Wildlife-Friendly Plastic-Free Netting in Erosion and Sediment Control Products

Water Quality Factsheet for Permit Applicants

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The Problem with Plastic Netting

A variety of manufactured products may be used during construction projects to temporarily protect soil from erosion and facilitate establishment of vegetation ("erosion control"), or to trap eroded sediment and retain it onsite ("sediment control"). Several of these products commonly contain plastic netting or mesh, which functions to: 1) stabilize soil or mulch; 2) bind loose fiber materials into a blanket or roll; or 3) reinforce geotextile fabric. Examples of temporary erosion and sediment control products that may contain plastic netting include mulch control netting, erosion control blankets, fiber rolls (wattles), and reinforced silt fences.

Snake entangled in an erosion control blanket's plastic netting. (Photo by Mark Backus).

Plastic netting used in these products has been found to entangle wildlife, including reptiles, amphibians, birds, and small mammals.[1] Snake entrapment is of particular concern, as there have been numerous reports of snake injury and mortality due to entanglement in plastic netting used in temporary erosion and sediment control products.[2,3]

Erosion and sediment control products classified as "temporary" are designed to degrade after a period of time, ranging from months to years. Some agencies also define these products as temporary if they are removed within two years after installation.

[1] Stuart, J.N., M.L. Watson, T.L. Brown, and C. Eustice. (2001). *Plastic netting: An entanglement hazard to snakes and other wildlife*. Herpetol. Rev. 32(3):162-164. http://www.tc.umn.edu/~smit4155/Erosion%20Mesh%20Lit/Stuart%20et%20al%202001.pdf

[2] Barton, C., and K. Kinkead. (2005). *Do erosion control and snakes mesh*? J. Soil Water Conserv. 60(2):33A-35A. http://www.tc.umn.edu/~smit4155/Erosion%20Mesh%20Lit/Barton%20and%20KinKead%202005.pdf

[3] Kapfer, J.M., and R.A. Paloski. (2011). *On the threat to snakes of mesh deployed for erosion control and wildlife exclusion*. Herpetol. Conserv. Biol. 6:1-9. http://www.herpconbio.org/Volume_6/Issue_1/Kapfer_Paloski_2011.pdf

However, several temporary erosion and sediment control products with netting – such as mulch control netting, erosion control blankets, and fiber rolls – are commonly left in place permanently, particularly when used while seeding or otherwise re-vegetating the site. Because the new vegetation grows up through the netting, the plants would likely be damaged if the erosion or sediment control product were to be removed.

The length of time it takes for plastic netting to begin to degrade depends on the netting composition and design, and the environmental conditions. When plastic netting does eventually fall apart, plastic fragments may be blown or washed into waterways and the ocean, creating an entanglement and ingestion hazard for marine life, potentially for many years. Due to its durability, buoyancy, and ability to concentrate toxins present in the ocean, plastic can be very harmful to marine life.[4] Fortunately, there are many temporary erosion and sediment control products available that do not contain plastic netting.

Biodegradable vs. Degradable Netting

The netting used in temporary erosion and sediment control products can be made of either natural fiber or synthetic plastic materials. Both natural-fiber and synthetic netting are available in a range of tensile strengths and longevity to meet various needs.

Biodegradable Netting

Only natural-fiber netting meets the definition of "biodegradable," which means that the material decomposes into elements found in nature within one year after customary disposal.[5] Common choices of biodegradable natural-fiber netting include jute, sisal, and coir (coconut husk fibers).

Degradable Plastic Netting

Synthetic plastics ("polymers") used to make the netting in erosion and sediment control products are most commonly derived from petrochemicals, and include polypropylene, nylon, polyethylene, and polyester. Usually plastic netting is "extruded" (i.e., plastic resin is melted and formed into a continuous mesh, with fixed joints between the strands). Alternatively, plastic may be formed into yarn or strands that are woven into netting.

Petroleum-based plastics are "degradable," which means they break down into plastic fragments that remain in the environment after degradation. Degradable is thus <u>not</u> the same as biodegradable, as it may take many years for the plastic fragments to break down into small enough pieces that they can be digested by microorganisms. Degradable plastic netting may also be labeled photodegradable, UV-degradable, oxo-degradable, or oxo-biodegradable (however, this is not truly biodegradable).

- ***Photodegradable or UV-degradable Plastic***

Photodegradable or UV-degradable plastics are designed so that after a certain period of time, ultraviolet (UV) stabilizers in the plastic cease functioning, and where exposed to sunlight the plastic will begin to break down into fragments. The parts of the netting not exposed to light (such as the underside of an erosion control blanket) may take much longer to photodegrade.

[4] California Coastal Commission. *Marine Debris* webpage. http://www.coastal.ca.gov/publiced/marinedebris.html

[5] U.S. Federal Trade Commission. (2012). *Guides for the Use of Environmental Marketing Claims ("Green Guides).* § 260.8 Degradable claims. https://www.ftc.gov/policy/federal-register-notices/guides-use-environmental-marketing-claims-green-guides

Photodegradable plastic erosion control netting has been found intact on project sites up to eight years after installation.[6]

- ***Oxo-degradable or Oxo-biodegradable Plastic***

Oxo-degradable or oxo-biodegradable plastic has a chemical additive that helps speed up degradation of the plastic, as long as the necessary elements of oxygen and microorganisms are available, and leave a residue of plastic pellets in the environment.

Bio-plastics

Although not yet available for netting used in erosion and sediment control products, there are also "bio-plastics" on the market that are made from agricultural crops (such as corn, palm, or bamboo). Some bio-plastics require special industrial composting in order to biodegrade. Note that some plastics labeled "bio-based plastics" are blends of crop-based and petrochemical-based materials (such as a blend of cornstarch and polyester), which leave a plastic residue in the environment when they degrade.

Temporary Erosion Control Products with Netting

Temporary "Rolled Erosion Control Products" (RECPs) are flexible nets, blankets, or mats that are unrolled to cover exposed soil surfaces, typically on slopes. These products are used to reduce erosion from rainfall and wind, hold moisture near the soil surface to promote seed germination, and stabilize soils until vegetation is established. Most temporary RECPs contain netting, either used by itself or used to bind loose fiber materials to form a blanket or mat.

Temporary RECPs are usually used while seeding, but may also be used to protect exposed soils when seeding would not be successful (such as late in the season). These products are commonly left in place permanently, but are called "temporary" because they are designed to degrade. Their effective longevity is typically designed to range from six months to five years, depending on the materials used.

Temporary Rolled Erosion Control Product (RECP)

Netting by Itself

RECPs composed entirely of netting go by many names, including mulch control netting, erosion control netting, soil netting, erosion control mat, jute mesh or netting, and coir mesh or netting. Because these products are woven with open spaces (apertures) in the netting, they are also classified as open-weave textiles. Mulch control netting is a woven natural-fiber or synthetic plastic mesh used to stabilize a loose mulch layer (such as straw or wood fiber), usually after seeding. Other erosion-control netting products have a more tightly-woven construction, which enables them to provide erosion control without the use of an underlying loose mulch layer.

[6] Walley, H.D., R.B. King, J.M. Ray, and J. Robinson. (2005). *What should be done about erosion mesh netting and its destruction of herpetofauna?* J. Kansas Herpetol. 16:26-28. http://www.tc.umn.edu/~smit4155/Erosion%20Mesh%20Lit/Walley%20et%20al.%202005.pdf

Synthetic plastic netting in these products is commonly made of polypropylene or polyester; natural-fiber netting is commonly made of coir or jute.

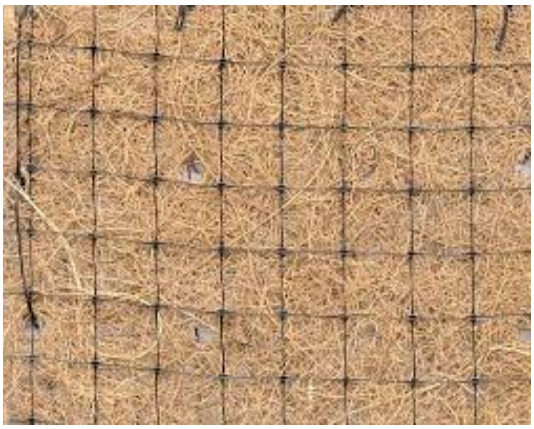
Coir mulch control netting

Jute mulch control netting

Although jute is a natural plant fiber, be aware that some manufacturers use the term "jute" in labeling a variety of synthetic netting products (such as polypropylene "Poly Jute") that mimic the look of natural fibers, but are actually made of plastic.

Erosion Control Blankets Made with Netting

An erosion control blanket is a manufactured product composed of natural or synthetic plastic fibers bound together to form a continuous mat (the "matrix'), usually with netting (natural or synthetic plastic) on both sides. The most common matrix materials are natural-fibers, such as straw, coir, or excelsior (fine curled wood fibers, usually aspen). Synthetic matrix materials (such as polypropylene) are also available. Erosion control blankets are available with netting on one or both sides, and there are also net-less blankets (for example, composed of excelsior). The netting may be made of either natural fibers (usually coir or jute) or synthetic plastic (usually polypropylene or nylon). The plastic netting is much less expensive than natural-fiber netting. This netting comes in a variety of mesh sizes; ½-inch and 1-inch openings are common sizes.



Coir erosion control blanket with plastic netting

Close-up of extruded plastic netting

These blankets can be composed of all natural-fiber materials, all synthetic plastic materials, or a combination of both natural and synthetic plastic. The netting is often stitched to the matrix, either with a synthetic thread (such as polypropylene) or a natural-fiber thread (such as cotton). A natural-fiber matrix (such as straw or coir) bound with plastic netting is a very widely-used type of erosion control blanket. Be aware that products with a natural-fiber matrix are often misleadingly labeled "biodegradable" even when the netting is synthetic plastic.

To be considered 100% biodegradable (which is the environmentally preferable option), all components of an erosion control blanket (including matrix, netting, and thread) must be made of natural-fiber materials, not just the matrix fibers. If a blanket with a straw matrix is used, certified weed-free straw should be used to avoid contributing to the spread of invasive weeds.

Temporary Sediment Control Products with Netting

Temporary sediment control products (such as fiber rolls and silt fences) are used to retain sediment from construction activities onsite. They function by slowing runoff down long enough for any sediment in the water to settle out. Fiber rolls are commonly left in place permanently, and are designed to degrade; silt fences are typically removed after construction is complete. The effective longevity of these products typically ranges from six months to five years, depending on the materials used.

Fiber Rolls

Fiber rolls (also called fiber logs or straw wattles) are prefabricated tubular products filled with a natural-fiber material (such as wheat straw, rice straw, coconut fiber, flax, or compost) and wrapped with netting. Fiber rolls may also be rolled tubes of erosion control blankets. They are available in a variety of sizes. The most common type of netting used in fiber rolls is plastic netting (such as UV-degradable polypropylene). Alternative biodegradable natural-fiber netting choices are available, including burlap, jute, or coir.

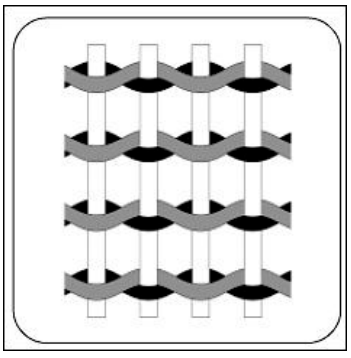
Reinforced Silt Fences

A silt fence is a temporary sediment control product used as a barrier to sediment leaving the site in stormwater runoff. It is constructed of a woven synthetic plastic filter fabric (e.g., polypropylene, nylon, polyester, or polyethylene yarn), commonly referred to as "geotextile fabric," stretched between supporting poles and entrenched. Silt fences are sometimes backed by metal or plastic mesh (such as polypropylene or nylon) to provide reinforcement in the event of a heavy sediment load; these may be referred to as heavy-duty or reinforced silt fences. This plastic netting commonly has a mesh size of about one inch square. Snake mortality due to entanglement in the plastic mesh of a reinforced silt fence has been documented.[7] In addition, if any silt fence, reinforced or not, is left in place until the geotextile fabric begins to fray and develop holes, this may also create a wildlife entanglement hazard.

Wildlife-Friendly Netting Designs & Practices

Loose-Weave Netting

An important factor in wildlife-safe netting design is to have movable (not fixed or welded) joints between the horizontal and vertical twines, thus allowing the twines to move independently. This design allows each opening (aperture) between the twines in the netting to be stretched as an animal passes through, thus reducing the potential for entrapment. Netting designs with movable joints may be called loose weave, leno weave, or gauze weave.



Loose-Weave Netting

[7] Black, R. (2003). *Conservation Advisory: Heavy duty silt fence may cause high mortality in large-bodied snake species*. Ministry Natural Resources. Ontario, Canada. http://www.massasauga.ca/pub_docs/Advisory_silt_fence.pdf

Mesh Size

Little research has been done on the optimal mesh size (i.e., opening size) in netting to avoid wildlife entrapment, which is likely to vary depending on the particular wildlife expected in the area. Snakes may be particularly vulnerable to entanglement in netting if they get stuck partway through, but can't back out because their scales catch on the netting.

Logically, mesh with an opening that is either too small for wildlife to attempt to pass through, or too large to impede the passage of wildlife, would reduce the threat of entrapment. However, small meshes may still entangle juvenile snakes and other small wildlife, such as frogs. Conversely, large mesh size alone may not be sufficient to eliminate the threat to wildlife, as large-bodied snakes have been found entangled even in netting with relatively large (one inch square) mesh openings.[8] Mesh size is of particular concern for plastic netting with fixed joints; however, natural-fiber netting may still pose an entanglement threat to snakes, particularly if the mesh opening is small and the weave is tight.

One small, unpublished study (sponsored by a netting manufacturer) of snakes tested in captivity found that among plastic netting with fixed joints, the commonly used ½-inch square mesh resulted in several snake entanglements, whereas larger mesh sizes (3 x 3, 3 x 4, or 1.7 x 0.8 inches), and an elongated rectangular mesh with a smaller, ¼-inch opening in one direction (1.25 x 0.25 inches), did not entangle any snakes.[9] Natural-fiber netting with movable joints (3 x 3 inches mesh size) also did not entangle any snakes. The manufacturer thus promotes their fixed-joint plastic netting with an elongated rectangular opening as "wildlife-friendly." However, this study did not separately test the effects of mesh size, opening shape, and whether the mesh joints are movable or fixed, which makes it difficult to draw conclusions about the optimal mesh size and shape.

Natural-Fiber Materials

Biodegradable natural-fiber erosion and sediment control products (including netting, filling, and thread) are more wildlife-friendly than synthetic plastic products. Natural-fiber netting typically has less tensile strength than extruded plastic netting, and thus may allow entrapped wildlife to break free. Unlike plastic netting, natural-fiber netting will not remain on the site entrapping wildlife long after its erosion or sediment control purpose has been served. In addition, natural-fiber netting will not leave a residue of plastic in the environment after degradation.

Erosion Control Products without Netting

There are several choices of erosion and sediment control products that do not contain netting. These include net-less erosion control blankets (for example, made of excelsior), loose mulch, hydraulic mulch, soil binders, unreinforced silt fences, and straw bales.

Prompt Removal of Products

"Temporary" erosion and sediment control products are commonly left in place permanently, particularly if vegetation has grown up through the netting. Prompt removal of these products when they are no longer needed is advisable, if it is possible to do so without damaging the new vegetation.

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[8] Kapfer, J.M., and R.A. Paloski. (2011). *On the threat to snakes of mesh deployed for erosion control and wildlife exclusion*. Herpetol. Conserv. Biol. 6:1-9. http://www.herpconbio.org/Volume_6/Issue_1/Kapfer_Paloski_2011.pdf

[9] Conwed Global Netting Solutions. *Netting design reduces snake entanglements with no impact on ECBs performance*. http://www.tc.umn.edu/~smit4155/Erosion%20Mesh%20Lit/Snake%20Case%20Study.pdf

Summary of Recommendations

To minimize wildlife entanglement and plastic debris pollution, choose temporary erosion and sediment control products that either do not contain netting, or that contain netting manufactured from 100% biodegradable non-plastic materials such as jute, sisal, or coir fiber. Degradable, photodegradable, UV-degradable, oxo-degradable, or oxo-biodegradable plastic netting (including polypropylene, nylon, polyethylene, and polyester) are not acceptable alternatives. All netting materials used should have a wildlife-safe, loose-weave design with movable joints between the horizontal and vertical twines, allowing the twines to move independently and thus reducing the potential for wildlife entanglement. Avoid the use of silt fences reinforced with metal or plastic mesh. When no longer required, temporary erosion and sediment control products should be promptly removed.

Plastic-Free Netting Requirements by Other California State Agencies

Several other California State agencies now require development projects to use wildlife-friendly plastic-free netting in erosion and sediment control products, wherever feasible. For example:

- **North Coast Regional Water Quality Control Board –** Standard Condition in Water Quality Certifications. For example, see Condition 12, Pg. 7: http://www.waterboards.ca.gov/northcoast/board_decisions/water_quality_certification/pdf/2012/120113_erka_hiksari_401.pdf
- **California Department of Fish and Wildlife, Region 1 (Northern Region) –** Standard Condition in Lake or Streambed Alteration Agreements. https://www.wildlife.ca.gov/Conservation/LSA
- **Caltrans –** Requirement in 2013 NPDES Statewide Storm Water Permit and Waste Discharge Requirements for the California Department of Transportation. Pg. 19: http://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2012/wqo2012_0011_dwq.pdf
- **State Water Resources Control Board –** Review Guidance for California's Statewide Construction General Permit. Pg. 8: http://www.swrcb.ca.gov/water_issues/programs/stormwater/docs/training/cgp_review_issue2.pdf

Additional References

- California Herps. (2016). *"Wildlife Netting" or Any Other Kind of Synthetic Netting Can Trap and Kill Herps.* Living with Wild Reptiles and Amphibians webpage. (Includes photos of snakes and lizards entangled in synthetic netting). http://www.californiaherps.com/info/livingwithherps.html
- Leatherman, B.M. (1996). *Phrynosoma coronatum blainvillii (San Diego horned lizard) conservation.* Herpetol. Review 27(2):80. (Documented the death of a San Diego Horned Lizard (*Phrynosoma cononatum blainvillii*) entangled in an erosion control blanket). https://www.zenscientist.com/index.php/pdflibrary1/func-finishdown/1142/
- Low, J. (2005). *Synthetic netting nabs serpents*. Life History Notes. J. Kansas Herpetol. 13:9. (Documented thirteen Common Garter Snakes (*Thamnophis sirtalis*) entangled in synthetic erosion control netting). http://home.gwu.edu/~rpyron/publications/McNearney_et_al_2005.pdf
- Walley, H.D., R.B. King, J.M. Ray, and J. Robinson. (2005). *Erosion mesh netting: a major threat hazard to snakes*. Bulletin of the Maryland Herpetological Society 41(1):36-38. (Documented the death of three adult Eastern Milk Snakes (*Lampropeltis t. Triangulum*) and one Northern Black Racer (*Coluber c. constrictor*) snake entangled in plastic silt netting).