sup>12</sup> :</b> - Within and around the boundaries of agricultural farms/ plantations	30	<b>Massachusetts’ Rivers Protection Act</b> in 1996: the law creates a protected area extending on both sides of most rivers and streams	61.0
<b>DENR Memorandum Circular No. 2009-14 S. 2009:</b> - to protect the environment as well as the health of the people and pursuant to the recent aerial spraying guidelines issued by the Fertilizer and Pesticides Authority	50	<b>Australia</b> The Department of Infrastructure, Planning and Natural Resources recommends	150

Philippines (Local and National)		International	
Law	Distance (meters)	Law	Distance (meters)
a buffer zone shall be strictly observed/required from residential areas/ river or body of water to the banana plantations.		that local councils incorporate a buffer zone between development and land where agricultural management could involve aerial spraying of pesticides. <sup>13</sup>	
<b>P.D. No. 705 Forestry Code Section 16:</b> Areas needed for forest purposes - along the edge of the normal high waterline of rivers and streams with channels of at least five (5) meters wide; - Strips of mangrove or swamplands along shorelines facing oceans, lakes and other bodies of water; and - strips of land facing lakes.	20 20 20	<b>Sweden:</b> The Swedish system consists of a matrix of variables. There are buffer zone tables for each combination of temperature and wind speed on the day of application, for either a “non-sensitive” (cropped) or “sensitive” (aquatic or ecologically important areas) area.	No single value specified
<b>P.D. NO. 1067 Water Code of the Philippines:</b> “Article 51. The banks of rivers and streams and the shores of the seas, and throughout their entire length. Along their margins, are subject to the easement of public use in the interest of recreation, navigation, floatage, fishing and salvage.” <sup>14</sup>	3 (urban areas) 20 (agricultural areas) 40 (forest)	<b>Tasmania - Law for Aerial Spraying:</b> buffers from private property from water resources. Exclusion zone apply to organic farms, schools, and health centers, people’s houses (especially with rainwater tanks) <sup>15</sup>	200 500 1,000
<b>R.A. No. 1273, Section 1 or Act Amending the Public Land Act :</b> <sup>16</sup> the bank on each side of any river or stream that may be found on the land applied for title shall be demarcated and preserved as permanent timberland to be planted exclusively to trees of known economic value, and that the owner shall not make any clearing thereon or utilize the same for ordinary farming purposes even after patent shall have been issued to him or a contract lease shall have been executive in his favor.	40	<b>Canada:</b> developed different buffer zone multipliers in calculating the needed buffer zone for aquatic areas and for different pesticide application method. Other parameters considered are spray quality (fine, medium, coarse, very coarse), and wind speed. <sup>17</sup>	No single value specified
		<b>Wisconsin’s</b> vegetative buffers along lakes,	



**How is the buffer zone for agricultural activities implemented on the ground in the Philippines?**

Under Philippine laws, the distance of the buffer zone from the area to be protected varies from three (3) meters to fifty (50) meters. The definition also varies: if within public lands - it is an area that should be planted with permanent trees and be treated as part of timberland; if in agricultural land – buffer zone is an area that should be planted with diversified trees that grow taller than what are planted in the plantation or planted with perennial trees/legumes.

Philippines (Local and National)		International	
Law	Distance (meters)	Law	Distance (meters)
<b>PD 1586 or the Philippine Environmental Impact Statement System<sup>18</sup></b> A common condition found in most ECCs: - between rivers and agribusiness plantations which is in accordance with other national laws - between plantations and springs, schools, houses, and road network.  <b>Another common condition in the ECC:<sup>19</sup></b> ... that the following stipulations on buffer zone shall be complied with. - Lot boundaries shall be planted with perennial trees/legumes to provide buffer/safety against pesticide drifts coming from within and or from outside sources	20	ponds, wetlands, marshes, rivers, streams and ditches. Whenever possible, the area of the vegetative buffer shall extend	at least 2.86
	30	<b>Netherlands:</b> It sets a standard buffer zone for all applications and rewards the use of low-drift nozzles or air assist sprayers with a reduced buffer zone of 1.5 m.	14 .0
	No specified value/ distance	<b>Virginia's</b> "Riparian Buffer Tax Credit" in 2000: requires that the timber landowners preserve buffer and remain it for 15 years to be eligible of the credit  <b>Georgia's</b> Conservation and Natural Resources Act of 2007 : mandates that "a natural vegetative buffer area shall be maintained on both sides of the stream	10.7 – 91.5  30.5



Upper Sirib. 2/10/07 The absence of vegetative cover or buffer zone at the edge of the plantation renders the soil vulnerable to erosion. One of the purposes of vegetative cover within buffer zone is to protect the soil from eroding.



Purok 6, Tamayong February 10, 2007. Houses surrounded by banana plantations.

Buffers near agribusiness plantations are very important in protecting people and bodies of water from pesticide drift. No less than the Philippine Coconut Authority has recognized the adverse impact of toxic chemical drifts and non-biodegradable persistent residues coming from plantations into adjacent lands planted with coconuts. In one of its memorandums issued in 2003, the PCA said that very likely farms situated within 250 m from banana plantations are affected by toxic chemicals applied manually, mechanically and plane sprays.<sup>20</sup>

Despite this memorandum and complaints by affected residents, there is no agency that strictly monitors buffer zone compliance. No companies have been penalized from this gross violation. The multipartite monitoring teams (MMT) formed for each ECC issued are clearly not working as manifested by the non-implementation of buffer zones until now. The following photos show proof of this claim:

**What are the legal actions that can be done for violations of buffer-zone requirements under Philippine laws:**

"Violations of the non-observance of buffer zones constitute civil and administrative wrongdoing and, to a certain extent, criminal offense under the law. Specifically, the non-observance of the buffer zone may constitute a public nuisance under our civil law".<sup>21</sup>

Art. 695 of the Civil Code classifies nuisance into public and private. "A public nuisance is an unlawful act or omission to discharge a legal duty, which act or omission endangers the lives, safety, health, property, or comfort of the public, or by which the public is obstructed in the exercise or enjoyment of any right common to all.

A public nuisance has been further defined as the doing of or the failure to do something which injuriously affects safety, health, or morals of the public, or works some substantial annoyance, inconvenience, or injury to the public.

The non-establishment of buffer zone is a public nuisance because it continuously subjects people living near plantations to the harm brought about by chronic exposure to pesticide drift.

The remedies applicable to the non-observance of buffer zone as public nuisance based on Art. 699 of the Civil Code are:

- (a) A prosecution under the Penal Code or any local ordinance;
- or
- (b) A civil action



A common sight near plantations; natural waterways which drain the surface run-off are situated beside plantations without the benefit of a vegetative buffer to hold soil and filter surface run-off carrying fertilizers and pesticides. Purok Samaka, Brgy. Tawantawan, Baguio District.



▲ Cavendish bananas closely planted along a tributary towards Davao River, traversing Dacudao, Calinan District.

▼ A water source in Dacudao, Calinan District surrounded by a banana plantation.

These remedies may be availed of by public officers (such as the local government unit), and the second, remedy by private persons such as the local communities, who are affected by the non-observance of buffer zones.

**Things to be done:**

- 1) DENR and LGU must conduct monitoring about the buffer zone compliance on the ground
- 2) Violators should be penalized by cancellation of ECC or other penalties provided for in existing laws
- 3) LGU should provide incentives to those who comply with the buffer zone requirement – incentives which could include a tax holiday, or financial or material remuneration during the establishment of a buffer zone,
- 4) Plantation companies should strictly observe the buffer zone requirement stipulated in their ECCs, particularly the planting of perennial/legumes surrounding their plantations and the 30 meter buffer for houses, schools, chapels and springs
- 5) The general public should help in the monitoring of buffer zone compliance by writing/reporting (with pictures) cases of non-compliance to DENR, Watershed Management Council and the City Mayor’s office.



Upper Tamayong, Calinan District. 2007

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<sup>1</sup><http://www.cdc.gov/healthyplaces/terminology.htm>; <http://www.noticentature.ie/glossary.html>

<sup>2</sup>Conservation Buffers to Reduce Pesticide Losses. USDA – Natural Resources conservation Service. March 2000.

<sup>3</sup>The word riparian comes the Latin word ripa which means bank

<sup>4</sup>A well designed windbreak/buffer zone can reduce dust and noise by 30%.

<sup>5</sup><http://water.epa.gov/type/watersheds/archives/chap6bea.cfm>

<sup>6</sup>Lowrance, et al., 1997; <http://www.in.nrcs.usda.gov/technical/agronomy/newconbuf.pdf>

<sup>7</sup>Chris and Rick Fesko’s farm on the hillside east of Skaneateles Lake is the largest farm, at 1,200 acres, in the watershed, and has the largest number of animals (250 Holstein milkers and 150 young stock). They also raise corn, hay, oats, wheat, and soybeans.

<sup>8</sup><http://water.epa.gov/type/watersheds/archives/chap6bea.cfm>

<sup>9</sup>Pesticides applied through aerial spraying drift to as far as 2 km according to USEPA study.

<sup>10</sup>Developed by Agroecology Issue Team (AIT) of the Leopold Center for Sustainable Agriculture located in Ames, Iowa and the Iowa State University Agroforestry Research Team (IStART)

<sup>11</sup>Agricultural Buffer Zone Strategy Proposal. Pest Management Regulatory Agency Health Canada. November 2, 2005.

<sup>12</sup>Its legality is questioned by the Philippine Banana Growers and Exporters Association (PBGEA). The case is pending at the Supreme Court.

<sup>13</sup>[http://www.edo.org.au/edonsw/site/factsh/fs03\\_5.php](http://www.edo.org.au/edonsw/site/factsh/fs03_5.php)

<sup>14</sup>Although this talk about easement but the said areas can be considered as buffer for bodies of water as it protects them from conversion into other uses.”

<sup>15</sup>Properties should be monitored for chemical residues and chemical trespass, laws should allow for prosecution.

<sup>16</sup>An Act to Amend Section Ninety of Commonwealth Act Numbered One Hundred and Forty-One otherwise known as the Public Land Act.

<sup>17</sup>Agricultural buffer Zone Strategy Proposal. Pest Management Regulatory Agency. Ottawa, Canada. November 2, 2005. [www.pmra-arla.gc.ca](http://www.pmra-arla.gc.ca); [www.hs-sc.gc.ca](http://www.hs-sc.gc.ca).

<sup>18</sup>One cannot find specific provision on buffer zone under PD 1586 but a standard provision in the Environmental Compliance Certificate (ECC) which is a requirement under this law.

<sup>19</sup>ECC of Global Fruits issued on February 16, 2004. The same provisions on buffer zones are included in the ECC of Stanfilco

<sup>20</sup>PCA memo issued by Severino S. Magat, Scientist IV & ARMD MANAGER for Administrator Danilo M. Coronacion, attention to all concerned Deputy Administrators, Regional/Center/Department Managers, Research Officers and Extension Officers. Issued on November 20, 2003.

<sup>21</sup>“Liabilities of Companies and Public Officers of the Government for the Non-observance and Non-enforcement of Buffer Zones in Specific Banana Plantation and Its Remedies”. Atty Glocelito Jayma. March 2011.