# ONE **AGENCY**. ONE **MISSION**.



As natural climate solutions grow in popularity, attention is shifting to forests as a net carbon sink. Forests accumulate carbon when trees absorb carbon dioxide (CO2) from the atmosphere during photosynthesis, becoming a carbon sink. The carbon from CO2 is then stored for a long time as woody biomass, leaf litter, deadwood and soil organic carbon. The total amount of carbon stored within a healthy forest is becoming a potential source of income for forest landowners through carbon offset markets.

#### CARBON OFFSETS

Carbon offsets are any activity that compensates for the emission of greenhouse gases (GHGs). Forestry activities include forest conservation, reforestation or afforestation, and improving forest management. These activities represent natural climate solutions that may be eligible for carbon credits. Carbon offset projects are issued carbon credits for the amount of carbon dioxide equivalent (CO2e) the project provides. Carbon dioxide is the most impactful GHG, therefore all other GHGs are compared to CO2. Typically, one carbon credit is issued for one metric ton of CO2e, about the same amount of CO2 one tree will absorb in 40 years. These carbon credits can then be bought and sold through a carbon market.

## **Quick Facts**

- Dried trees are about 50% carbon, by weight.
- About 50% of the total carbon in a forest is stored in the soil.



## **Compliance Markets**

California's Cap-and-Trade Program and the Regional Greenhouse Gas Initiative (blue) are compliance markets in the United States, which set limits on GHG emissions. Apart from carbon, Texas' Highly Reactive Volatile Organic Compound Emissions Capand-Trade Program is a compliance market.

#### **Carbon Calculations**

The CO2e of any GHG is calculated by multiplying the amount of the particular GHG by its global warming potential (GWP). The U.S. Environmental Protection Agency defines the GWP as "how much energy the emissions of one ton of a gas will absorb over a given period of time, relative to the emissions of one ton of carbon dioxide."

Gas Compound	20 Year GWP	100 Year GWP
Carbon Dioxide (CO2)	1	1
Methane (CH4)	84	25
Nitrous Oxide (N2O)	264	298
HFC-134a	3710	1430
CFC-11	6900	7390
Carbon tetraflouride (CF4)	4880	17200

 $CO2e = GHG \times GWP = 4 \text{ tons } CH4 \times 25 = 100 \text{ tons } of CO2e$ 

\*Methane (CH4) has a GWP of 25, meaning 4 tons of CH4 released into the atmosphere will trap as much heat as 100 tons of CO2.

#### CARBON MARKETS

Carbon markets can be either voluntary or regulatory (compliance). Governments regulate compliance markets. Voluntary carbon markets are composed of individuals, companies, and governments committed to minimizing their carbon footprint. Accordingly, organizations reduce their GHG emissions and purchase carbon credits in carbon markets to compensate for any remaining GHG emissions. Carbon credits are issued and traded through a carbon registry. Frequently, private companies will work with landowners to develop, enroll and validate carbon offset projects.

## **CARBON REGISTRY**

Carbon registries operate as a marketplace for carbon credits. Before a carbon credit can be registered for sale, an independent third party must verify that an approved protocol was followed to measure the amount of CO2e . Upon successful verification, carbon credits are issued and tracked with a unique serial number to prevent double counting. Registries must address the following requirements:

**Additionality** – carbon credits must only be issued for projects that otherwise would not have occurred in the absence of the issued credit.

**Leakage** – carbon offset projects must not shift CO2 emissions elsewhere as a consequence of the project.

**Permanence** – carbon offsetting projects must not be reversed before the allotted time after the issuance of the carbon credit.

**Exclusive** – carbon credits must be issued for at least one metric ton of CO2e and to only one entity for each credit.

**Verified** – carbon credits must be quantified based on scientific evidence, verified through a third-party, and enrolled in a credible carbon registry.

