

Optimized Fire Suppression Formula for Large-Scale Fires

Key Ingredients (Per 10 Liters of Solution):

- Water (preferably warm): 8 liters (80%)
- Biodegradable detergent (e.g., castile soap, soap nut extract): 1 liter (10%)
- Baking soda (sodium bicarbonate): 500 g (5%)
- Citric acid: 200 g (2%)

Optional Additives:

- Borax (sodium borate) for fire retardancy: 100 g (1%)
- Bentonite clay or biochar for smothering: 200–500 g (2–5%)

Optional Thickener:

- Xanthan gum or agar-agar for foam stability: 30 g (0.3%)

Mixing Instructions:

1. Dissolve thickener in warm water to create a gel base (if using).
2. Mix baking soda and borax in a separate container.
3. Prepare a soapy solution by dissolving the detergent in water.
4. Combine all ingredients in the water base, adding citric acid last for froth activation.
5. Stir or agitate continuously during application to prevent separation.

Key Benefits:

- Non-toxic, environmentally friendly, and biodegradable.
- Produces stable foam that clings to surfaces and resists wind/heat.
- Smothers flames by displacing oxygen and cooling surfaces.

Application Notes:

- Use foam sprayers or firefighting systems for effective deployment.
- Ensure adequate mixing and agitation to maintain solution consistency.
- Test on small fires before scaling up for larger use cases.

Performance Goals:

- Foam stability under windy and hot conditions for at least 5–10 minutes.
- Effective suppression within 3 minutes for small fires.
- Minimal environmental residue, verified as biodegradable.

Prepared for: Field Testing and Large-Scale Fire Trials (e.g., State of California)