|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | <--- 1 m ---> |   |  |   |  |   |  |   |  |   |  |
| <1m> | Ginseng GI) | 1/2 meter | BC | 1/2 meter | FU | 1/2 meter | VS | 1/2 meter | GO | 1/2 meter | GI |
| 1/2 meter |   |   |   |   |   |   |
|  | Goldenseal (GO) | GI | BC | FU | VS | GO |
| 1/2 meter |   |   |   |   |   |   |
|  | VA Snakeroot (VS) | GO | GI | BC | FU | VS |
| 1/2 meter |   |   |   |   |   |   |
|  | F. Unicorn (FU) |   | VS |   | GO |   | GI |   | BC |   | FU |
| 1/2 meter |   |   |   |   |   |   |   |   |   |   |   |
|  | Black Cohosh (BC) |   | FU |   | VS |   | GO |   | GI |   | BC |

Figure 1. planting design for FFN private landowner trials



Figure 2. Block 1 of large planting scheme



Figure 3. Block 2 of large planting scheme



Figure 4. Block 3 of large planting scheme

Figure 5. Relationship between ginseng root weight and vegetation weights of plants harvested from the UGA experimental forest in 2011.

Figure 6. Relationship between false unicorn root weight and vegetation weights of plants harvested from the UGA experimental forest in 2011.

Figure 7. Relationship between goldenseal root weights and vegetation weights of plants harvested from the UGA experimental forest planting in 2011.

Figure 8. Relationship between ginseng root and vegetation weights of plants harvested from Catawba Sustainability Center in 2012

Figure 9. Relationship between green root weight and number of leaflets for ginseng plants harvested from the Catawba Sustainability Center in 2012.

Figure 10. Relationship between goldenseal green root weights and green leaf weights for plants harvested from the Catawba Sustainability Center plantings in 2012.

Figure 11. Relationship between goldenseal green leaf diameter (cm) and green root weights (grams) for plants harvested from the Catawba Sustainability Center plantings in 2012



Figure 12. Ginseng growth in sites with and without Japanese stilt grass suggests that the invasive plant may improve ginseng production.

Table 1. Soil and other ecological factors of planting sites for FFN participants, including the McCormick Farm.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Location** | **P (lb/ac)** | **K (lb/ac)** | **Ca (lb/ac)** | **Mg (lb/ac)** | **Zn (ppm)** | **Mn (ppm)** | **Cu (ppm)** | **Fe (ppm)** | **B (ppm)** | **pH** |
| AR | 4 | 161 | 2879 | 374 | 1.2 | 12.5 | 0.4 | 6.3 | 0.8 | 6.8 |
| BH | 6 | 96 | 1745 | 116 | 1 | 11.8 | 0.2 | 3.8 | 0.6 | 6.71 |
| BK | 5 | 78 | 1404 | 189 | 2.5 | 18.9 | 0.2 | 8.1 | 0.3 | 5.9 |
| BW | 4 | 42 | 141 | 54 | 1.2 | 5.2 | 0.5 | 16.7 | 0.2 | 5 |
| CSC | 4 | 144 | 703 | 131 | 1.7 | 9.7 | 0.3 | 17.1 | 0.2 | 5.4 |
| DF | 4 | 135 | 296 | 113 | 2.7 | 17 | 0.2 | 43 | 0.2 | 5.1 |
| DM | 4 | 136 | 549 | 119 | 1 | 10.2 | 0.3 | 8.9 | 0.2 | 5.3 |
| DR | 6 | 383 | 1119 | 493 | 1.5 | 10.5 | 0.5 | 33 | 0.5 | 5.5 |
| GS | 4 | 101 | 283 | 76 | 1.6 | 13.5 | 0.3 | 27.5 | 0.2 | 4.9 |
| JB | 9 | 182 | 7377 | 344 | 5.1 | 32.8 | 0.2 | 10.7 | 1.4 | 6.8 |
| JL | 4 | 202 | 2094 | 367 | 2.7 | 8.6 | 0.2 | 3.8 | 0.5 | 6.5 |
| JW | 5 | 153 | 558 | 179 | 2.2 | 11.2 | 0.5 | 24.5 | 0.2 | 5.1 |
| LG | 11 | 125 | 1110 | 164 | 1.4 | 13.2 | 0.2 | 13.3 | 0.3 | 5.6 |
| MF-B1-T1 | 9 | 72 | 570 | 86 | 1.6 | 13.5 | 0.2 | 7.7 | 0.2 | 5.2 |
| MF-B2-T1 | 9 | 72 | 570 | 86 | 1.6 | 13.5 | 0.2 | 7.7 | 0.2 | 5.2 |
| MF-B3-T1 | 14 | 99 | 789 | 117 | 1.4 | 16.7 | 0.2 | 8.8 | 0.3 | 5.3 |
| RG | 9 | 193 | 1931 | 152 | 0.9 | 14.8 | 0.3 | 5 | 0.4 | 6.8 |
| SW | 5 | 153 | 558 | 179 | 2.2 | 11.2 | 0.5 | 24.5 | 0.2 | 5.1 |
| TV | 4 | 154 | 723 | 124 | 1.4 | 5.4 | 0.2 | 15.7 | 0.2 | 5.1 |
|   |  |  |  |  |  |  |  |  |  |  |
| minimum | 4.0 | 42.0 | 141.0 | 54.0 | 0.9 | 5.2 | 0.2 | 3.8 | 0.2 | 4.9 |
| mean | 6.3 | 141.1 | 1336.8 | 182.3 | 1.8 | 13.2 | 0.3 | 15.1 | 0.4 | 5.6 |
| maximum | 14.0 | 383.0 | 7377.0 | 493.0 | 5.1 | 32.8 | 0.5 | 43.0 | 1.4 | 6.8 |
|   |   |   |   |   |   |   |   |   |   |   |
| **Location** | **Buffer Index** | **CEC (meq/100g)** | **% Acidity** | **% Base Saturation** | **% Cation Saturation** | **% Mg Saturation** | **% K Saturation** | **FSQI Value** | **Slope %** | **Aspect** |
| AR | 6.4 | 9 | 0.7 | 99.3 | 79.9 | 17.1 | 2.3 | 10 | 51 | 64 |
| BH | 6.27 | 10.7 | 7.2 | 92.8 | 81.5 | 8.9 | 2.3 | 9 | 50 | 305 |
| BK | 6.14 | 5.9 | 26 | 74 | 59.1 | 13.1 | 1.7 | 13 | 13 | 14 |
| BW | 5.78 | 4.3 | 85.4 | 14.6 | 8.2 | 5.2 | 1.3 | 12 | 25 | 38 |
| CSC | 5.87 | 5.6 | 55.9 | 44.1 | 31.2 | 9.6 | 3.3 | 7 | 57 | 336 |
| DF | 5.81 | 4.9 | 71.8 | 28.2 | 15.1 | 9.5 | 3.5 | 12 | 30 | 52 |
| DM | 5.92 | 4.9 | 58.3 | 41.7 | 28.1 | 10 | 3.6 | 13 | 47 | 30 |
| DR | 6.09 | 7.2 | 25.7 | 74.3 | 39 | 28.4 | 6.9 | 7 |  | 119 |
| GS | 5.67 | 5.5 | 79 | 21 | 12.9 | 5.7 | 2.4 |  |  |  |
| JB | 6.34 | 20.4 | 1.8 | 98.3 | 90.2 | 6.9 | 1.1 | 7 | 40 | 280 |
| JL | 6.27 | 7.8 | 9.9 | 90.1 | 67.3 | 19.5 | 3.3 | 8 | 24 | 245 |
| JW | 5.59 | 7.1 | 67.4 | 32.6 | 19.5 | 10.3 | 2.8 | 9 | 35 | 260 |
| LG | 5.88 | 6.7 | 46.1 | 53.9 | 41.4 | 10.1 | 2.4 | 12 | 25 | 28 |
| MF-B1-T1 | 60.1 | 4.2 | 55.3 | 44.7 | 34 | 8.5 | 2.2 | 12 | 9 | 2 |
| MF-B2-T1 | 60.1 | 4.2 | 55.3 | 44.7 | 34 | 8.5 | 2.2 | 11 | 2 | 300 |
| MF-B3-T1 | 5.92 | 5.4 | 52.5 | 47.5 | 36.3 | 8.9 | 2.3 | 12 | 3 | 352 |
| RG | 6.37 | 5.9 | 3.1 | 97 | 82.1 | 10.7 | 4.2 | 12 | 23 | 31 |
| SW | 5.59 | 7.1 | 67.4 | 32.6 | 19.5 | 10.3 | 2.8 | 9 | 35 | 260 |
| TV | 5.81 | 6 | 58.2 | 41.8 | 30 | 8.5 | 3.3 | 7 | 34 | 270 |
|   |  |  |  |  |  |  |  |  |  |  |
| minimum | 5.6 | 4.2 | 0.7 | 14.6 | 8.2 | 5.2 | 1.1 | 7.0 | 2.0 |  |
| mean | 11.7 | 7.0 | 43.5 | 56.5 | 42.6 | 11.0 | 2.8 | 10.1 | 29.6 |  |
| maximum | 60.1 | 20.4 | 85.4 | 99.3 | 90.2 | 28.4 | 6.9 | 13.0 | 57.0 |  |
|   |   |   |   |   |   |   |   |   |   |   |
|   |   |   |   |   |   |   |   |   |   |   |
| **Location** | **Slope Position** | **Oak SI (ft)** | **Elevation (ft)** |  |  |  |  |  |  |  |
| AR | 2 | 70 |  |  |  |  |  |  |  |  |
| BH | 4 | 65 | 1914 |  |  |  |  |  |  |  |
| BK | 4 | 80 | 2117 |  |  |  |  |  |  |  |
| BW | 1 | 75 | 2568 |  |  |  |  |  |  |  |
| CSC | 2 | 60 | 2131 |  |  |  |  |  |  |  |
| DF | 3 | 75 | 2580 |  |  |  |  |  |  |  |
| DM | 5 | 80 | 2316 |  |  |  |  |  |  |  |
| DR | 2 | 50 | 2111 |  |  |  |  |  |  |  |
| GS |  |  | 2578 |  |  |  |  |  |  |  |
| JB | 2 | 60 | 2020 |  |  |  |  |  |  |  |
| JL | 3 | 60 | 2899 |  |  |  |  |  |  |  |
| JW | 5 | 65 | 1819 |  |  |  |  |  |  |  |
| LG | 2 | 75 | 2788 |  |  |  |  |  |  |  |
| MF-B1-T1 | 4 | 75 | 1800 |  |  |  |  |  |  |  |
| MF-B2-T1 | 3 | 72 | 1800 |  |  |  |  |  |  |  |
| MF-B3-T1 | 3 | 75 | 1800 |  |  |  |  |  |  |  |
| RG | 4 | 75 | 1905 |  |  |  |  |  |  |  |
| SW | 5 | 65 | 2774 |  |  |  |  |  |  |  |
| TV | 2 | 60 | 2751 |  |  |  |  |  |  |  |
|   |  |  |  |  |  |  |  |  |  |  |
| minimum | 1.0 | 50.0 | 1800.0 |  |  |  |  |  |  |  |
| mean | 3.1 | 68.7 | 2259.5 |  |  |  |  |  |  |  |
| maximum | 5.0 | 80.0 | 2899.0 |  |  |  |  |  |  |  |

Table 2. Soil conditions of the three sites on the UGA forest that were planted.

|  |  |
| --- | --- |
|   | Block |
|   | 1 | 2 | 3 |
| pH (soil water) | 4.77c | 5.07b | 5.74a |
| pH (CaCl2) | 4.04c | 4.28b | 5.03a |
| g-C/100 g-soil | 3.39b | 3.29b | 11.98a |
| g-N/100 g-soil | 0.13b | 0.13b | 0.48a |
| C:N | 25.93a | 25.67a | 24.24a |
| meq Ortho-P/100g-soil | 1.07a | 0.66a | 0.75a |
| meq Ca/100g-soil | 1.15b | 0.97b | 3.69a |
| meq K/100g-soil | 0.16b | 0.15b | 0.24a |
| cmol exchangeable acidity/kg-soil | 1.46a | 1.04b | 0.21c |
| meq CEC/100g-soil | 3.23b | 2.71b | 5.42a |
| % base saturation | 53.7b | 60.7b | 95.2a |

Table 3. Overall plant survival of species planted by private landowners of the FFN.

|  |  |
| --- | --- |
| **Species** | **Mean** **(Std Dev)** |
| Ginseng | 11.4 (6.5) |
| Goldenseal | 14.6 (6) |
| Virginia Snakeroot | 3.9 (4.9) |
| False unicorn | 0 |
| Black cohosh | 0 |

Table 4. 2012 survival of species planted at the McCormick farm in 2010, reported by treatment.

|  |  |  |
| --- | --- | --- |
|  | **Treatment** |  |
| Species | T1 – No Disturb | T2 – Rake | T3 – Till | Mean |
| Black cohosh | 0 | 0 | 0 | 0 |
| False unicorn | 10.1 (3.4) | 12.8 (4.6) | 15.0 (2.6) | 12.63 (3.53) |
| Ginseng | 10.6 (3.9) | 10.5 (4.8) | 6.0 (3.6) | 9.0 (4.1) |
| Goldenseal | 10.9 (4) | 7.9 (3.8) | 7.6 (3.5) | 8.8 (3.76) |

Table 5. Overall plant survival of species planted at the UGA experimental forest in 2010, reported by treatment.

|  |  |  |
| --- | --- | --- |
|  | **Treatment** |  |
| Species | T1 – No Disturb | T2 – Rake | T3 – Till | Mean |
| Black cohosh | 0 | 0 | 1.1 | 0.4 |
| False unicorn | 18.9 (2.9) | 17.4 (1.7) | 17.6 (3.4) | 17.9 (2.7) |
| Ginseng | 5.8 (2.2) | 7.4 (3.9) | 9.3 (3.5) | 7.5 (3.2) |
| Goldenseal | 5.6 (5.7) | 10.3 (3.4) | 10.1 (5.0) | 8.7 (4.7) |

Table 6. Demographic characteristics of FFN participants, and potential forest farmers.

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic** | **Response Category** | **Mean** | **Percent of Respondents** |
| **Primary motivations for collaborative conservation partnership membership\*** | Environmental |   | 79% |
| Educational |   | 79% |
| Economic |   | 46% |
| Social |   | 44% |
| **Initial information source about collaborative conservation partnership** | Word of mouth |   | 46% |
| Presentation |   | 25% |
| Other organization |   | 16% |
| Advertisement |   | 15% |
| **Belong to multiple conservation groups** |   |   | 60% |
| **Gender** | Male |   | 59% |
| Female |   | 36% |
| Both (a couple) |   | 5% |
| **Household Annual Income** |   | $55,000-$99,000 |   |
| **Age** |   | 55-64 |   |
| **Race** |   |   |   |
| **Educational Attainment** |   | Bachelor's Degree |   |
| **Acres forestland owned** |   | 95 |   |
| **Years of land tenure** |   | 24 |   |
| **Primary residence** |   |   | 75% |
| **Primary ownership motivations** | Live there |   |   |
| Appreciate the woods/aesthetics/privacy |   |   |
| Recreation |   |   |
| **Most common harvest objectives** | Improve forest health |   | 44% |
| Achieve objectives in management plan |   | 44% |
| Obtain products for personal use |   | 41% |
| **Primary land management information sources** | Virginia Department of Forestry |   | 87% |
| Conservation organizations |   | 57% |
| Extension/university personnel |   | 55% |
| Private consultant |   | 49% |
| **Diffusion of Innovations Adopter Categories** | Innovators |   | 53% |
| Majority |   | 21% |
| Laggards |   | 26% |

Table 7. Descriptive statistics for ginseng root and vegetation harvested from the UGA experimental forest plantings in 2011.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   |   | **Total** | **Root** | **Vegetation** |
| **Count** | 158 | 158 | 158 |
| **mean** | 0.386 | 0.120 | 0.265 |
| **maximum** | 1.779 | 0.759 | 1.197 |
| **minimum** | 0.111 | 0.001 | 0.049 |
| **skew** | 3.078 | 2.826 | 3.036 |
| **kurtosis** | 12.696 | 10.638 | 14.255 |
| **variance** | 0.060 | 0.013 | 0.020 |
| **std. deviation** | 0.246 | 0.115 | 0.143 |
| **Pearson** |  |   0.820 |   |   |

Table 8. Descriptive statistics for false unicorn root and vegetation harvested from the UGA experimental forest plantings in 2011.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Total** | **Root** | **Vegetation** |
| **Count** | 161 | 161 | 161 |
| **Min** | 0.50 | 0.50 | 0.00 |
| **Max** | 16.00 | 15.50 | 5.00 |
| **Mean** | 3.52 | 2.53 | 0.99 |
| **Stdev** | 2.74 | 2.35 | 0.86 |
| **Variance** | 7.52 | 5.54 | 0.73 |
| **Pearsons** | 0.31 |  |   |

Table 9. Descriptive statistics for goldenseal root and vegetation harvested from the UGA experimental forest plantings in 2011.

|  |  |  |  |
| --- | --- | --- | --- |
|   | **Total** | **Root** | **Vegetation** |
| **Count** | 82 | 82 | 82 |
| **Min** | 0.5 | 0 | 0 |
| **Max** | 4 | 2 | 2 |
| **Mean** | 1.43 | 0.88 | 0.55 |
| **Stdev** | 0.69 | 0.44 | 0.40 |
| **Variance** | 0.48 | 0.19 | 0.16 |
| **Pearsons** | 0.37 |  |   |